



# WEST CHATFIELD AVENUE CORRIDOR STUDY

*Jefferson County Project No. 5-69-33-3524*

Final Report  
December 9, 2004

MULLER

CHATFIELD AVENUE  
CORRIDOR STUDY



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**Table 1: Abbreviations and Acronyms**

|        |   |
|--------|---|
| SF     | Square Feet   |
| CFS    | Cubic Feet per Second   |
| SEC    | Seconds   |
| VPD    | Vehicles Per Day  |
| ADT    | Average Daily Traffic   |
| LOS    | Level of Service  |
| ROW    | Right-of-Way  |
| DDBA   | Designated Dipping Bedrock Area                                       |
| RDCM   | Roadway Design and Construction Manual                                |
| MUTCD  | Manual on Uniformed Traffic Control Devices                           |
| UDFCD  | Urban Drainage and Flood Control District                             |
| FHAD   | Flood Hazard Area Delineation   |
| FEMA   | Federal Emergency Management Agency                                   |
| FHWA   | Federal Highway Administration  |
| AASHTO | American Association of State Highway and<br>Transportation Officials |
| CDOT   | Colorado Department of Transportation                                 |
| DWD    | Denver Water Department   |
| RTD    | Regional Transportation District                                      |

## **EXECUTIVE SUMMARY**

This study evaluates the West Chatfield Avenue corridor for roadway and pedestrian improvements. West Chatfield Avenue is a Minor Arterial Street within the Jefferson County roadway system. The Jefferson County Division of Highways and Transportation initiated a study of the West Chatfield Avenue Corridor to assess the existing conditions along the corridor, identify deficiencies, gather public input, and develop a conceptual plan for improvements along the corridor.

### **Existing Conditions Summary**

The West Chatfield Avenue corridor has been identified by Jefferson County as a corridor experiencing traffic growth and in need of enhancements. The projected year 2025 daily weekday traffic volume on West Chatfield Avenue are 17,000 vehicles per day (vpd) between West Ken Caryl Avenue and South Kipling Parkway; 18,000 vpd between South Kipling Parkway and South Wadsworth Boulevard; 20,500 vpd between South Wadsworth Boulevard and South Pierce Street; and 13,400 vpd from South Pierce Street to South Kendall Boulevard. The Jefferson County Roadway Design and Construction Manual (RDCM) (Revised October 2002) states that a roadway with an Average Daily Traffic (ADT) greater than 10,000 but less than 25,000 shall be a 4-lane minor arterial roadway section.

A total of 150 accidents occurred along the corridor between West Ken Caryl Avenue and South Kendall Boulevard, involving 303 vehicles, with 50 injury accidents and 1 fatality. Almost half of these accidents occurred at the South Kipling Parkway (34) and South Wadsworth Boulevard (40) intersections. The rest were evenly spaced along the three sections of the corridor – South Ken Caryl Avenue to South Kipling Parkway (26), South Kipling Parkway to South Wadsworth Boulevard (24), and South Wadsworth Boulevard to South Kendall Boulevard (26). One fatal accident was a broadside accident involving alcohol at South Sangre De Cristo Road on May 19, 2000. Since this accident, a signal was installed at this intersection.

The study area has been broken out into three segments. Segment 1 includes South Ken Caryl Avenue to South Kipling Parkway; Segment 2 includes South Kipling Parkway to South Wadsworth Boulevard; and Segment 3 includes South Wadsworth Boulevard to South Kendall Boulevard.

West Chatfield Avenue has two through lanes in each direction with medians and some auxiliary lanes for the entire length of Segment 1 and between South Kipling Parkway and South Everett Way in Segment 2. There is one lane in each direction with no median or auxiliary lanes between South Dudley Street to the

north leg of South Carr Street, and three lanes from South Carr Street to South Wadsworth Boulevard (one through lane eastbound and two westbound lanes) with a paved median for left turns. For Segment 3, there are four through lanes and auxiliary lanes between South Wadsworth Boulevard and South Quay Street. From South Pierce Street to the end of the project, there is one through lane in each direction and no medians or auxiliary lanes. The existing roadway has substandard grades and vertical curves in Segments 1 and 2. There are also substandard intersection sight triangles in these two segments. The only substandard horizontal curve is near South Kendall Boulevard in Segment 3.

Currently, the south leg of South Carr Street and the north leg of South Carr Street intersecting at West Chatfield Avenue are offset by 170 feet. This creates problems both for through traffic on South Carr Street and for vehicles turning left into either the north or south leg of South Carr Street from West Chatfield Avenue. There were four injury accidents and three property damage accidents at this intersection between 1999 and 2002. Safety at these intersections and concern about accidents were a top complaint at both public meetings. Currently there are no left-turn lanes on West Chatfield Avenue for vehicles turning onto South Carr Street. Private residences currently abut all corners of these intersections and would be affected with any realignment of the north or south leg of South Carr Street.

In Segment 1, local drainage flows are routed to storm sewer inlets by means of curb and gutter or depressed medians. In Segment 2, drainage of West Chatfield Avenue is comprised of local roadway runoff and a small amount of off-site flow that drains to the North Tributary of Massey Draw. Segment 3 generally experiences the most significant contribution of off-site runoff onto the roadway. This runoff is captured by curb and gutter or roadside ditches.

There are existing sidewalks, varying in width from 3-foot to 8-foot throughout the corridor. There are a few segments in the corridor where no sidewalk exists including the west side of West Chatfield Avenue between West Ken Caryl Avenue and Shaffer Drive in Segment 1, between South Dudley Street and South Wadsworth Boulevard in Segment 2, and between South Pierce Street and South Lamar Street in Segment 3. There are currently no bike lanes on West Chatfield Avenue. Segment 1 currently has roadside and median landscaping. The remainder of the project generally is not landscaped with the exception of a few localized areas where developers have incorporated roadside landscaping into the West Chatfield Avenue improvement plans.

## Proposed Improvements Summary

Needs along the corridor were analyzed and identified. These include the need for additional through lanes and auxiliary lanes, traffic signals, pedestrian improvements, median and landscaping improvements, and storm drainage improvements. These improvements have been incorporated into conceptual design plans that are provided as an additional document to this report (bound separately). This conceptual design includes the following elements:

### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

- Design speed of 40 mph for this segment.
- Acceleration and deceleration lanes added per requirements of the State Highway Access Code. Lengths per Jefferson County RDCM.
- Retaining walls (length and height shown in plans, maximum height 5 feet) to accommodate the roadway design, where required.
- Curb added for improved safety on existing depressed medians. Retain existing depressed median to save existing trees where possible. Continue to allow drainage into median.
- For existing raised medians, add median cover material and median edging. Retain existing landscaping where possible; during final design determine trees requiring removal.
- Widen existing sidewalk to 8 feet where possible giving consideration to existing right-of-way and existing tree locations. Final sidewalk width and alignment to be completed during final design.
- Storm sewer main added between South Continental Divide Road and South Kipling Parkway.
- This entire segment requires milling and overlay and may require pavement replacement in localized areas. Since this area is within the dipping bedrock area of the project, any pavement replacement will require overexcavation. During final design, a thorough evaluation of the existing pavement should be conducted to determine if existing pavement thickness is adequate for future traffic growth.
- Single-sided 8-foot fence will likely not be incorporated in this segment since through lanes are not being constructed closer to private residential property, but should be evaluated during final design using the most current County Fence Policy.

### *Segment 2A (South Kipling Parkway to South Garrison Street)*

- Design speed of 40 mph for this segment.
- Between South Iris Way and South Garrison Street, parking along West Chatfield Avenue eliminated creating extra space for tree lawn and 8-foot sidewalk.

- Between South Kipling Parkway and South Garrison Street, painted medians reconstructed to raised medians with landscaping. Existing depressed medians remain.
- Where reconstruction due to widening is not required, this segment requires overlay with the exception of South Iris Way to South Garrison Street, which was recently overlaid. This can be further evaluated during final design.
- Where reconstruction is required, overexcavation will be required due to the dipping bedrock area.
- Single-sided 8-foot fence will likely not be incorporated in this segment since through lanes are not being constructed closer to private residential property, but should be evaluated during final design using current the most current County Fence Policy.

*Segment 2B (South Garrison Street to South Wadsworth Boulevard)*

- Design speed of 40 mph for this segment.
- Horizontal alignment designed to meet 40 mph design speed.
- Vertical alignment designed to meet 40 mph design speed where reconstruction is required.
- Acceleration and deceleration lanes added per requirements of the State Highway Access Code. Lengths per Jefferson County RDCM.
- Retaining walls (length and height shown in plans, maximum height 7 feet) to accommodate the roadway design, where required.
- Between South Garrison Street and South Wadsworth Boulevard, roadway section upgraded to 2 lanes in each direction.
- In restricted portion between South Dudley Street and South Carr Street, 11-foot through lanes and 5-foot attached sidewalk. Fourteen-foot painted median allows left turns into side-streets and private residential drives.
- Between South Carr Street and South Wadsworth Boulevard, roadway widened to the north and 8-foot detached sidewalks incorporated on both sides of West Chatfield Avenue.
- Side-by-side 10-foot left turn lanes incorporated at offset South Carr Street.
- Storm sewer system added between South Garrison Street and Massey Draw and between South Allison Street and South Wadsworth Boulevard.
- Access control to improve safety in the vicinity of South Wadsworth Boulevard and South Carr Street intersections.
- During final design, a thorough evaluation of the existing pavement should be conducted to determine if existing pavement thickness is adequate for future traffic growth. In some locations, a pavement overlay may be warranted.
- Where reconstruction is required west of South Ammons Street (Station 303+00), overexcavation may be required due to the dipping bedrock area.

- Exact locations for 8-foot single-sided wood fence are not shown. Locations for fences will be determined during final design per the latest County Fence Policy. Considerations on whether to include fencing include whether through lanes are moving closer to private residences; if the majority of residents request fencing; and if the fence restricts intersection site triangles.

*Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

- Design speed of 40 mph west of South Pierce Street and 35 mph east of South Pierce Street
- Horizontal alignment designed to meet the design speed. Includes reconstructing curve west of South Kendall Boulevard to meet Jefferson County RDCM criteria.
- Vertical alignment designed to meet 40 mph design speed west of South Pierce Street and 35 mph design speed east of South Pierce Street.
- Acceleration and deceleration lanes added per requirements of the State Highway Access Code. Lengths per Jefferson County RDCM.
- Retaining walls (length and height shown in plans, maximum height 3 feet) to accommodate the roadway design, where required.
- Inconsistencies in West Chatfield Avenue typical section corrected in the vicinity of the South Pierce Street intersection.
- From South Pierce Street to South Kendall Boulevard, typical section updated to meet Jefferson County RDCM criteria for Collector Street. Painted median for left turns added between South Pierce Street and South Lamar Street.
- Eight-foot sidewalk added on both sides of West Chatfield Avenue from South Pierce Street to South Lamar Street. (The C-470 Trail currently exists between South Lamar Street and South Kendall Boulevard).
- Storm sewer system added between South Pierce Street and South Kendall Boulevard.
- This entire segment requires overlay and may require pavement replacement in localized areas. During final design, a thorough evaluation of the existing pavement should be conducted to determine if existing pavement thickness is adequate for future traffic growth.
- Exact locations for 8-foot single-sided wood fence are not shown. Locations for fences will be determined during final design per the latest County Fence Policy. Considerations on whether to include fencing include whether through lanes are moving closer to private residences; if the majority of residents request fencing; and if the fence restricts intersection site triangles.

## **Chapter One: Introduction**

### ***1.1 Project Scope and Study Area***

West Chatfield Avenue is classified as a Minor Arterial Street on the Jefferson County Major Thoroughfare Plan. The Jefferson County Division of Highways and Transportation initiated a study of the West Chatfield Avenue Corridor to assess the existing conditions along the corridor, identify deficiencies, gather public input, and develop a conceptual plan for improvements along the corridor.

The purpose of this study is to present data that has been gathered, document needs, and outline improvement recommendations to increase capacity and improve safety for West Chatfield Avenue between West Ken Caryl Avenue and South Kendall Boulevard. (See Figure 1 - Project Location) The study area has been broken out into three segments. Segment 1 includes West Ken Caryl Avenue to South Kipling Parkway, Segment 2 includes South Kipling Parkway to South Wadsworth Boulevard, and Segment 3 includes South Wadsworth Boulevard to South Kendall Boulevard. The study also outlines which portions of the project area do not currently meet Jefferson County Standards. Recommendations for improvements along the corridor are included in the report along with the impacts of those recommendations. The report also includes the development of a list of potential construction projects including recommendations for project priority.

The project area is in unincorporated Jefferson County. The west end of the project from West Ken Caryl Avenue to South Kipling Parkway (Segment 1) is within the Ken Caryl Ranch Metropolitan District. This 4.3-mile corridor varies between a 2-lane section and a 4-lane section.



Numerous concerns from the Jefferson County Staff, the Consultant Team, and the Public were considered in the development of improvement recommendations, including:

- The need for improvements to address capacity, safety and Level of Service (LOS) issues.
- Upgrade to Jefferson County Design standards for a minor arterial street.
- The physical constraints of the existing conditions.
- Improve deficient intersections including evaluating traffic signal warrants and roundabout feasibility.
- Incorporate landscaping along roadway to meet the “Southeast Jefferson County Local Improvement District” (e.g. One-Half Cent Sales Tax District) objective.
- Upgrade pedestrian facilities.
- Access to adjacent properties.
- Costs and economic justification of improvements.
- Implementation plan to address funding availability.

West Chatfield Avenue serves the communities of the City of Littleton, Ken Caryl Ranch and other unincorporated portions of Jefferson County. The project area is predominantly characterized as suburban residential. Other land uses include light industrial on the south side of West Chatfield Avenue in the Ken Caryl Ranch area and commercial at the intersections of West Ken Caryl Avenue, South Kipling Parkway, and South Wadsworth Boulevard. West Chatfield Avenue intersects with the following major thoroughfares: West Ken Caryl Avenue, South Kipling Parkway, South Wadsworth Boulevard, South Kendall Boulevard/South Platte Canyon Road which all intersect with Colorado Highway C-470. Direct access to abutting land serving residential (including private residential drives), commercial, and light industrial is prevalent along the entire project corridor.

## ***1.2 Project Purpose and Need***

West Chatfield Avenue has been identified by Jefferson County as a corridor experiencing traffic growth. Average Daily traffic volumes (year 2003) on West Chatfield Avenue are 14,300 vehicles per day (vpd) on weekdays between West Ken Caryl Avenue and South Kipling Parkway, 10,000 vpd between South Kipling Parkway and South Wadsworth Boulevard, 12,300 vpd between South Wadsworth Boulevard and South Pierce Street, and 9,700 vpd from South Pierce Street to South Kendall Boulevard. Average Daily projected traffic volumes (year 2025) on West Chatfield Avenue are 17,000 vehicles per day (vpd) on a weekday between West Ken Caryl Avenue and South Kipling Parkway (representing 1.0% annual growth), 18,000 vpd between South Kipling Parkway and South

Wadsworth Boulevard (2.7% annual growth), 20,500 vpd between South Wadsworth Boulevard and South Pierce Street (2.4% annual growth), and 13,400 vpd from South Pierce Street to South Kendall Boulevard (1.5% annual growth). The Jefferson County RCDM states that a roadway with an ADT greater than 10,000 but less than 25,000 shall be a 4-lane minor arterial roadway section.

The 2025 AM and PM peak hour Level of Service (LOS) for signalized intersections along the corridor have been calculated. Six levels of service are defined from A to F, with LOS A representing the best operating conditions and LOS F the worst. LOS E is generally considered to correspond to maximum capacity. For West Chatfield Avenue, the AM peak is generally between 7:15 to 8:15 and the PM peak is generally between 4:30 to 5:30 PM. Intersections with the poorest projected year 2025 traffic operation without improvements but with improved signal timing include South Kipling Parkway with LOS E in the AM and PM peak and South Wadsworth Boulevard with LOS F in the PM peak. The West Ken Caryl Avenue intersection is projected to have LOS D in the AM and PM peak. The South Pierce Street intersection is projected to have a LOS D in the PM peak.

A total of 150 accidents occurred along the corridor, involving 303 vehicles, with 50 injury accidents and one fatality in the three years between 1999 and 2001. Of the 150 accidents along the corridor, 59 were rear-end collisions, 41 were broadside accidents, 30 were approach turns, four were sideswipes and 16 were other types. The fatal accident was a broadside accident involving alcohol at Sangre De Cristo Road. Since this accident, a signal was installed at this intersection.

Substandard geometry along the corridor also contributes to safety concerns. Warranted acceleration and deceleration lanes are not included in the existing template, yet are required at many intersections. In Segment 2, the typical section is currently four lanes between South Kipling Parkway and South Everett Way (p. 14-18 in the conceptual plans), two lanes from South Everett Way to the north leg of South Carr Street (p. 18-20), three lanes from South Carr Street to South Wadsworth Boulevard (one through lane eastbound) (p. 20-23) and then four lanes again in Segment 3 east of South Wadsworth Boulevard (p.23-26). South Carr Street is currently at an offset with the north leg intersecting West Chatfield Avenue east of the south leg by 170 feet. The horizontal curve west of South Kendall Boulevard does not meet design criteria. Finally, intersection sight line requirements are not met at some locations along the corridor and are detailed in section 2.2.2 of this report.

Improvements for pedestrians are also warranted and are discussed in detail in section 2.2.6 of this report. Many locations along the corridor have narrow existing sidewalks. There are a few segments the corridor where no sidewalk exists including the west side of West Chatfield Avenue between West Ken Caryl

Avenue and Shaffer Parkway in Segment 1 (p. 4–9 in the conceptual plans), between South Dudley Street and South Wadsworth Boulevard in Segment 2 (p.19-23), and between South Pierce Street and South Lamar Street in Segment 3 (p. 26-28). There are currently no bike lanes on West Chatfield Avenue. See Appendix B for existing sidewalk locations.

The goal of this Study is to evaluate improvements that will accommodate year 2025 forecasted traffic volumes, while addressing issues related to safety, local access, pedestrian facilities, project cost, community interest, and landscaping.

### ***1.3 Study Process***

The process for this corridor study was developed to provide input from the surrounding community in addition to evaluating the corridor from a capacity, operational, and safety standpoint. Data gathering was the first step in the process. Data gathered included aerial survey and photography. Existing traffic was counted and projected traffic volumes calculated. Accident history for the corridor was collected. Existing right-of-way was obtained from the Jefferson County Information Technology-Operations Division. Existing utilities were incorporated on the conceptual plans through the use of key maps provided by utility companies. Existing storm drainage facilities were located through the use of existing mapping and field visits. General geotechnical considerations were evaluated through field reconnaissance and literary review.

Options for improvements to upgrade the corridor were developed including improvements to intersections, addition of through capacity lanes, road geometry, turning lanes, sidewalks and streetscapes, access, and medians. The first public open house was held to present the data gathered, the purpose and need for the project, and possible improvement options. Feedback was obtained from the public on existing deficiencies and preferred improvements.

The preferred improvements were developed and a second public open house held to present the preferred improvements to the public. Public feedback was also collected at this open house. All graphics from the public open houses were posted on the Jefferson County Division of Highways and Transportation's website ([http://www.co.jefferson.co.us/ext/dpt/public\\_works/highways/index.htm](http://www.co.jefferson.co.us/ext/dpt/public_works/highways/index.htm)). The recommendations for the corridor were then finalized and prioritization of the improvements developed.

## **Chapter Two: Assessment of Existing Conditions**

### ***2.1 Existing Land Use***

The project corridor is located in unincorporated Jefferson County. Segment 1, between West Ken Caryl Avenue and South Kipling Parkway, is located within the Ken Caryl Ranch Metropolitan District.

Existing land uses were identified through the use of aerial photography, property ownership information, and field observation. The corridor is primarily urban residential with the following exceptions:

#### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

Vacant land comprises the southwest corner of West Ken Caryl Avenue and West Chatfield Avenue. A business park is located on the west and south side of West Chatfield Avenue, between West Shaffer Place and South Sangre De Cristo Road. An assisted living home is located on the northwest corner of South Continental Divide Road and West Chatfield Avenue. Finally, a commercial development exists between South Sangre De Cristo Road and South Kipling Parkway, northbound south of West Chatfield Avenue.

#### *Segment 2 (South Kipling Parkway to South Wadsworth Boulevard)*

Commercial land comprises the northeast and southeast corner of South Kipling Parkway and West Chatfield Avenue. A church property exists on the southwest corner of South Dudley Street and West Chatfield Avenue. A vacant parcel zoned residential is located between the church and South Carr Street. A day care center is located on the southeast corner of South Wadsworth Boulevard and West Chatfield Avenue.

#### *Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

There is commercial development east of South Wadsworth Boulevard. A vacant parcel of land is located between South Reed Street and South Quay Street south of West Chatfield Avenue. Two church properties are located on the northeast corner of South Pierce Street and West Chatfield Avenue. A vacant parcel owned by the church and day care center comprise the northwest corner. The federal government owns vacant property near South Lamar Street and West Chatfield Avenue.

## **2.2 Existing Roadway System**

West Chatfield Avenue is classified as a Minor Arterial Street on the Jefferson County Major Thoroughfare Plan. Appendix B, "Existing Conditions at West Chatfield Avenue" details existing roadway elements. Widths for turn lanes, through lanes and medians are dimensioned for the corridor. Median locations and types are color coded with a solid hatch. A solid colored hatch designates sidewalks with different colors signifying different existing sidewalk widths. Intersection control is designated with sign symbols or traffic signal symbols. Posted speed limits are shown on the graphics in Appendix B. Colored arrows designating location of existing accesses to West Chatfield Avenue are shown.

### **2.2.1 Horizontal Alignment**

The street alignment begins at the intersection of West Ken Caryl Avenue (east and west leg), South Simms Street (north leg), and West Chatfield Avenue (south leg). This intersection is located on the section corner of Sections 28, 29, 32, and 33 of Township 5 South, Range 69 West of the 6<sup>th</sup> Principal Meridian. The alignment then follows the section line between Sections 32 and 33 to the south. The alignment then curves to the east with a 1,600-foot radius curve. The alignment continues east past the intersection of South Kipling Parkway and then transitions further south with reverse curves, the first with a 950-foot radius and the second with a 750-foot radius. The alignment then continues east past South Wadsworth Boulevard on the section line with Section 34, 35, and 36 of Township 5 South, Range 69 West of the 6<sup>th</sup> Principal Meridian to the north and Section 3, 2, and 1 of Township 6 South, Range 69 West of the 6<sup>th</sup> Principal Meridian to the south. The alignment finally curves to the northeast with a 250-foot radius curve. The project ends at the intersection of West Chatfield Avenue (southwest leg), South Kendall Boulevard (south and northwest leg), and South Platte Canyon Road (northeast leg).

The final horizontal curve of the alignment, southwest of the South Kendall Boulevard intersection (Station 373+00), does not meet design criteria for the desired design speed of 35 mph. (According to Jefferson County standards, the design speed for minor arterial roadways is 40 mph. However, Jefferson County determined a design speed of 35 mph would be adequate for the segment between South Pierce Street and South Kendall Boulevard due to the lower projected volumes and the residential accesses along this segment.) The existing radius is approximately 300 feet. The minimum allowable curve radii according to Jefferson County Roadway Design and Construction Manual (Section 3.4.1), is 275 feet for 30 mph, 415 feet for 35 mph, and 600 feet for 40 mph. There were five accidents at this location of West Chatfield Avenue during the 1999-2001-time period of accident data. The guardrail at this curve appears to be damaged from vehicles striking it and is lower than the CDOT standard of 27" from the shoulder to the top of guardrail.

## 2.2.2 Vertical Alignment

The Jefferson County RDCM has the following criteria for the vertical alignment for minor arterial streets (40 mph design speed):

- The maximum allowable grade is 6% and the minimum allowable grade is 1%.
- The minimum allowable K-value for a crest vertical curve is 80 and the minimum allowable K-value for a sag vertical curve is 70.
- The minimum sight distance requirement for left turns out of an unsignalized intersection is 440 feet and for right turns is 380 feet.

A few locations of West Chatfield Avenue do not meet Jefferson County Standards for minimum or maximum allowable grade. An existing grade of 8.5% currently exists between West Ken Caryl Avenue and West Park Range Road on West Chatfield Avenue. The grade just east of South Kipling Parkway on West Chatfield Avenue is below the minimum allowable grade at 0.8%. Finally, the grade between South Dover Street and South Carr Street is 6.3%.

There are two existing vertical crest curves on Segment 1 that do not meet minimum Jefferson County K-values and therefore vertical stopping sight distance. The first is the vertical curve near West Park Range Road and the second is the vertical curve just north of the intersection of Cochetopa Pass/West Shaffer Place. However, both curves meet the minimum K-value of 44 for crest vertical curves for 40 MPH according to American Association of State Highway and Transportation Officials (AASHTO) (Exhibit 3-76, AASHTO "A Policy on Geometric Design of Highways and Streets", 2001).

Several complaints regarding poor stopping sight distance on the existing roadway were received in the form of written comments from the citizens at the first public meeting. The intersections with West Chatfield Avenue that were mentioned were West Park Range Road, Cochetopa Pass, Sawatch Range Road, South Continental Divide Road, South Carr Street, South Dudley Street, South Garrison Street, South Kendall Boulevard and the horizontal curve on West Chatfield Avenue west of South Garrison Street.

Intersection sight triangles per Jefferson County Criteria for a 40 mph design speed have been evaluated for all existing intersections that are two-way stop controlled. The following are turning movements that do not meet intersection sight line requirements:

- Northbound right turn out of West Park Range Road. (Due to vertical curve)
- Eastbound left and right turns onto West Chatfield Avenue from West Shaffer Place. (Vegetation)
- Westbound left and right from Cochetopa Pass. (Vegetation)
- Northbound left from South Continental Divide Road. (Vegetation)
- Southbound right from South Continental Divide Road. (Vegetation)
- Northbound left and right from South Bradford Drive. (Vegetation)
- Northbound left and right from access west of South Kipling Parkway. (Vegetation)
- Northbound left from South Iris Way. (Vegetation)
- Northbound right from South Yukon Street. (Vegetation)

### **2.2.3 Typical Section/Turn Lanes**

The typical section of the number and width of existing through lanes along with the location and width of existing turn lanes is depicted on Appendix B, "Existing Conditions on West Chatfield Avenue". Developers have constructed some improvements to West Chatfield Avenue while leaving adjacent areas substandard. West Chatfield Avenue has two through lanes in each direction for the entire length of Segment 1, from West Ken Caryl Avenue to South Kipling Parkway. In Segment 2, the typical section is currently four lanes between South Kipling Parkway and South Everett Way, two lanes from South Dudley Street to the north leg of South Carr Street, and three lanes from South Carr Street to South Wadsworth Boulevard (one through lane eastbound). For Segment 3, there are four through lanes between South Wadsworth Boulevard and South Quay Street. From South Pierce Street to the end of the project, there is one through lane in each direction.

Right-turn acceleration lanes and right and left-turn deceleration lanes are dimensioned on Appendix B "Existing Conditions on West Chatfield Avenue".

## 2.2.4 Posted Speed Limit

The posted speed is 40 mph for the entire Segment 1. For Segment 2, the posted speed is 40 mph from South Kipling Parkway to South Garrison Street and 35 mph from South Garrison Street to South Wadsworth Boulevard. For Segment 3, the posted speed is 35 mph from South Wadsworth Boulevard to South Pierce Street and 30 mph from South Pierce Street to South Kendall Boulevard.

## 2.2.5 Access

The Jefferson County RDCM states that for a minor arterial street, "Neither the movement of traffic nor access takes precedence. Reasonable access is allowed with the exception of private residential driveways." See "Existing Conditions on West Chatfield Avenue", Appendix B, for access locations.

### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

Segment 1 (West Ken Caryl Avenue to South Kipling Parkway) has no residential access directly to West Chatfield Avenue. There are several business accesses along this segment.

### *Segment 2 (South Kipling Parkway to South Wadsworth Boulevard)*

Segment 2 has private residential driveway access to West Chatfield Avenue. The most constrained portion of the corridor is between South Dudley Street and South Carr Street in Segment 2. West Chatfield Avenue is currently one lane in each direction between South Dudley Street and South Carr Street with homes and garages set back as little as 21 feet from the existing right-of-way. This segment also has five private residential driveways directly accessing West Chatfield Avenue. Residential streets accessing West Chatfield Avenue are spaced at 300-foot intervals. The existing topography is high on the north of West Chatfield Avenue and then slopes steeply downward on the south side of West Chatfield Avenue adding an additional constraint in this segment for drive profiles.

Currently, the south leg of South Carr Street and the north leg of South Carr Street at West Chatfield Avenue are offset by 170 feet. This creates problems both for through traffic on South Carr Street and for vehicles turning left into either the north or south leg of South Carr Street from West Chatfield Avenue. There were four injury accidents and three property damage accidents at this intersection between 1999 and 2002. Safety at this intersection and concern about accidents were a top complaint at both public meetings. Currently there are no left-turn lanes

on to South Carr Street. Private residences currently abut all corners of these intersections and would be affected with any realignment of the north or south leg of South Carr Street.

Between South Carr Street and South Wadsworth Boulevard, the south side of West Chatfield Avenue has similar constraints of homes close to the existing through lanes and private residential drives directly accessing West Chatfield Avenue. Residential Streets accessing West Chatfield Avenue are spaced at 300-foot intervals. However, on the north side of West Chatfield Avenue, the right-of-way for private homeowners is offset 40 feet from the edge of the existing westbound lanes. The 40-foot tract of land between the roadway right-of-way and the private homeowner right-of-way is owned by Foothills Park and Recreation District.

### *Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

There are several business accesses along this segment. It also has private residential access to West Chatfield Avenue between South Pierce Street and South Lamar Street on the south side of West Chatfield Avenue. In this area, the right-of-way is 80 feet in width, with 30 feet south of the section line and 50 feet north of the section line.

## **2.2.6 Pedestrian Facilities**

The Jefferson County guideline for a sidewalk along a minor arterial street is a detached 8-foot wide sidewalk with a 5-foot wide tree lawn. Existing sidewalk width and locations are shown in Appendix B.

There are a few segments the corridor where no sidewalk exists including the west side of West Chatfield Avenue between West Ken Caryl Avenue and Shaffer Parkway in Segment 1 (p. 4–9 in the conceptual plans), between South Dudley Street and South Wadsworth Boulevard in Segment 2 (p.19-23), and between South Pierce Street and South Lamar Street in Segment 3 (p. 26-28). There are currently no bike lanes on West Chatfield Avenue.

A portion of the C-470 Trail runs along West Chatfield Avenue in Segment 3. The trail intersects West Chatfield Avenue at South Lamar Street. From South Lamar Street, it continues on the north side of West Chatfield Avenue east past South Kendall Boulevard. The existing trail is asphalt and 8 feet in width.

### **2.2.7 Median Type**

The Jefferson County guideline for a minor arterial street is an 18-foot median. The existing median width and type (curb and gutter, depressed without curb and gutter, or painted) along with type of landscaping is shown on Appendix B. There are two locations where no median exists along West Chatfield Avenue. One is in Segment 2 between South Dudley Street and the north leg of South Carr Street. The second is in Segment 3 between South Pierce Street and South Kendall Boulevard.

### **2.2.8 Intersection Control Type**

The majority of the intersections along the corridor are two-way stop controlled. Traffic signals control the intersections at West Ken Caryl Avenue; South Sangre De Cristo Road; South Kipling Parkway; South Garrison Street; South Wadsworth Boulevard; and South Pierce Street. South Kendall Boulevard is four-way stop controlled. The traffic signal at South Wadsworth Boulevard is operated and maintained by CDOT.

A pedestrian signal has been installed for crossing the east leg of the South Iris Way intersection. Mortenson Elementary is located north of West Chatfield Avenue on South Iris Way, so the signal is utilized as a school crossing. The current configuration of the pedestrian signal presents difficulty for the South Iris Way traffic. These vehicles cannot easily see the signal heads for the pedestrian signal, resulting in some confusion by drivers as to which traffic is required to stop. There was concern at both public meetings regarding this signal in addition to complaints by school staff. Many citizens have been confused by this configuration, or expressed concerns regarding the number of near accidents.

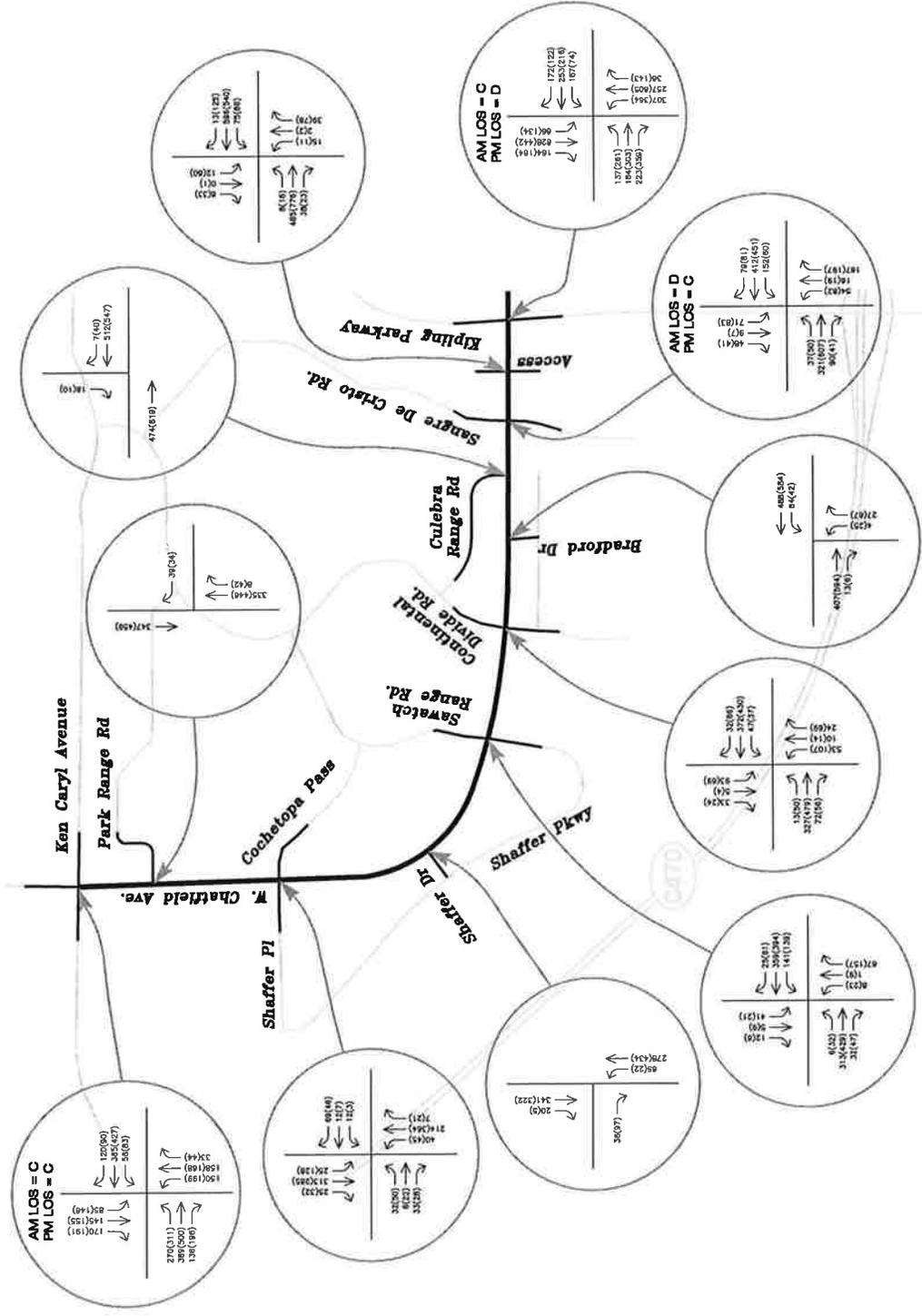
## ***2.3 Alternative Transportation Modes***

The Regional Transportation District (RTD) provides bus service along West Chatfield Avenue from South Continental Divide Road to South Kendall Boulevard. Route 401, Ken Caryl/Highlands Ranch, serves this portion of West Chatfield Avenue. The route begins at the Ken Caryl Park and Ride and ends at the Highlands Ranch Town Center. Weekday trip frequency is 30 minutes from 5:30 am to 8:30 pm. Saturday and Sunday frequency is 60 minutes with service from 6:30 am to 8:30 pm on Saturday and 8:30 am to 7:30 pm on Sunday.

## **2.4 Existing Traffic Summary**

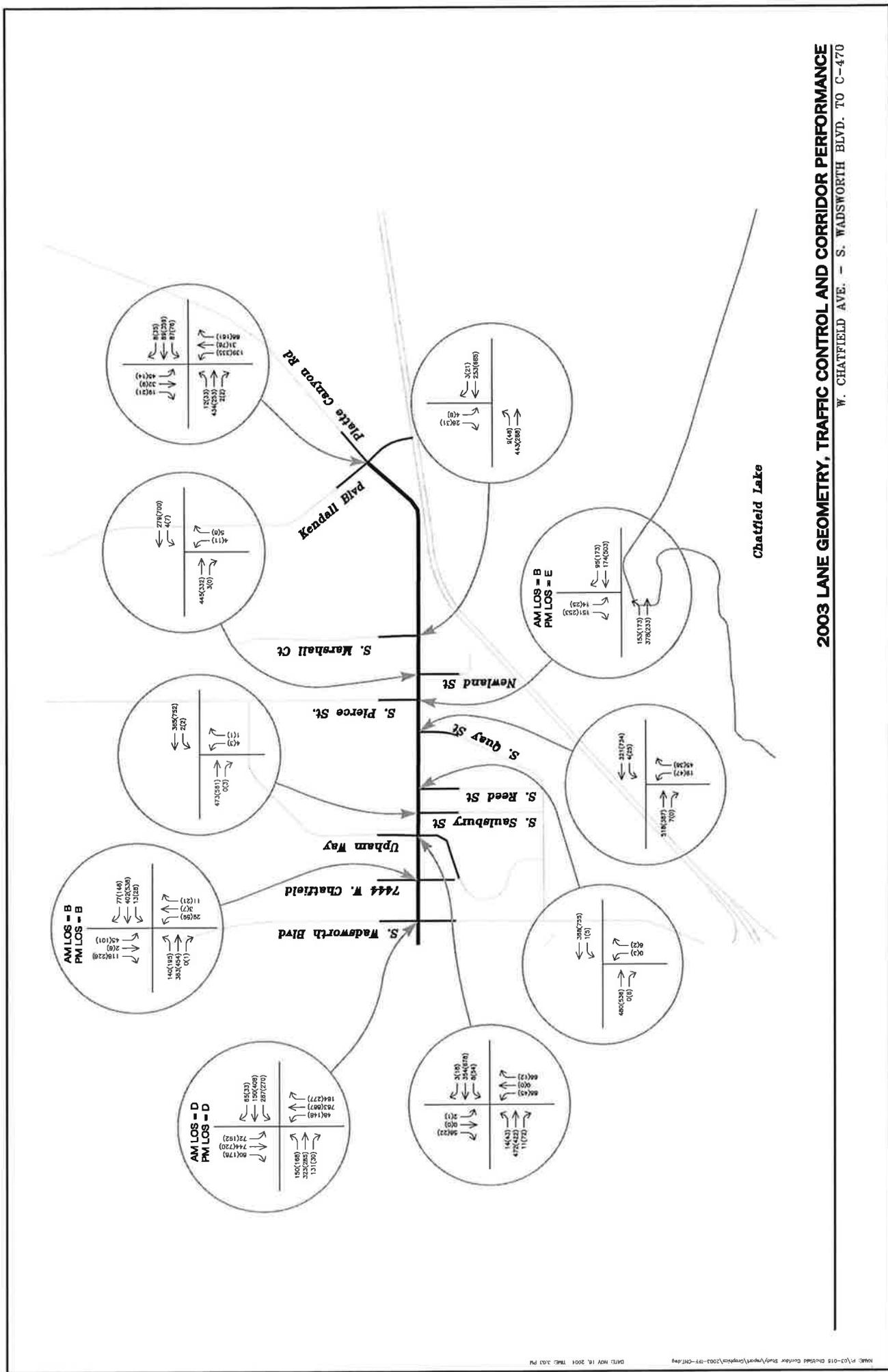
Traffic volume and operations characteristics were collected in May 2003 on West Chatfield Avenue and at major intersections. The existing traffic data is shown in Figure 2, "2003 Traffic Count Data and Level of Service". Intersection turning movements were recounted at South Iris Way and South Kendall Boulevard in March of 2004 due to public comment at the first public meeting. These recounts were not significantly different than the original data. Daily traffic volumes (2003) on West Chatfield Avenue are 14,300 vehicles per day (vpd) on a weekday between West Ken Caryl Avenue and South Kipling Parkway (Segment 1), 10,000 vpd between South Kipling Parkway and South Wadsworth Boulevard (Segment 2), 12,300 vpd between South Wadsworth Boulevard and South Pierce Street, and 9,700 vpd from South Pierce Street to South Kendall Boulevard (Segment 3).

The signalized intersections of South Kipling Parkway and South Wadsworth Boulevard control the peak hour traffic along the West Chatfield Avenue corridor. Due to the need to accommodate the heavier volumes, the South Kipling Parkway and South Wadsworth Boulevard traffic is given precedence and longer green times at each of these intersections, as opposed to the West Chatfield Avenue traffic. Both intersections currently have a level of service (LOS) D for the PM peak hour, although some of the West Chatfield Avenue movements have an LOS of E or worse. The all-way stop-controlled intersection of South Kendall Boulevard is the controlling point for the peak hour traffic for West Chatfield Avenue between South Pierce Street and South Kendall Boulevard. The existing delay LOS at the signalized intersections is also shown in Figure 2.



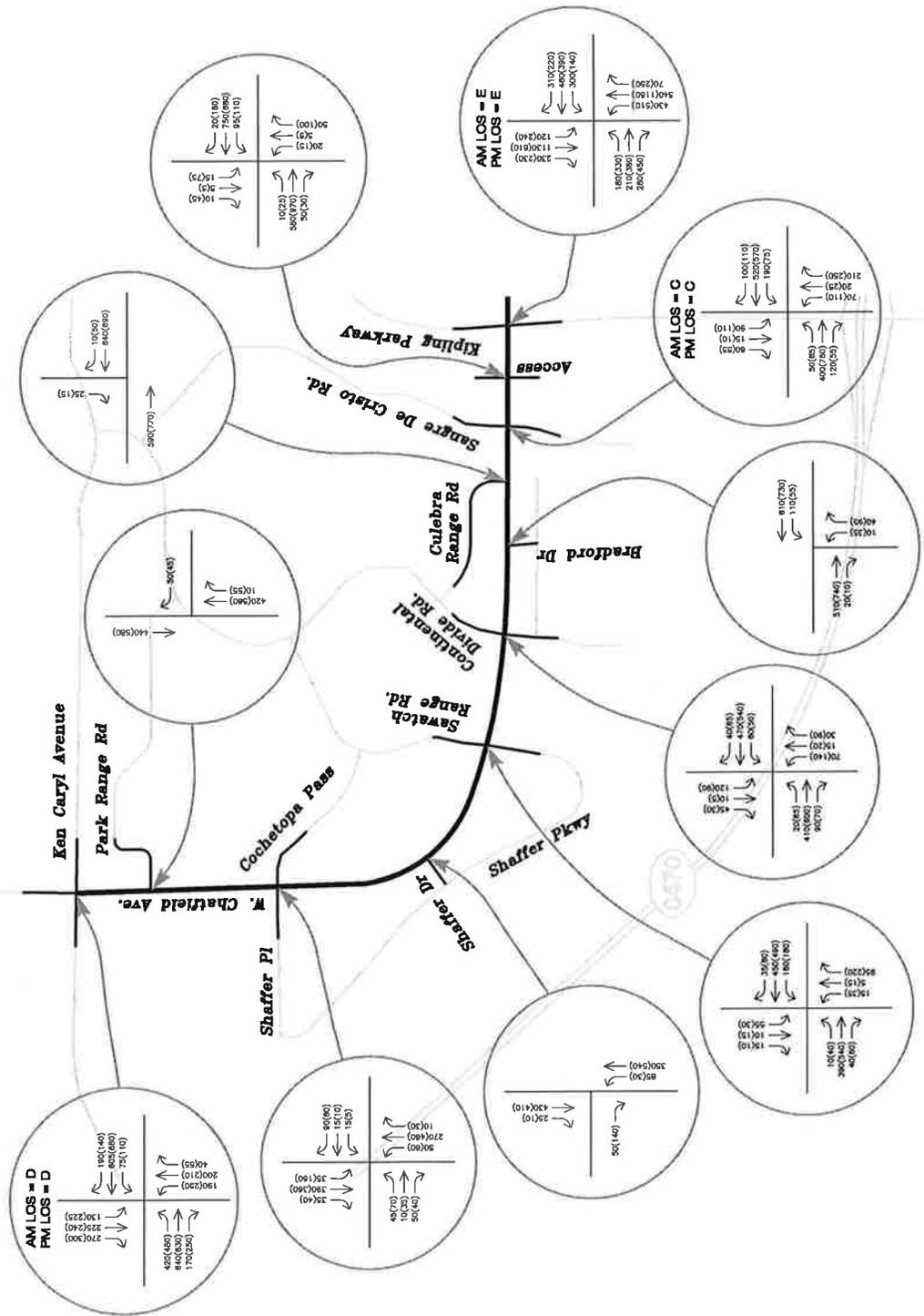
**2003 LANE GEOMETRY, TRAFFIC CONTROL AND CORRIDOR PERFORMANCE**  
**W. CHATFIELD AVE. - KEN CARYL AVE. TO KIPLING PKWY.**





**2003 LANE GEOMETRY, TRAFFIC CONTROL AND CORRIDOR PERFORMANCE**  
 W. CHAFFIELD AVE. - S. WADSWORTH BLVD. TO C-470

**2025 LANE GEOMETRY, TRAFFIC CONTROL AND CORRIDOR PERFORMANCE**  
**W. CHATFIELD AVE. - KEN CARYL AVE. TO KIPLING PKWY.**



## **2.5 Forecast Traffic Summary**

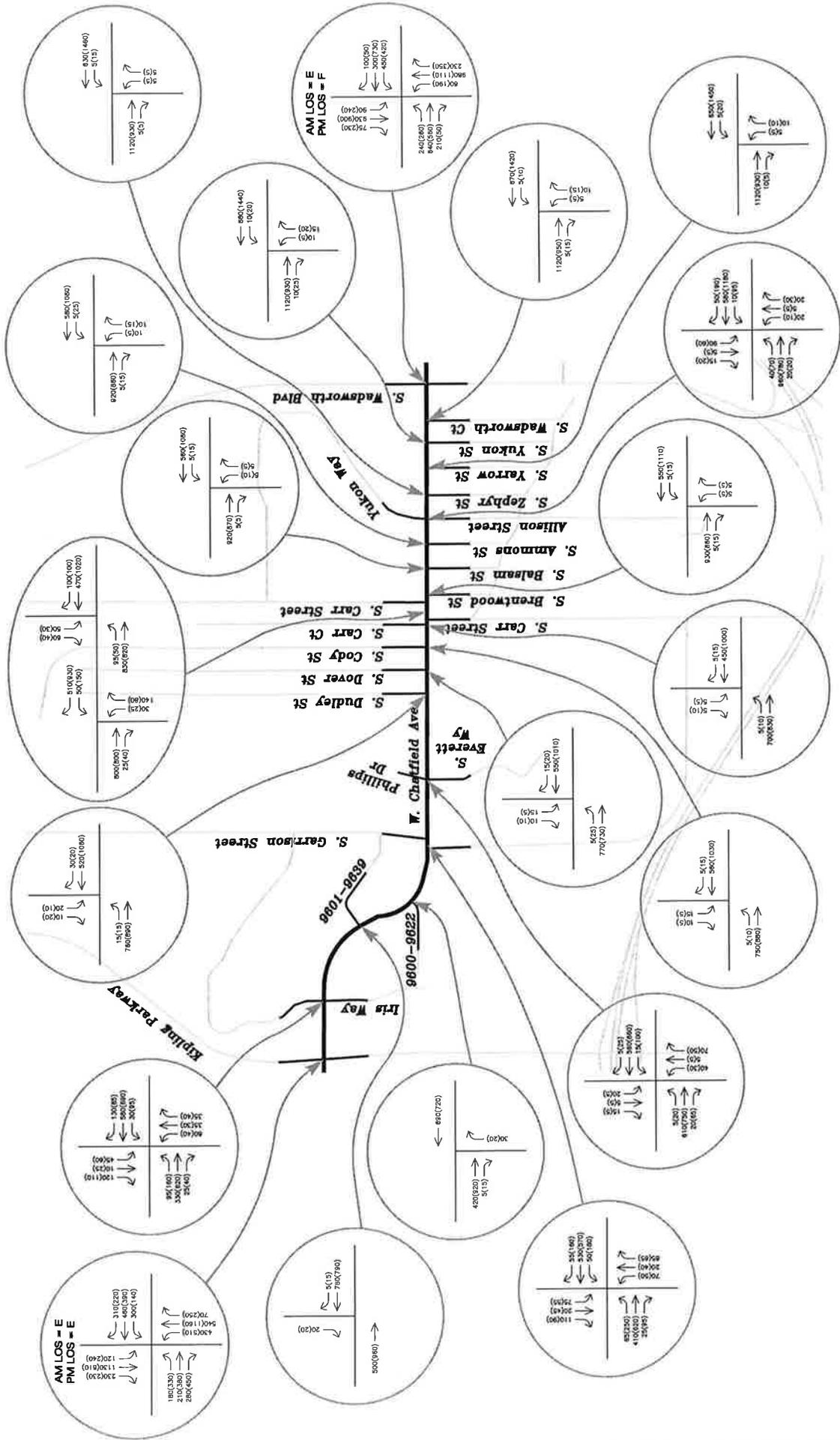
Several sources were available and compared for the future traffic forecasts on West Chatfield Avenue. Jefferson County maintains a travel demand model that includes West Chatfield Avenue, and the DRCOG 2025 model was referenced, as it has the most up-to-date regional roadway and land use forecasts available.

Daily projected traffic volumes (2025) on West Chatfield Avenue are 17,000 vehicles per day (vpd) on a weekday between West Ken Caryl Avenue and South Kipling Parkway, 18,000 vpd between South Kipling Parkway and South Wadsworth Boulevard, 20,500 vpd between South Wadsworth Boulevard and South Pierce Street, and 13,400 vpd from South Pierce Street to South Kendall Boulevard.

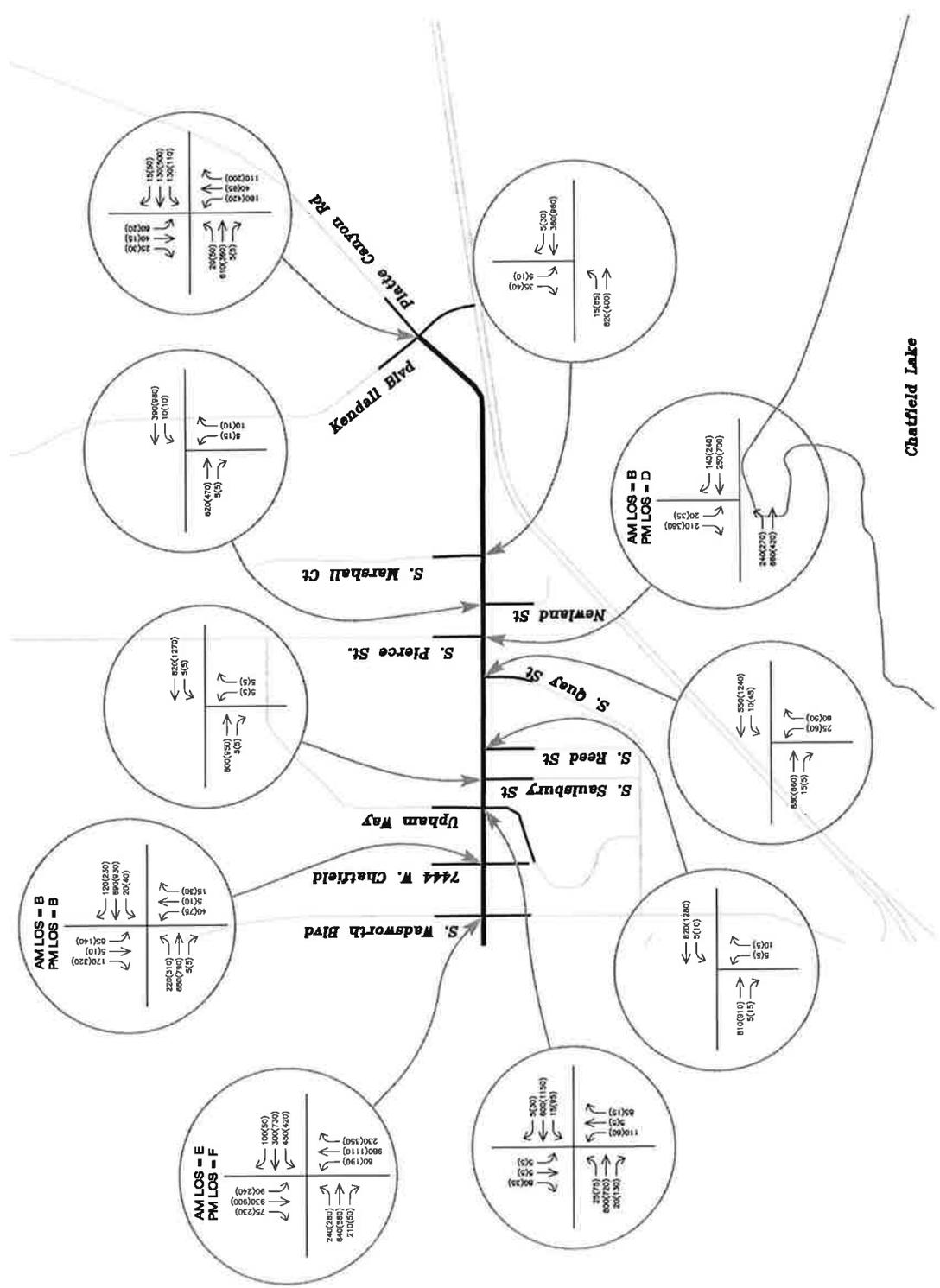
The DRCOG model forecasted 2025 volumes significantly less than the Jefferson County model, especially for the segments between South Kipling Parkway and South Pierce Street. It was determined at a meeting on May 19, 2003, that the Jefferson County model would be used for the forecasted 2025 traffic volumes. Personnel at Jefferson County decided that the DRCOG model did not accurately represent the local components of the corridor. Peak hour turning movements forecasts were developed for all intersections to be consistent with the Jefferson County model. The 2025 peak hour turning volumes are shown in Figure C.

The additional vehicle demand forecasted for 2025 represents a 19% increase in daily traffic between West Ken Caryl Avenue and South Kipling Parkway, an 80% increase between South Kipling Parkway and South Wadsworth Boulevard, a 67% increase between South Wadsworth Boulevard and South Pierce Street, and a 38% increase between South Pierce Street and South Kendall Boulevard. This increased daily demand was evaluated for two-lane alternatives along the West Chatfield Avenue corridor, no action, and with the proposed improvements.

**2025 LANE GEOMETRY, TRAFFIC CONTROL AND CORRIDOR PERFORMANCE**  
**W. CHATFIELD AVE. - KIPLING PKWY. TO S. WADSWORTH BLVD.**



**2025 LANE GEOMETRY, TRAFFIC CONTROL AND CORRIDOR PERFORMANCE**  
**W. CHATFIELD AVE. - S. WADSWORTH BLVD. TO C-470**



## **2.6 Accident History**

Accident history for West Chatfield Avenue, from West Ken Caryl Avenue to South Kendall Boulevard, was collected from Jefferson County for 1999, 2000 and 2001. Accident data for the West Chatfield Avenue and South Wadsworth Boulevard (SH 121) intersection was collected from the Colorado Department of Transportation (CDOT) for the same time period. Accident data collected is shown in Figure 4 "Accident History for West Chatfield Avenue Corridor Study". A total of 150 accidents occurred along the corridor, involving 303 vehicles, with 50 injury accidents and 1 fatality. Almost half of these accidents occurred at the South Kipling Parkway (34) and South Wadsworth Boulevard (40) intersections. The rest were evenly spaced along the three sections of the corridor – West Ken Caryl Avenue to South Kipling Parkway (26), South Kipling Parkway to South Wadsworth Boulevard (24), and South Wadsworth Boulevard to South Kendall Boulevard (26).

Of the 150 accidents along the corridor, 59 were rear-end collisions, 41 broadside accidents, 30 approach turns, 4 sideswipes and 16 other types. However, when the South Kipling Parkway and South Wadsworth intersections are not included, broadside accidents (28) are the most common accident, followed closely by rear-end collisions (23). The higher number of broadside accidents is indicative of the number of two-way stop-controlled intersections along the corridor; whereas the majority (25) of the approach turn accidents occur at the signalized intersections. The rest of the accidents along the corridor consisted of 9 approach turn, 2 sideswipes and 14 other collisions. The fatal accident was a broadside accident involving alcohol at Sangre De Cristo. Since this accident, a signal was installed at South Sangre De Cristo Road

At the South Kipling Parkway and West Chatfield Avenue intersection, there were 34 accidents - 16 approach turn, 12 rear-end collisions, and 6 broadside accidents. Of the approach turn collisions, 6 were due to northbound traffic and 6 to southbound traffic. Of the rear-end collisions, 3 were due to northbound traffic and 4 to southbound traffic. Almost 70% of the accidents at the intersection were caused by South Kipling Parkway traffic, due to the higher Average Daily Traffic (ADT) on South Kipling Parkway in comparison to West Chatfield Avenue. There were 13 injury accidents, most occurring with the approach turn collisions, and no fatalities at this intersection.

In the 1998 Jefferson County Crash Frequency Location Study, the intersection of South Kipling Parkway and West Chatfield Avenue was listed as the highest crash frequency intersection with 35 weighted crashes. The intersection was also listed as the 13<sup>th</sup> highest crash rate intersection, with an accident rate of 4.20 weighted accidents per million vehicles. Weighted accidents are computed by adding the number of property damage accidents, five times the number of injury accidents and twelve times the number of fatal accidents. The weighted crashes for the intersection were 33, 29 and 36 for 1999, 2000 and 2001, respectively. The crash rates (in weighted accidents per million vehicles) were 3.76, 2.78 and 3.13, all lower than the rate referenced in the 1998 study for the South Kipling Parkway and West Chatfield Avenue intersection.

At the South Wadsworth Boulevard and West Chatfield Avenue intersection, there were 40 accidents: 24 rear-end collisions, 7 broadside accidents, 5 approach turn, 2 sideswipes and 2 other collisions. The predominant type of accident was the rear-end collision, usually indicative of congestion at signalized intersections. Of the rear-end collisions, 9 were due to northbound traffic and 8 to southbound traffic. Over 65% of the accidents at the intersection were caused by South Wadsworth Boulevard traffic, a result of South Wadsworth Boulevard having nearly twice the ADT of West Chatfield Avenue. Only with the approach turn collisions was the West Chatfield Avenue traffic (3) responsible for more accidents than the South Wadsworth Boulevard traffic (2). There were 14 injury accidents and no fatalities at this intersection, with most of the injuries resulting from rear-end collisions.

Both Jefferson County and CDOT use weighted crash averages for analyzing accident data. CDOT then calculates a Weighted Hazard Index (WHI) to determine hazardous intersections and roadway segments. Positive values of the WHI indicate an intersection or segment that has an accident frequency or severity higher than the statewide average. The calculated WHI for the South Wadsworth Boulevard and West Chatfield Avenue intersection was -4.43, signifying an intersection with a hazard index lower than that of the South Wadsworth Boulevard corridor.



## **2.7 Existing Environmental Conditions**

No environmental services were conducted as a part of this study. During final design stages, threatened and endangered species, migratory birds, hazardous materials, and wetlands should be evaluated.

## **2.8 Engineering Constraints**

### **2.8.1 Utilities**

Utilities of the following companies are known to exist within the project corridor:

#### AT&T Broadband/Comcast

Scott Moore  
303-603-6804  
6793 W. Canyon Avenue #13-C  
Littleton, CO 80128

#### Denver Water

Don Wyman  
303-628-6628  
1600 W 12<sup>th</sup> Avenue  
Denver, CO 80204

#### Foothills Park and Recreation District

Bill Kieck  
303-409-2311  
3624 S. Kipling Parkway  
Denver, CO 80235

#### Lockheed Martin

Barb Carlsen  
303-971-8867

#### Meadowbrook-Fairview Metropolitan District/Meadowbrook Water District

Chris Allison  
303-972-2054  
7944 S Depew  
Littleton, CO 80128

Platte Canyon Water and Sanitation District/Southwest Metropolitan Water and Sanitation District

Steve Baldegan  
303-979-2333  
8739 W Coal Mine Avenue  
Littleton, CO 80123

Qwest

Adrienne Morrow  
9750 E. Costilla Avenue, 2<sup>nd</sup> Floor  
Englewood, CO 80112  
303-792-6687

Xcel Energy – Electric

Bob Martinez  
10001 W. Hampden Avenue  
Lakewood, CO 80227  
303-980-3973

Xcel Energy – Gas

Jim McQuiston  
303-571-3744  
1123 W 3<sup>rd</sup> Avenue  
Denver, CO 80223

Existing utility locations are shown in the conceptual design plans. During final design stages, utility conflicts should be identified and impacts minimized by the use of non-destructive potholing. Utility constraints should also be considered when evaluating pavement sections.

## **2.8.2 Right-of-way/Ownership**

Right-of-way information was obtained from the Jefferson County Information Technology-Operations Division for this study. The right-of-way width varies throughout the project. Right-of-way limits and ownership are shown in the conceptual design plans.

*Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

The ownership outside the roadway right-of-way is typically the Ken Caryl Ranch Master Association in the residential areas of the segment. For the office complex, adjacent property is owned by various businesses. The right-of-way between Ken Caryl and West Park Range Road varies in width from 100 feet to 129 feet. Between West Park Range Road and Shaffer Drive, the right-of-way is 90 feet in width. From Shaffer Drive to South Kipling Parkway, the right-of-way is 100 feet in width.

*Segment 2 (South Kipling Parkway to South Wadsworth Boulevard)*

For Segment 2 (South Kipling Parkway to South Wadsworth Boulevard), the right-of-way width between South Kipling Parkway and South Estes Street is 100 feet. In this portion along West Chatfield Avenue, the area surrounding the town home complexes are owned by the homeowner's associations. From South Estes Street to South Carr Street, the narrowest right-of-way width on the project, the width is 59 feet and residential homeowners own the adjacent land. Between South Carr Street and South Wadsworth Boulevard, the right-of-way widens on the north for a total width of 79 feet. The adjacent property owner to the north in this segment is Foothills Park and Recreation District.

*Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

For Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard), the right-of-way width between South Wadsworth Boulevard and South Pierce Street varies between 100 and 115 feet. Between South Pierce Street and South Kendall Boulevard, the right-of-way varies from 80 to 87 feet in width. Adjacent property for this segment is mostly owned by private homeowners, with some property owned by the Army Corps of Engineers. Existing ownership and right-of-way information is shown in the conceptual design plans.

## 2.8.3 Drainage

### **Major Basin Description**

The project limits, from a drainage standpoint, encompass approximately 53 acres. According to the Urban Drainage and Flood Control District's (UDFCD) Major Drainageway Planning and Flood Hazard Area Delineation (FHAD) reports for Massey Draw, the majority of the project area lies within the North Tributary of Massey Draw Drainage Basin with a small portion of the project drainage tributary to the South Jefferson County Drainageway (SJCD) 6200 Basin and the Massey Draw Drainageway. Flood Insurance Rate Maps were used to confirm that the North Tributary of Massey Draw was the only Federal Emergency Management Agency (FEMA) flood zone within the project area.

These major drainage basins consist primarily of residential or commercial properties with a number of park areas located along the major drainageways. Available drainage reports for developments adjacent to the project were obtained and used to determine flows tributary to the project site. When known flows could not be determined, 5-year and 100-year storm runoff was estimated on a cubic feet per second (cfs)/acre basis using similar basins from previous roadway projects. These values are believed to be accurate enough for the conceptual planning level. All storm sewer sizing has been estimated using tributary basin runoff values and street slopes and are subject to change during the final design. There are no known irrigation facilities that will be impacted by this project.

### **Sub-Basin Description by Segment**

#### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

The general topography of the local sub-basins from West Ken Caryl Avenue to South Continental Divide Road is sloped in a southeast direction. Local drainage flows are routed to storm sewer inlets by means of curb and gutter or depressed medians. Storm sewer laterals are connected to each of the inlets but there is not currently a storm sewer mainline west of South Kipling Parkway. Each of the storm sewer laterals route drainage perpendicular to the roadway and outfall outside the pavement limits. The majority of the roadway drainage along this section of West Chatfield Avenue is tributary to the Massey Draw Drainageway. The depressed medians along this stretch of West Chatfield Avenue are located between Sta. 165+80 and South Continental Divide Road. Roadway drainage tends to sheet flow into the steep channel formed within these depressed medians. There are signs of erosion along the edge of asphalt in areas where the sheet flows converge and the channel is incised at various locations, despite numerous wooden drop structures

that have been constructed in the medians. Some of the wooden drop structures are in poor shape but all seem to have helped reduce the amount of erosion. The depressed medians are vegetated with native grasses and large mature trees, which appear to rely on the collected roadway drainage. Irrigation systems are not installed in the depressed medians.

From South Continental Divide Road to South Kipling Parkway, runoff from the adjacent properties on the north side of West Chatfield Avenue drain south through a number of sidewalk chases onto West Chatfield Avenue. Roadway drainage between South Continental Divide Road and South Kipling Parkway is routed east by means of curb and gutter. The intersection of West Chatfield Avenue and South Kipling Parkway has historically experienced flooding and shows evidence of poor drainage. Pondered flows at the intersection drain to the North Tributary of Massey Draw crossing beneath South Kipling Parkway, approximately 230 feet north of West Chatfield Avenue.

*Segment 2 (South Kipling Parkway to South Wadsworth Boulevard)*

The section of West Chatfield Avenue from South Kipling Parkway to South Garrison Street is higher in elevation than the adjacent properties, and only minor runoff from these properties enters the roadway. Drainage along this section of West Chatfield Avenue is comprised of local roadway runoff and a small amount of off-site flow that drains to the North Tributary of Massey Draw. The roadway longitudinal slope from west to east is maintained throughout this section. Superelevation of the roadway begins at the roadway intersection with South Iris Way and continues until about 300 feet west of the roadway intersection with South Garrison Street. Near Sta. 253+00, a grass-lined depressed median begins and continues to approximately Sta. 263+30. This median is unlike the previously mentioned vegetated medians, in that it does not include any trees. A Type D area inlet exists at the end of the median near Sta. 263+20. Two additional Type R curb inlets are located on the south curb and gutter near Sta. 256+20 and on the north curb and gutter near Sta. 263+00. It is undetermined where runoff collected in these inlets is conveyed, and no additional storm sewer exists between South Kipling Parkway and South Garrison Street. A small on-site detention pond is located south of and adjacent to the roadway near Sta. 263+50, and may be the point of discharge for these inlets.

It is believed that runoff which reaches South Garrison Street follows the curb returns and continues both north and south on South Garrison Street. It is possible that during larger storm events, some runoff actually crosses the intersection and continues east on the roadway.

The section of West Chatfield Avenue from South Garrison Street to South Wadsworth Boulevard is higher in elevation than the adjacent properties. Drainage along this section of West Chatfield Avenue is comprised of local roadway runoff that drains to the North Tributary of Massey Draw. A sag in the roadway profile occurs near the existing North Tributary of Massey Draw crossing at West Chatfield Avenue (Sta. 286+60). The crossing consists of a single 42" corrugated metal pipe with the capacity of less than the 5-year storm event. The next downstream crossing on the North Tributary of Massey Draw is located approximately 1,000 feet downstream at South Carr Street. Improvements to this crossing have been completed since the release of the Major Drainageway Planning Report and seem to vary from the recommendations of the Master Plan.

East of the North Tributary of Massey Draw crossing to South Wadsworth Boulevard the general topography slopes in a southern direction. The roadway profile contains a crest near Sta. 298+00. Street runoff collected between the North Tributary of Massey Draw and Sta. 298+00, is conveyed by roadside ditch west to the Tributary. Some runoff may be directed south down roadside ditches on South Carr Street and South Brentwood Street. An undetermined amount of runoff from South Cody Street, South Carr Street Court, and South Carr Street on the north side of the roadway is conveyed to the north roadside ditch within this section.

From Sta. 298+00 to the intersection with South Wadsworth Boulevard, the roadway slopes in an easterly direction. Drainage on the south side of the roadway is carried in an east direction by roadside ditch and flows south down each of the intersecting side-streets. Runoff continues to the south on the side-streets through roadside ditches and driveway culverts. The majority of residential properties backing to the north side of West Chatfield Avenue tend to drain south towards the roadway, where runoff is collected in a roadside ditch and conveyed east towards South Wadsworth Boulevard. The ditch continues north along the west side of South Wadsworth Boulevard. There is a Type R curb inlet located on the South Yukon Way curb return (Sta. 305+60), which collects an undetermined amount of street runoff from the Columbine Knolls South development. A storm sewer beginning with a flared end section in the roadside ditch (Sta. 304+55), passes through the inlet and conveys flow to the roadside ditch on the east side of the intersection by means of a flared end section (Sta. 307+05).

Another Type R curb inlet is located on the curb and gutter of the northwest corner of the South Wadsworth Boulevard intersection (Sta. 320+00). The storm sewer from the inlet is believed to route the flows to the north to the SJCD 6200 Drainageway. The outfall of this storm sewer system is undetermined.

### *Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

West Chatfield Avenue continues to slope to the east from South Wadsworth Boulevard east to the end of the project limits at South Kendall Boulevard. A centerline crown is maintained throughout. Generally, this section of West Chatfield Avenue experiences the most significant contribution of off-site runoff onto the roadway. With the exception of South Upham Way (Sta. 332+00), South Pierce Street (Sta. 348+90), and South Lamar Street (Sta. 362+20), all other intersecting streets slope towards the roadway.

Curb and gutter exists on the north side of the roadway from South Wadsworth Boulevard east to Sta. 346+85. The curb returns at the South Pierce Street intersection also have curb and gutter (Sta. 348+90). Curb and gutter does not exist on the remainder of the north side of the roadway, and all runoff is captured and conveyed in a grass-lined roadside ditch. At Sta. 371+00, a flared end section in the ditch diverts an undetermined amount of flow by pipe to a storm sewer inlet on the south side of the roadway at Sta. 371+35. The ditch continues and ends immediately east of South Kendall Boulevard near Sta. 381+35, and a culvert conveys flow beneath the road to the continuation of the roadside ditch on the east side of the intersection. The capacity of the culvert crossing is undetermined.

Curb and gutter exists on the south side of the roadway from South Wadsworth Boulevard east to Sta. 368+35. Curb and gutter does not exist on the remainder of the south side of the roadway, and all runoff is captured and conveyed in a grass-lined roadside ditch and enters a ditch inlet at Sta. 371+35 at the end of the ditch. Street runoff from beyond Sta. 371+35 to the end of the project at South Kendall Boulevard simply sheet flows off the street and down the adjacent embankment.

### **2.8.4 Geologic**

The west portion of West Chatfield Avenue, from approximately West Ken Caryl Avenue (Station 153+00) to approximately South Ammons Street (Station 303+00) falls within the Dipping Bedrock Overlay District as defined by the Colorado Geologic Survey. Per Jefferson County design criteria, this area will require overexcavation and moisture-density control. Generally, Station 152+00 to 245+00 (West Ken Caryl Avenue to South Iris Way) and Station 268+00 to 387+00 (South Garrison Street to South Kendall Boulevard) exhibit medium to severe cracking. Station 245+00 to 268+00 (South Iris Way to South Garrison Street) appear to have been recently overlaid and have little cracking. Appendix H of this report is the Geologic Reconnaissance and Pavement Distress Evaluation performed by Ground Engineering.

## **2.8.5 Landscape/Vegetation/Medians**

West Chatfield Avenue is included as a project in the Jefferson County "Southeast Jefferson County Local Improvement District" (e.g. One-Half Cent Sales Tax District). Incorporating landscaping into roadway improvements is a key objective of the funding. Landscaping preservation and design opportunities exist along the entire corridor.

### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

Large trees exist on the outside of the roadway and in the median. The trees are healthy and worth preserving, where possible, with the exception of some trees in the existing raised medians between South Continental Divide Road and South Kipling Parkway where existing pine trees in the median show signs of distress. A landscaping opportunity exists between West Ken Caryl Avenue and Sawatch Range Road where trees currently are not present and can be incorporated into the design. In this area, there are some newly planted trees west of the existing southbound lanes between Cochetopa Pass and Shaffer Drive for a 500-foot section. The sidewalk on this segment is typically narrow and often attached. Preserving trees in this segment will be important while improving the sidewalk and roadway. The segment of sidewalk on the east side of Chatfield between Cochetopa Pass and Shaffer Drive is approximately 3.5 feet in width. There is a steep slope immediately adjacent to the sidewalk with mature trees. A wall could be utilized in this area to protect trees along the side slope to allow sidewalk enhancements.

### *Segment 2 (South Kipling Parkway to South Wadsworth Boulevard)*

There is currently no median landscaping in this segment. The existing median, where it is present, is depressed with grass in some areas and painted in other areas. On the outside edges of the existing roadway from South Iris Way to South Everett Way, there are trees in the tracts owned by the homeowner's associations. From South Everett Way to South Wadsworth Boulevard, the south side of the road is not formally landscaped, but trees planted by homeowners on private property are scattered throughout this section. On the north side of the road, a similar situation of homeowner planted trees on private property exists to South Carr Street. From South Carr Street to South Wadsworth Boulevard, the north side of West Chatfield Avenue is owned by Foothills Park and Recreation District. This area is mostly unplanted with the exception of a few trees east of South Yukon Street and the trees at the entrance to the subdivision at South Allison Street. Landscaping opportunities exist with minor modifications to the paved and depressed medians. There are also opportunities along the side of West Chatfield Avenue if a tree lawn is

established. This can be added in some areas with minimal impacts on existing trees.

*Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

There is landscaping along the roadway between South Wadsworth Boulevard and South Upham Way north of West Chatfield Avenue adjacent to the King Soopers shopping area and to the south of West Chatfield Avenue adjacent to the Marina Pointe Shopping Center. There is also landscaping at the entrances to the Marina Pointe Condominiums. The remainder of this segment is not landscaped. There are many opportunities to add landscaping. The existing sidewalk is detached on the north side of West Chatfield Avenue from South Wadsworth Boulevard to South Pierce Street. This area would provide a streetscape opportunity. Adding a raised median between South Wadsworth Boulevard and South Pierce Street could also create small planting areas. From South Pierce Street to South Lamar Street, landscaping can be incorporated by adding or maintaining an 8-foot detached sidewalk and tree lawn.

## **2.9 General Public Input**

The first Public Open House meeting was held on August 14, 2003 at the Ken Caryl Ranch House. The public meeting was advertised by sending fliers to 1,011 residents and businesses along the corridor. Thirty signs were posted along West Chatfield Avenue and side-streets. A press release was submitted on July 15, 2003 and the meeting was advertised in the Columbine Courier and the Ken Caryl Ranch newspaper.

Approximately 146 people attended the meeting. Additionally, nine project representatives from the Muller Engineering team and Jefferson County attended.

The intent of the meeting was to educate the public about the history and objectives of the project, present technical data, show existing conditions, present options for improvements, and provide a forum for both input and questions from the public.

There were 26 boards presented at the Open House and 3 Large Roll Plots showing alternatives for the corridor.

Seventy-five surveys were turned in at the meeting or sent to Muller Engineering by September 9, 2003. In addition, 103 petitions, with comment sheets attached in some cases, were received after the public meeting from homeowners in the Meadowbrook Heights Area (on the south side of West Chatfield Avenue

between South Wadsworth Boulevard and South Carr Street). All public comment sheets and summary of the comments received are in the Summary of Public Meeting No. 1 dated September 18, 2003. Appendix C is a chart summarizing the public response received for the first public meeting.

A Public Open House was held on August 12, 2003 to receive citizen input on Carr Street Realignment alternatives. Nineteen homeowners surrounding Chatfield who could be affected by one or more of the Carr Street realignment alternatives were hand delivered a flier inviting them to the meeting. The summary of this public meeting is included in Appendix D.

A Second Public Meeting was held on Wednesday, March 3, 2004 and is summarized in section 3.3 of this report.

## **Chapter Three: Identification of Needs and Improvement Plan**

### ***3.1 Identification of Needs***

#### **3.1.1 Traffic Operations Analysis**

The Countywide Transportation Plan, dated April 1998 and updated in December 2002, established LOS D or better as a goal for maximum congestion during peak hours on all Jefferson County roadways which are classified as an arterial or greater. The 2025 projected LOS and traffic counts are shown in Figure 3. It is anticipated that widening the two lane portions of West Chatfield Avenue in Segment 2 to four lanes will accommodate existing and projected traffic demand. In Segment 3, from South Pierce Street to South Kendall Boulevard, it is anticipated that projected traffic can be accommodated with a two-lane section as exists now with the addition of left-turn and deceleration lanes. The intersections of West Chatfield Avenue with South Kipling Parkway and South Wadsworth Boulevard are anticipated to operate at lower than the LOS goal of D during the peak hours in year 2025. At these two intersections, improvements beyond the scope of the West Chatfield Avenue Study may be warranted to accommodate future traffic needs.

Table 2 shows the side-street delay for all signalized intersections and LOS for stop-controlled intersections. The 2025 condition was analyzed based on proposed improvements and projected traffic. Side-street delay is below LOS D in 2025 for many side-streets intersecting West Chatfield Avenue. Delay studies can be completed in the future for these intersections to evaluate the need for improvements.

**Table 2a**

**LEVEL OF SERVICE COMPARISON - SIGNALIZED INTERSECTION**

| Intersection                  | Existing Conditions - 2003 |     |       |     | Proposed Improvements - 2025 |     |       |     |
|-------------------------------|----------------------------|-----|-------|-----|------------------------------|-----|-------|-----|
|                               | AM                         |     | PM    |     | AM                           |     | PM    |     |
|                               | Delay                      | LOS | Delay | LOS | Delay                        | LOS | Delay | LOS |
| Ken Caryl Avenue/Simms Street | 27.8                       | C   | 26.3  | C   | 31.7                         | C   | 33.7  | C   |
| Sangre De Cristo Road         | 37.5                       | D*  | 32.0  | C   | 29.0                         | C   | 29.8  | C   |
| Kipling Parkway               | 31.3                       | C   | 46.4  | D*  | 51.6                         | D*  | 46.7  | D*  |
| Wadsworth Boulevard           | 36.8                       | D*  | 50.2  | D*  | 42.7                         | D   | 58.5  | E*  |
| 7444 W. Chatfield Avenue      | 13.2                       | B   | 18.0  | B   | 15.5                         | B   | 23.5  | B   |
| Pierce Street                 | 11.4                       | B   | 62.7  | E*  | 15.6                         | B   | 21.1  | C   |

\*At least one movement LOS E or worse

**Table 2b**

**LEVEL OF SERVICE COMPARISON - STOP CONTROLLED INTERSECTIONS**

| Intersection                      | Existing Conditions - 2003 |    |    |    | Proposed Improvements - 2025 |    |    |    |
|-----------------------------------|----------------------------|----|----|----|------------------------------|----|----|----|
|                                   | AM                         |    | PM |    | AM                           |    | PM |    |
|                                   | WB                         | EB | WB | EB | WB                           | EB | WB | EB |
| Park Range Road                   | A                          |    | B  |    | B                            |    | B  |    |
| Cochetopa Pass/Shaffer Place      | B                          | C  | B  | D  | C                            | C  | C  | F  |
| Shaffer Drive                     |                            | A  |    | B  |                              | B  |    | B  |
| Sawatch Range Rd/Shaffer Pkwy     | B                          | D  | C  | F  | C                            | F  | E  | F  |
| Continental Divide Road           | C                          | D  | F  | F  | D                            | F  | F  | F  |
| Bradford Drive                    | B                          |    | C  |    | B                            |    | D  |    |
| Culebra Range Road                |                            | B  |    | B  |                              | B  |    | B  |
| Access West of Kipling Pkwy       | C                          | D  | D  | F  | D                            | F  | F  | F  |
| Iris Way                          | C                          | C  | D  | F  | F                            | E  | F  | F  |
| 9601-9639 Chatfield (Hoyt Street) |                            | B  |    | A  |                              | B  |    | B  |
| 9600-9622 Chatfield               | A                          |    | B  |    | B                            |    | B  |    |
| Everett Way/Phillips Drive        | B                          | B  | B  | C  | D                            | D  | F  | F  |
| Dudley Street                     |                            | B  |    | C  |                              | C  |    | E  |
| Dover Street                      |                            | B  |    | C  |                              | C  |    | C  |
| Cody Street                       |                            | B  |    | C  |                              | C  |    | D  |
| Carr Court                        |                            | B  |    | B  |                              | B  |    | B  |
| Carr Street (South Leg)           | B                          |    | C  |    | D                            |    | F  |    |
| Carr Street (North Leg)           |                            | C  |    | C  |                              | E  |    | E  |
| Brentwood Street                  | B                          |    | C  |    | B                            |    | B  |    |
| Balsam Street                     | B                          |    | C  |    | C                            |    | D  |    |
| Ammons Street                     | B                          |    | B  |    | D                            |    | C  |    |
| Allison Street/Yukon Way          | C                          | E  | C  | F  | F                            | F  | F  | F  |
| Zephyr Street                     | C                          |    | C  |    | D                            |    | D  |    |
| Yarrow Street                     | B                          |    | C  |    | C                            |    | D  |    |
| Yukon Street                      | C                          |    | B  |    | D                            |    | D  |    |
| Wadsworth Court                   | C                          |    | B  |    | B                            |    | B  |    |
| Upham Way                         | C                          | B  | D  | B  | F                            | C  | F  | F  |
| Saulsbury Street                  | B                          |    | C  |    | C                            |    | E  |    |
| Reed Street                       | B                          |    | C  |    | C                            |    | D  |    |
| Quay Street                       | C                          |    | C  |    | D                            |    | E  |    |
| Newland Street                    | B                          |    | C  |    | C                            |    | D  |    |
| Marshall Court                    |                            | B  |    | C  |                              | B  |    | D  |

### **3.1.2 Accident Analysis**

#### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

The most frequent occurring accident types are broadside accidents, followed by approach turns and rear-end accidents. Lengthening the existing left-turn lanes and adding right-turn lanes as shown in the conceptual plans should help to reduce the number of rear-end accidents. The only concentration of accidents was at South Sangre De Cristo Road (9), with 5 of the accidents being broadside accidents. Since 2001, a traffic signal has been added at the intersection, which should result in a decrease of broadside accidents. However, no accident data after the installation of the traffic signal is available.

At South Kipling Parkway, the most frequent occurring accident types are approach turns, followed by rear-ends and broadsides. In 2003, double left-turn lanes were added to South Kipling Parkway. Adding double left-turn lanes to the west leg of West Chatfield Avenue and allowing vehicles to only turn left on green arrows should reduce the number of approach turn accidents.

#### *Segment 2 (South Kipling Parkway to South Wadsworth Boulevard)*

The most frequent occurring accident types are broadsides and rear-end accidents. Widening of the road, adding of left-turn lanes and correcting the roadway profile from South Estes Street to South Wadsworth Boulevard as shown in the conceptual design plans should reduce the number of rear-end accidents. In addition, raised medians near South Carr Street and South Wadsworth Boulevard will prevent left-turns, reducing the possibilities of broadside accidents. Accidents were concentrated at South Carr Street with four property damage accidents and four injury accidents and at South Garrison Street with six property damage accidents and four injury accidents. Due to the opening of a middle school on South Garrison Street south of West Chatfield Avenue, a traffic signal was added to the intersection in the fall of 2003. No accident data after the installation of the traffic signal is available; however, the signal should result in a decrease of broadside accidents at the South Garrison Street intersection.

At South Wadsworth Boulevard, the most frequent occurring accident types are rear-ends, comprising 60% of the accidents occurring at the intersection. Although less than 35% of the accidents are due to West Chatfield Avenue traffic, the addition of a left-turn and a right-turn lane to the west leg should reduce the number of rear-ends occurring on West Chatfield Avenue.

### *Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

The most frequent occurring accident types are broadside and rear-ends. Accidents were concentrated at 7444 W. Chatfield (four property damage and four injury accidents), and on the horizontal curve between South Lamar Street and South Kendall Boulevard (two property damage and three injury accidents). At South Pierce Street, adding a right-turn lane for the westbound lane and restriping the intersection should help to improve the safety at the intersection. Increasing the design speed of the curve and adding curb and gutter to the section between South Lamar Street and South Kendall Boulevard should improve the safety and may result in fewer cars running off the road. Due to the opening of commercial development, a traffic signal was added at 7444 West Chatfield Avenue in 2000. Since the addition of the traffic signal, fewer broadside accidents have been experienced at the intersection.

### **3.1.3 Signal Warrants**

Several intersections within the corridor were analyzed to determine if the installation of a traffic signal was warranted. The South Garrison Street and West Chatfield Avenue intersection was initially included in the analysis; however, because of the opening of the Falcon Bluffs Middle School on South Garrison Street south of West Chatfield Avenue, Jefferson County performed a separate signal warrant study. The study concluded that this location required a traffic signal, which was installed in late 2003.

The following unsignalized intersections experienced a level of service of E or worse for 2003 traffic counts and were, therefore, chosen for signal warrant analysis: Cochetopa Pass/Shaffer Place, Sawatch Range Road, South Continental Divide Road, South Iris Way, South Everett Way/Phillips Drive, South Carr Street, South Allison Street/Yukon Way, South Upham Way, South Quay Street and South Kendall Boulevard. The Manual on Uniform Traffic Control Devices (MUTCD) outlines the criteria for determining whether a traffic signal may be justified at an intersection. Each intersection was evaluated using 2003 turning movement counts, and 2003 ADT counts when available. Only South Kendall Boulevard met any of the signal warrant criteria, meeting both Warrant 2 (Four-Hour Vehicular Volume) and Warrant 3 (Peak Hour Volume and Delay).

In order to determine when each intersection might meet signal warrant criteria in the future (for planning purposes only), the turning movement counts were projected to years 2010 and 2025 and analyzed based on the improved and unimproved condition. For the 2010 turning movements, both South Continental Divide Road and South Iris Way were projected to meet the criteria for Warrant 3A (Peak Hour Delay); no other intersection met any of the criteria. For the 2025 projected turning movements, only the Cochetopa Pass/Shaffer Place and South Everett Way/ Phillips Drive intersections did not meet the criteria for Warrant 3.

The South Continental Divide Road and South Iris Way intersections should be reanalyzed within the next five years to determine if the traffic volumes have increased enough to meet any of the warrant criteria. Also, after any portion of the corridor has been improved, traffic volumes should be reevaluated to determine if changing traffic patterns have negatively affected any of the intersections within the improved portion.

### **3.1.4 Roundabout Viability**

Roundabouts were analyzed at several intersections along the corridor as directed by Jefferson County. The conceptual geometric layout for these roundabouts is in Appendix F. The intersections analyzed include Shaffer Place/Cochetopa Pass, South Continental Divide Road, South Sangre De Cristo Road, South Garrison Street, South Dover Street, South Carr Street, South Allison Street/Yukon Way, South Pierce Street, and South Kendall Boulevard. All of the above roundabouts were designed as two lane roundabouts with the exception of South Kendall Boulevard, which was designed as a single lane roundabout. The roundabouts were configured to reduce the impacts to ROW by using a small circular template. The roundabouts have a 150-foot inscribed circular diameter. *Roundabouts: An Informational Guide (P. 13)* recommends 150 to 180 feet for urban double-lane roundabouts.

A RODEL (Modern roundabout traffic operational analysis software) analysis was completed for six of the intersections to determine the projected traffic operations at these locations. The results are summarized in Table 3 below:

**Table 3: Projected Year 2025 Roundabout Levels of Service and Delay**

| Intersection                     | AM           |     | PM           |     |
|----------------------------------|--------------|-----|--------------|-----|
|                                  | Delay (sec.) | LOS | Delay (sec.) | LOS |
| Shaffer Parkway / Cochetopa Pass | 2.7          | A   | 3.0          | A   |
| Continental Divide Road          | 3.1          | A   | 3.8          | A   |
| South Carr Street                | 3.0          | A   | 3.5          | A   |
| South Allison Street             | 3.4          | A   | 5.5          | A   |
| South Pierce Street              | 3.1          | A   | 5.0          | A   |
| South Kendall Boulevard          | 8.4          | A   | 10.0         | A   |

These results indicate that the intersections will operate at a high level of service (minimal delay and congestion) if they are constructed as modern roundabouts.

There are several site-specific conditions identified in the Federal Highway Administration (FHWA) publication *Roundabouts: An Informational Guide* that are important to evaluate when determining if a modern roundabout is feasible for a location. Key conditions include and how these pertain to the roundabouts studied on West Chatfield Avenue follow:

- Physical limitations including Right-of-Way constraints and drainage issues.  
*The required footprint of the roundabouts studied is in Appendix F. Roundabouts at Shaffer Place/Cochetopa Pass, South Continental Divide Road, South Sangre De Cristo Road, and South Garrison Street do not have significant right-of-way impacts. Roundabouts at South Dover Street, South Allison Street/Yukon Way, South Pierce Street, and South Kendall Boulevard would have impacts to private residential property. A roundabout at South Carr Street would likely require the condemnation of one house.*
- Traffic that would have difficulty negotiating a roundabout, mainly truck volumes.  
*The low truck volumes would not affect roundabout function on West Chatfield Avenue.*

- Proximity of traffic control devices that require preemption, such as railroad tracks.  
*There are no railroad crossings or intersections that require preemption in the vicinity of the roundabouts. There is an emergency fire station 150 feet west of Sangre De Cristo Road, but due to the relative infrequency of that signal, we don't feel it would affect the function of a roundabout.*
- Proximity of bottlenecks that would back up traffic into the roundabout.  
*The distance from South Sangre de Cristo Road to South Kipling Parkway is 900 feet. The distance from South Allison Street to South Wadsworth Boulevard is 1,550 feet. Other intersections with West Chatfield Avenue adjacent to roundabouts would not cause bottlenecks into the roundabouts.*
- Problems with grades or topography.  
*It is unfavorable to have steep grades for traffic entering a roundabout. One reason for this is more difficulty in yielding to traffic in the circle on steep grades. Adequate sight distance for drivers to anticipate the roundabout is also essential. Generally, approach grades less than 4 percent are considered favorable for a roundabout. South Continental Divide Road is the only concern for the grade criteria. The south leg of South Continental Divide Road is 6.5%, sloping away from West Chatfield Avenue. Drivers approaching the roundabout from this leg of South Continental Divide Road may not have adequate sight distance to anticipate the roundabout.*
- Intersections where an unacceptable delay would be added to a major roadway or movement due to the equal treatment of entering vehicles.  
*As is shown in Table 3 above, the intersections identified would operate efficiently if constructed with roundabouts.*
- Heavy pedestrian or bicycle movements.  
*West Chatfield Avenue is not anticipated to have heavy pedestrian traffic or bicycle traffic that would negatively effect the operation of the roundabout. The roundabouts would include crossings for pedestrians and bicycles.*
- Arterial streets located in a coordinated signal network.  
*The intersections along West Chatfield Avenue are not in a coordinated signal network, so there would be no preclusion of a roundabout due to this condition.*

From site-specific conditions a roundabout would likely be precluded at South Continental Divide Road because of inadequate sight distance on the steep approach on the southern leg of the intersection. A roundabout would also be precluded at South Carr Street since it would likely require the taking of a residence, which Jefferson County has decided against on this project. All other identified intersections are potential candidates for a roundabout. South Kendall Boulevard is the only unsignalized intersection along the West Chatfield Avenue corridor that currently meets a MUTCD traffic signal warrant. This intersection is under the jurisdiction of CDOT and further CDOT coordination should be completed during the design process. The implementation of roundabouts at the remaining intersections will primarily be an issue of community interest and should be evaluated once the intersections meet signal warrants. When presented to the public during the First Public Meeting (August 14, 2003), the general consensus was that the public did not favor roundabouts along this corridor.

### **3.1.5 Auxiliary Lanes**

Additional auxiliary lanes for turning movements and acceleration and deceleration are a key issue to improve safety for the West Chatfield Avenue corridor.

The need and length requirements for auxiliary lanes were evaluated using the Jefferson County RCDM and the State Highway Access Code dated August 18, 1999. The requirements for each turning movement along the corridor are summarized in Table 4. Table 4 is broken out into signalized and unsignalized intersections. As can be seen on these tables, the State Highway Access Code is less restrictive on the warrant for acceleration and deceleration lengths. Because this is a retrofit job and there are right-of-way and existing landscaping restrictions along the entire corridor, Jefferson County concurred that the State Highway Access Code could be used to determine whether a new acceleration or deceleration lane be installed. The turning movements which incorporated new auxiliary lanes as shown in the conceptual design plans are highlighted in green in Table 4.

The length of the turning lane incorporated into the preferred plan is also summarized in Table 4. The acceleration/deceleration lengths, storage lengths and taper lengths incorporated into the preferred option were per the Jefferson County RDCM. For left turning movements, deceleration length was not incorporated. The State Highway Access code does not require this additional length for minor arterials, but instead only requires storage length. The retrofit nature of the project and the desire to incorporate landscaping in the medians support these shorter turn lane lengths.

# Table 4a

## Auxiliary Lane and Taper Length Table

| Cross Street            | Turning Movement | Accel/Decel | 2025 VPH | Turn Lane Exists? Length | Turn Lane to be Added? Length                      | Jefferson County RDCM |                |              |              | State Highway Access Code |                |              |              |
|-------------------------|------------------|-------------|----------|--------------------------|--|-----------------------|----------------|--------------|--------------|---------------------------|----------------|--------------|--------------|
|                         |                  |             |          |                          |  | Accel/Decel Length    | Storage Length | Taper Length | Total Length | Accel/Decel Length        | Storage Length | Taper Length | Total Length |
| Ken Caryl Avenue        | NB Right         | Decel       | 55       | NO                       | YES-310'   | 310                   |                | 180          | 300          |                           | 70             | 195          | 265          |
| Ken Caryl Avenue        | NB Left          | Decel       | 250      | YES-245'                 | EXT 310'   | 310                   | 310            | 180          | 810          |                           | 340            | 195          | 535          |
| Ken Caryl Avenue        | EB Right         | Accel       | 250      | NO                       |  | 360                   |                | 180          | 560          |                           | Not Required   |              |              |
| San Jose De Cristo Road | EB Right         | Decel       | 120      | NO                       | YES-230'   | 230                   |                | 140          | 370          |                           | 120            | 144          | 264          |
|                         |                  |             |          |                          | NO MORE ROOM FOR STOP SIGN                         |                       |                |              |              |                           |                |              |              |
| San Jose De Cristo Road | EB Left          | Decel       | 65       | YES-100'                 |  | 230                   | 90             | 140          | 460          |                           | 65             | 144          | 209          |
| San Jose De Cristo Road | WB Right         | Decel       | 110      | NO                       | YES-360'   | 230                   |                | 140          | 370          |                           | 110            | 144          | 264          |
| San Jose De Cristo Road | WB Left          | Decel       | 180      | YES-110'                 | LONG TRAIL-240'                                    | 230                   | 240            | 140          | 610          |                           | 190            | 144          | 334          |
| San Jose De Cristo Road | NB Right         | Decel       | 250      | YES                      |  | 150                   |                | 100          | 250          |                           | 250            | 96           | 346          |
| San Jose De Cristo Road | NB Right         | Accel       | 250      | NO                       | YES-360'   | 180                   |                | 120          | 310          |                           | Not Required   |              |              |
| San Jose De Cristo Road | NB Left          | Decel       | 110      | YES                      |  | 150                   | 145            | 100          | 395          |                           | 110            | 96           | 206          |
| San Jose De Cristo Road | SB Right         | Decel       | 55       | YES                      |  | 150                   |                | 100          | 250          |                           | 50             | 96           | 146          |
| San Jose De Cristo Road | SB Right         | Accel       | 55       | NO                       | YES-400'   | 180                   |                | 100          | 310          |                           | Not Required   |              |              |
| San Jose De Cristo Road | SB Left          | Decel       | 110      | YES                      |  | 150                   | 145            | 100          | 395          |                           | 110            | 96           | 206          |
| San Jose De Cristo Road | EB Right         | Decel       | 450      | NO                       | YES-330'   | 230                   |                | 140          | 370          |                           | 450            | 144          | 594          |
| Xelina Parkway          | EB Right         | Accel       | 450      | YES                      |  | 760                   |                | 240          | 1000         |                           |                | 180          | 780          |
| Xelina Parkway          | EB Left          | Decel       | 330      | YES-100'                 |  | 230                   | 435            | 140          | 785          |                           | 330            | 144          | 474          |
| Xelina Parkway          | WB Right         | Decel       | 310      | YES-230'                 |  | 230                   |                | 140          | 370          |                           | 310            | 144          | 454          |
| Xelina Parkway          | WB Right         | Accel       | 310      | NO                       |  | 760                   |                | 240          | 1000         |                           |                | 180          | 780          |
| Xelina Parkway          | WB Left          | Decel       | 300      | YES-460'                 |  | 230                   | 375            | 140          | 745          |                           | 300            | 144          | 444          |
| Xelina Parkway          | WB Right         | Decel       | 250      | YES                      |  | 320                   |                | 180          | 500          |                           | 330            | 190          | 500          |
| Xelina Parkway          | NB Right         | Decel       | 250      | YES-540'                 |  | 380                   |                | 180          | 560          |                           | Not Required   |              |              |
| Xelina Parkway          | NB Left          | Decel       | 510      | YES                      |  | 320                   | 640            | 180          | 1140         |                           | 510            | 180          | 1010         |
| Xelina Parkway          | SB Right         | Decel       | 230      | YES                      |  | 320                   |                | 180          | 500          |                           | 320            | 180          | 500          |
| Xelina Parkway          | SB Right         | Accel       | 230      | NO                       | YES-330' RD RM TO LENGTHEN CUE TO SHIPING ENTRANCE | 380                   |                | 180          | 560          |                           | Not Required   |              |              |
| Xelina Parkway          | SB Left          | Decel       | 240      | YES                      |  | 320                   | 300            | 180          | 800          |                           | 240            | 180          | 740          |
| Wadsworth Boulevard     | EB Right         | Decel       | 210      | YES-120'                 |  | 230                   |                | 140          | 370          |                           | 210            | 144          | 354          |
| Wadsworth Boulevard     | EB Right         | Accel       | 210      | YES                      |  | 760                   |                | 240          | 1000         |                           |                | 180          | 780          |
| Wadsworth Boulevard     | EB Left          | Decel       | 250      | YES-140'                 | LONG TRAIL-480'                                    | 230                   | 330            | 140          | 700          |                           | 250            | 144          | 404          |
| Wadsworth Boulevard     | WB Right         | Decel       | 100      | YES-340'                 |  | 230                   |                | 140          | 370          |                           | 100            | 144          | 244          |
| Wadsworth Boulevard     | WB Right         | Accel       | 100      | YES                      |  | 760                   |                | 240          | 1000         |                           |                | 180          | 780          |
| Wadsworth Boulevard     | WB Left          | Decel       | 450      | YES-200'                 | NO ROADWAY LENGTHEN SHIPING TURN                   | 230                   | 560            | 140          | 930          |                           | 450            | 144          | 594          |
| Wadsworth Boulevard     | NB Right         | Decel       | 350      | YES                      |  | 320                   |                | 180          | 500          |                           | 320            | 180          | 500          |

# Table 4a

## Auxiliary Lane and Taper Length Table

| Cross Street             | Turning Movement | Accel/Decel | 2025 VPH | Turn Lane Exists? Length | Turn Lane to be Added? Length                    | Jefferson County RDCM |                |              |              | State Highway Access Code |                |              |              |     |     |
|--------------------------|------------------|-------------|----------|--------------------------|--|-----------------------|----------------|--------------|--------------|---------------------------|----------------|--------------|--------------|-----|-----|
|                          |                  |             |          |                          |  | Accel/Decel Length    | Storage Length | Taper Length | Total Length | Accel/Decel Length        | Storage Length | Taper Length | Total Length |     |     |
| Wadsworth Boulevard      | NB Right         | Accel       | 350      | YES-260'                 | NO ROOM TO LENGTHEN SHIPING TURN                 | 380                   |                | 180          | 560          |                           |                |              |              |     |     |
| Wadsworth Boulevard      | NB Left          | Decel       | 180      | YES                      |  | 320                   | 240            | 180          | 740          |                           |                |              |              | 180 | 690 |
| Wadsworth Boulevard      | SB Right         | Decel       | 230      | YES                      |  | 320                   |                | 180          | 500          |                           |                |              |              | 180 | 500 |
| Wadsworth Boulevard      | SB Right         | Accel       | 230      | NO                       | YES-380'   | 380                   |                | 180          | 560          |                           |                |              |              |     |     |
| Wadsworth Boulevard      | SB Left          | Decel       | 240      | YES                      |  | 320                   | 300            | 180          | 800          |                           |                |              |              | 240 | 740 |
| 7444 W. Chaffield Avenue | EB Right         | Decel       | 5        | YES-260'                 |  | 230                   |                | 140          | 370          |                           |                |              |              |     |     |
| 7444 W. Chaffield Avenue | EB Left          | Decel       | 340      | YES-230'                 | NO ROOM TO LENGTHEN WAOS LEFT AND TRANSIT AT 101 | 230                   | 360            | 140          | 760          |                           |                |              |              |     | 454 |
| 7444 W. Chaffield Avenue | WB Right         | Decel       | 230      | YES                      |  | 230                   |                | 140          | 370          |                           |                |              |              | 144 | 374 |
| 7444 W. Chaffield Avenue | WB Left          | Decel       | 40       | YES-160'                 |  | 230                   | 40             | 140          | 410          |                           |                |              |              | 50  | 194 |
| 7444 W. Chaffield Avenue | NB Right         | Decel       | 30       | YES                      |  | 150                   |                | 100          | 250          |                           |                |              |              |     |     |
| 7444 W. Chaffield Avenue | NB Right         | Accel       | 30       | YES                      | PRIVATE SHOPPING ENTRANCE                        |                       |                |              |              |                           |                |              |              |     |     |
| 7444 W. Chaffield Avenue | NB Left          | Decel       | 75       | NO                       |  | 150                   | 100            | 100          | 350          |                           |                |              |              | 75  | 185 |
| 7444 W. Chaffield Avenue | SB Right         | Decel       | 320      | YES                      |  | 150                   |                | 100          | 250          |                           |                |              |              | 320 | 410 |
| 7444 W. Chaffield Avenue | SB Right         | Accel       | 320      | YES-340'                 |  | 150                   |                | 100          | 250          |                           |                |              |              |     |     |
| 7444 W. Chaffield Avenue | SB Left          | Decel       | 140      | YES                      |  | 150                   | 175            | 100          | 425          |                           |                |              |              | 140 | 230 |
| Pierce Street            | EB Left          | Decel       | 270      | YES-215'                 |  | 230                   | 340            | 140          | 710          |                           |                |              |              | 270 | 414 |
| Pierce Street            | WB Right         | Decel       | 340      | NO                       | YES-260'   | 230                   |                | 140          | 370          |                           |                |              |              | 240 | 384 |
| Pierce Street            | WB Right         | Accel       | 240      | YES                      |  | 380                   |                | 180          | 560          |                           |                |              |              |     |     |
| Pierce Street            | SB Right         | Decel       | 380      | YES                      |  | 230                   |                | 140          | 370          |                           |                |              |              | 380 | 504 |
| Pierce Street            | SB Right         | Accel       | 360      | NO                       | NO   | 380                   |                | 180          | 560          |                           |                |              |              |     |     |
| Pierce Street            | SB Left          | Decel       | 55       | YES                      |  | 230                   | 40             | 140          | 410          |                           |                |              |              | 50  | 154 |

# Table 4b

## Auxiliary Lane and Taper Length Table

| Cross Street                  | Turning Movement | Accel/Decel | 2025 VPH | Turn Lane Exists? Length | Turn Lane to be Added? Length                | Jefferson County RDCM |                |              |              | State Highway Access Code |                |              |              |
|-------------------------------|------------------|-------------|----------|--------------------------|--|-----------------------|----------------|--------------|--------------|---------------------------|----------------|--------------|--------------|
|                               |                  |             |          |                          |  | Accel/Decel Length    | Storage Length | Taper Length | Total Length | Accel/Decel Length        | Storage Length | Taper Length | Total Length |
| Clark Range Road              | NB Right         | Decel       | 55       | NO                       | YES-310'                                     | 310                   | 140            | 140          | 450          | 70                        | 195            | 195          | 265          |
| Clark Range Road              | WB Right         | Accel       | 50       | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Cochetopa Pass/Shaffer Place  | NB Right         | Decel       | 30       | NO                       | YES-185'                                     | 185                   | 140            | 140          | 225          | Not Required              |                |              |              |
| Cochetopa Pass/Shaffer Place  | NB Left          | Decel       | 60       | YES-160'                 | NO   | 185                   | 50             | 115          | 260          | 50                        | 115            | 115          | 185          |
| Cochetopa Pass/Shaffer Place  | SB Right         | Decel       | 40       | NO                       | YES-230'                                     | 230                   | 140            | 140          | 370          | Not Required              |                |              |              |
| Cochetopa Pass/Shaffer Place  | SB Left          | Decel       | 160      | YES-120'                 | NO   | 310                   | 125            | 190          | 625          | 220                       | 195            | 195          | 415          |
| Cochetopa Pass/Shaffer Place  | EB Right         | Accel       | 50       | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Cochetopa Pass/Shaffer Place  | WB Right         | Accel       | 90       | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Shaffer Drive                 | SB Right         | Decel       | 25       | NO                       | NO   | 200                   | 140            | 140          | 370          | Not Required              |                |              |              |
| Shaffer Drive                 | EB Right         | Accel       | 135      | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Sawatch Range Rd/Shaffer Pkwy | EB Right         | Decel       | 50       | NO                       | YES-230'                                     | 230                   | 140            | 140          | 370          | 50                        | 144            | 144          | 194          |
| Sawatch Range Rd/Shaffer Pkwy | EB Left          | Decel       | 40       | YES-230'                 | NO   | 230                   | 50             | 140          | 420          | 50                        | 144            | 144          | 194          |
| Sawatch Range Rd/Shaffer Pkwy | WB Right         | Decel       | 90       | NO                       | YES-230'                                     | 230                   | 140            | 140          | 370          | 80                        | 144            | 144          | 224          |
| Sawatch Range Rd/Shaffer Pkwy | WB Left          | Decel       | 180      | YES-300'                 | NO   | 290                   | 150            | 140          | 520          | 180                       | 144            | 144          | 324          |
| Sawatch Range Rd/Shaffer Pkwy | NB Right         | Accel       | 220      | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Sawatch Range Rd/Shaffer Pkwy | SB Right         | Accel       | 15       | NO                       | NO   | 230                   | Not Required   | Not Required | Not Required | Not Required              |                |              |              |
| Sawatch Range Rd/Shaffer Pkwy | EB Right         | Decel       | 30       | NO                       | YES-230'                                     | 230                   | 140            | 140          | 370          | 90                        | 144            | 144          | 234          |
| Sawatch Range Rd/Shaffer Pkwy | EB Left          | Decel       | 45       | YES-280'                 | NO   | 290                   | 75             | 140          | 445          | 65                        | 144            | 144          | 209          |
| Continental Divide Road       | WB Right         | Decel       | 85       | NO                       | YES-230'                                     | 230                   | 140            | 140          | 370          | 85                        | 144            | 144          | 229          |
| Continental Divide Road       | WB Left          | Decel       | 60       | YES-195'                 | NO   | 230                   | 70             | 140          | 440          | 50                        | 144            | 144          | 194          |
| Continental Divide Road       | NB Right         | Accel       | 90       | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Continental Divide Road       | SB Right         | Accel       | 45       | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Continental Divide Road       | EB Right         | Decel       | 20       | NO                       | NO   | 230                   | 140            | 140          | 370          | Not Required              |                |              |              |
| Continental Divide Road       | EB Left          | Decel       | 110      | YES-135'                 | NO   | 290                   | 100            | 140          | 470          | 110                       | 144            | 144          | 254          |
| Bradford Drive                | NB Right         | Accel       | 95       | NO                       | NO   | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Bradford Drive                | WB Right         | Decel       | 50       | NO                       | YES-400'                                     | 230                   | 140            | 140          | 370          | 50                        | 144            | 144          | 194          |
| Clayton Range Road            | SB Right         | Accel       | 25       | NO                       | NO   | 230                   | Not Required   | Not Required | Not Required | Not Required              |                |              |              |
| Cummins Range Road            | EB Right         | Decel       | 50       | NO                       | YES-230'                                     | 230                   | 140            | 140          | 370          | Not Required              |                |              |              |
| Cummins Range Road            | EB Left          | Decel       | 25       | YES-59'                  | NO   | 290                   | 50             | 140          | 420          | Not Required              |                |              |              |
| Access West of Kipling        | WB Right         | Decel       | 160      | NO                       | YES-340'                                     | 370                   | 140            | 140          | 370          | 160                       | 144            | 144          | 304          |
| Access West of Kipling        | WB Left          | Decel       | 110      | YES-55'                  | NO ROOM TO LENGTHEN TO RHP TRN RM DUE TO RHP | 230                   | 175            | 140          | 545          | 110                       | 144            | 144          | 254          |
| Access West of Kipling        | NB Right         | Accel       | 100      | NO                       | NO   | 280                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Access West of Kipling        | SB Right         | Accel       | 45       | NO                       | YES-400'                                     | 380                   | 180            | 180          | 560          | Not Required              |                |              |              |
| Access West of Kipling        | EB Right         | Decel       | 40       | YES-260'                 | NO   | 230                   | 140            | 140          | 370          | Not Required              |                |              |              |
| Int Way                       | EB Left          | Decel       | 160      | YES-190'                 | NO   | 230                   | 180            | 140          | 520          | 160                       | 144            | 144          | 304          |
| Int Way                       | WB Right         | Decel       | 130      | YES                      | YES-230'                                     | 230                   | 140            | 140          | 370          | 130                       | 144            | 144          | 274          |





# Table 4b

## Auxiliary Lane and Taper Length Table

| Cross Street      | Turning Movement | Accel/Decel | 2025 VPH | Turn Lane Exists? Length | Turn Lane to be Added? Length         | Jefferson County RDCM |                |              |              | State Highway Access Code |                |              |              |
|-------------------|------------------|-------------|----------|--------------------------|---------------------------------------|-----------------------|----------------|--------------|--------------|---------------------------|----------------|--------------|--------------|
|                   |                  |             |          |                          |                                       | Accel/Decel Length    | Storage Length | Taper Length | Total Length | Accel/Decel Length        | Storage Length | Taper Length | Total Length |
| Salisbury Street  | WB Left          | Decel       | 5        | YES-130'                 |                                       | 230                   | 40             | 140          | 410          | Not Required              |                |              | Not Required |
| Salisbury Street  | NB Right         | Accel       | 5        | NO                       | NO                                    |                       | Not Required   |              |              | Not Required              |                |              | Not Required |
| Field Street      | EB Right         | Decel       | 15       | NO                       | NO                                    | 230                   |                | 140          | 370          | Not Required              |                |              | Not Required |
| Field Street      | WB Left          | Decel       | 10       | YES-214'                 | YES-100' SWATH FOR LANDSC             | 230                   | 40             | 140          | 410          | Not Required              |                |              | Not Required |
| Field Street      | NB Right         | Accel       | 10       | YES                      |                                       |                       | Not Required   |              |              | Not Required              |                |              | Not Required |
| Duby Street       | EB Right         | Decel       | 15       | YES                      | SWATH TO BE NEEDED STORAGE FOR PIERCE | 230                   |                | 140          | 370          | Not Required              |                |              | Not Required |
| Duby Street       | WB Left          | Decel       | 45       | YES-100'                 |                                       | 230                   | 75             | 140          | 445          | 50                        | 144            |              | 194          |
| Duby Street       | NB Right         | Accel       | 40       | NO                       | NO                                    | 380                   |                | 180          | 560          | Not Required              |                |              | Not Required |
| Lutland Street    | EB Right         | Decel       | 5        | NO                       | NO                                    | 230                   |                | 140          | 370          | Not Required              |                |              | Not Required |
| Lutland Street    | WB Left          | Decel       | 10       | NO                       | VERIFIED                              | 230                   | 40             | 140          | 410          | Not Required              |                |              | Not Required |
| Newland Street    | NB Right         | Accel       | 10       | NO                       | NO                                    |                       | Not Required   |              |              | Not Required              |                |              | Not Required |
| Marshall Court    | EB Left          | Decel       | 55       | NO                       | VERIFIED                              | 200                   | 100            | 140          | 470          | 65                        | 144            |              | 209          |
| Marshall Court    | WB Right         | Decel       | 30       | NO                       | NO                                    | 230                   |                | 140          | 370          | Not Required              |                |              | Not Required |
| Marshall Court    | SB Right         | Accel       | 40       | NO                       | NO                                    | 380                   |                | 180          | 560          | Not Required              |                |              | Not Required |
| Kendall Boulevard | EB Left          | Decel       | 50       | NO                       | YES-170'                              | 230                   | 75             | 140          | 445          | 50                        | 144            |              | 194          |
| Kendall Boulevard | WB Right         | Decel       | 50       | NO                       | NO                                    | 230                   |                | 140          | 370          | Not Required              |                |              | Not Required |
| Kendall Boulevard | SB Right         | Accel       | 30       | NO                       | NO                                    | 380                   |                | 180          | 590          | Not Required              |                |              | Not Required |

There were a few turning movements that do not meet auxiliary lane criteria in the preferred plan. Generally this is because of the close proximity of adjacent intersections. These include the following:

- The westbound left-turn deceleration lane and the northbound right-turn acceleration lane at the business access west of South Kipling Parkway.
- The southbound right-turn acceleration lane at South Kipling Parkway.
- The westbound left-turn deceleration lane onto the south leg of South Carr Street.
- The eastbound right deceleration lane, the westbound left deceleration lane, and the northbound right acceleration lane at South Wadsworth Boulevard.
- The eastbound left deceleration lane and the northbound left deceleration lane at the signalized intersection east of South Wadsworth Boulevard.

The South Carr Street Realignment Memorandum dated August 14, 2003 discussed different options for realigning the South Carr Street intersection. The selected alternative, not requiring homes to be taken, was back-to-back left turns. This does not allow for the required length of left turn lanes. Sight distance will also be significantly restricted by opposing left-turn vehicles at the South Carr Street back-to-back left-turns. This was considered and found to be acceptable given the geometric constraints.

### **3.1.6 Drainage**

The conceptual level drainage design is shown in the conceptual design plans. The following is a summary of these improvements:

#### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

The storm sewer system at the roadway intersection with West Ken Caryl Avenue should be researched, identifying both the configuration and hydraulics. Modifications may be necessary. Another storm sewer system at Sta. 167+15 should be researched to determine inlet capacity and whether upsizing or improvements are necessary. Several chases exist in the area and these should be eliminated and runoff collected and conveyed to the storm sewer crossing, where practical.

The culvert starting at Sta. 171+40, and which conveys runoff beneath W. Shaffer Place should be hydraulically analyzed and upsized or improved, as necessary. Several of the grade control structures within the grass-lined median between Sta. 172+20 and South Continental Divide Road need repair or replacing. Independent analysis of each structure and subsequent downstream/upstream erosion should be addressed. Attention should be paid to minimize disturbance of the mature trees

located within the median. It is anticipated that cuts in the proposed median curb and gutter would be used periodically to allow runoff to enter the median rather than installing inlets. Another median culvert starting at Sta. 185+85 conveys runoff beneath a left turn lane on Shaffer Drive. The hydraulics and condition of the culvert should be determined and improvements made as necessary.

A storm sewer system exists at the roadway intersection with Sawatch Range Road (Sta. 198+30). Inlets are located in both the east and west medians, and on the northwest, northeast, and southeast curb returns. It is likely the entire system will be removed and replaced since curb and gutter improvements are proposed.

The configuration and hydraulics of the storm sewer system at the roadway intersection with South Continental Divide Road (Sta. 209+20) should be determined. Runoff appears to be discharged to the Johns Manville Federal Credit Union property. The configuration of the existing system should be modified to connect to the proposed beginning of the storm sewer main. The main will likely be 18" to 24" in diameter and convey flow to the east. An inlet is proposed on the south curb and gutter near Sta. 216+50. Several sidewalk chases discharge runoff onto the roadway between South Continental Divide Road and the Culebra Range Road (Sta. 223+50). These chases should be connected to the storm sewer main where practical. Inlets are to be installed on the northwest curb return of the roadway intersection with Culebra Range Road and connected to the main. The main from the connection east will likely be 30" to 36" in diameter. Several more sidewalk chases are located between Culebra Range Road and South Sangre De Cristo Road. These also should be connected to the storm sewer main. Inlets are proposed at Sta. 232+55 on both the north and south roadway curb and gutter. These inlets connect to the main with approximate sizing still between 30" to 36" in diameter. The main continues east and connects to the existing culvert at South Kipling Parkway. Two additional inlets on the north and south side of the roadway are proposed and connect to the main. This should alleviate flooding at the South Kipling Parkway intersection. The existing culvert downstream of the main connection will likely be removed and replaced and a new outfall installed to the roadside ditch along the west side of northbound South Kipling Parkway. Capacity of the existing ditch will need to be determined and modifications to the ditch will be constructed, as necessary.

#### *West Portion of Segment 2 (South Kipling Parkway to South Garrison Street)*

Very few drainage improvements are required on this section of roadway. Further investigation of the existing inlet at Sta. 256+20 is required. Once the configuration and hydraulics are determined, adjustments to the inlet

will be made. The plans show removing the inlet and installing a similar structure on the new curb and gutter. Further investigation is also required for the storm sewer system near Sta. 263+20. It is believed the two existing structures are connected, but it is unknown where collected runoff is conveyed. A storm sewer main is proposed to begin in the general vicinity of these inlets and connect to the existing system. The main will likely be 18" to 24" in diameter. Two additional inlets are proposed for the north and south roadway curb and gutter near Sta. 268+00, just west of South Garrison Street. The main continues to the east and is described in the following roadway section summary.

*East Portion of Segment 2 (South Garrison Street to South Wadsworth Boulevard)*

East beginning at South Garrison Street, the storm sewer main continues. Two additional inlets on the north and south roadway curb and gutter near Sta. 275+30 are proposed. The storm sewer main line from this point to the east will likely increase in size to 30" to 36" in diameter. The existing flared end section which discharges runoff through the sidewalk chase near Sta. 280+90 should be modified to connect to the proposed storm sewer main. Another inlet is proposed for the south roadway curb and gutter near Sta. 282+25. This inlet is located on the curb return of the intersection with South Estes Street. Two more inlets are located on the north and south roadway curb and gutter near Sta. 285+00 on the curb return of the intersection with South Dudley Street. The proposed 30" to 36" main continues east to the North Tributary of Massey Draw.

The UDFCD Major Drainageway Planning report identifies only one area for recommended improvements within the project limits, which is at the North Tributary of Massey Draw crossing at West Chatfield Avenue (Sta. 286+60). The report indicates that the existing culvert crossing is undersized and should be replaced with a culvert to convey the 100-year storm event without overtopping the roadway.

A preliminary investigation of the crossing was performed and it was determined a 14'(S) x 6'(R) concrete box culvert would meet recommendations made in the Major Drainageway Planning report as well as site constraints. Several items will need to be investigated further including; conflicting utilities, downstream and upstream water characteristics, excavation upstream and downstream of the crossing, and the South Dudley Street upstream crossing. There is also another culvert crossing downstream about 1,000 feet at South Carr Street, which will need to be reviewed. In addition, environmental resources and impacts will have to be evaluated.

Another set of inlets is proposed on the north and south roadway curb and gutter near Sta. 287+00, the sag in the roadway profile. The plans show the main storm sewer line connected to a lateral between these inlets and then the main discharges to the North Tributary of Massey Draw on the south side of the roadway. During final design it may be determined that the storm sewer will have to connect directly to the proposed concrete box culvert.

A separate storm sewer system begins near Yukon Way at an inlet proposed on the north roadway curb return (Sta. 305+30). Some of the existing storm sewer will be removed and replaced, including the existing inlet on the same curb return. The main continues east and will likely be 18" to 24" in diameter. No additional inlets are shown to connect to the main until the intersection at South Wadsworth Boulevard, however additional inlets may be beneficial at some or all of the intersections with streets on the south side of the roadway. The next planned set of inlets to be installed is on the north and south roadway curb and gutter near Sta. 319+60 and Sta. 319+90. The existing inlet on the northwest curb return will be removed along with the open basin and flared ends downstream of the inlet. A new connection will be installed and may include an additional inlet on the South Wadsworth Boulevard side of the curb return with West Chatfield Avenue. The capacity of the system being connected to is unknown and will need to be determined during the final design.

### *Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

Drainage improvements are not planned between South Wadsworth Boulevard and South Quay Street. An inlet is proposed on the south roadway curb and gutter near Sta. 343+80. An 18" to 24" storm sewer main runs east from the inlet. Runoff discharged from the flared end section to the sidewalk chase near Sta. 347+60 will be connected to the main directly and the chase will be removed. Another storm sewer inlet is proposed on the north side of the Roadway curb and gutter near Sta. 348+00. At the inlet connection to the main, the storm sewer sizing will likely increase to 30" to 36" in diameter and continue east. Another inlet is proposed on the south side of the roadway curb and gutter near Sta. 351+90, just west of the intersection with Newland Street. Similar inlets are proposed on the north side of the roadway curb and gutter near Sta. 352+50 and Sta. 356+60. After the second inlet connection the storm sewer main will likely increase to 42" to 48" in diameter and continue east. Near the intersection with South Lamar Street, another inlet will be installed at Sta. 361+75 and connected to the main. The storm sewer main continues east to the end of the project. An existing storm sewer system exists near Sta. 371+00, but the exact configuration is undetermined. Portions of the system may be removed or relocated, and it is possible that the system will be connected to the main. A final inlet

### 3.1.8 Landscaping Improvements

Refer to landscape related notes on the conceptual design plans for more specific landscape strategy recommendations at various parts of the corridor. Following are general landscape concepts that should be considered for incorporation in the final design:

- Safety is paramount; maintain important sight lines across medians and along sidewalks. Pedestrians and motorists must be able to see each other near intersections.
- Detached sidewalks are preferred where possible.
- Use care in protecting significant vegetation at edges of roadway grading. Minimize landscape impacts, if possible, and incorporate sound horticultural tree protection strategies during construction.
- Provide mitigation or replacement planting of trees and shrubs to compensate for existing significant vegetation that needs to be removed for roadway improvements.
- Design a landscape plan that connects neighborhoods by creating pleasant roadside landscapes that enhance pedestrian accessibility. Detached sidewalks are preferred where feasible, regular street tree plantings are desirable to mitigate harsh winds and sunlight conditions.
- Taller shrubs and small trees, similar to an informal hedgerow, at right-of-way edge, help to provide some visual separation from roadway particularly for residential areas.
- Incorporate sustainable landscape design practices, including using mostly native plant species, and low water use irrigation systems. Design landscapes that minimize the amount of manual maintenance required.
- Incorporate Jefferson County's future requirements for managing stormwater quality. (e.g. use of depressed medians, etc.)
- For hardscapes, median pavements, and retaining walls, find an attractive solution that borrows from similar locally used methods utilizing native materials where possible. This reinforces community identity and local landscape vernacular.

Other medians with existing developed landscape can be evaluated to determine what existing landscape can be preserved and what will need to be enhanced. Landscaped medians require concrete edging or splash apron to shed much of the grit and sand that would otherwise build up on medians. The excavation and construction of median edging or splash aprons will impact the existing median vegetation. This will require a closer look at landscape details and coordination of landscape design with the local maintenance district. Some existing medians are too narrow or too close to intersections and should be considered for hardscaping.

Street trees should be considered along sidewalks and informal shrub hedgerows along the right-of-way. Commercial areas that seek more visibility may require wider tree spacing and lower shrubs along sidewalks.

*Segment 2 (South Kipling Parkway to South Wadsworth Boulevard)*

This segment of the corridor currently has only intermittent private developed roadside landscapes. There are no developed median landscapes. Roadway concept plans propose a number of new medians and a variety of roadside changes, with other areas not significantly altered. The landscape strategy is much the same as Segment 1 with regard to those landscape planning objectives outlined above.

Landscaping within the right-of-way in Segment 2 will be the responsibility of Jefferson County maintenance personnel. All landscape and irrigation system designs should be coordinated with the landscape grounds maintenance supervisors. Some roadside landscaping at the right-of-way edge will be impacted similar to Segment 1. Some precautions may be necessary to protect and preserve significant trees, and some mitigation planting may be warranted where existing private landscape is removed with roadway improvements. New roadside planting that is outside of the right-of-way should be coordinated with local property owners or HOA's as they will be responsible for irrigation and long-term maintenance.

New median landscape design should incorporate the following:

- Consider landscape plantings only for medians wider than 10 feet. Narrow medians should be hardscaped. Ends of medians near intersections should also be paved.
- Edges of landscape areas should receive a splash apron or median edging of enhanced concrete.
- Landscape should consist of larger deciduous trees, shrubs and ground covers. No turf grass should be planned for medians narrower than 20 feet. Lower shrubs and ground covers should be planted near intersections where sight lines are critical.
- Some isolated wider medians that are too small in size, may not be cost effective to landscape and irrigate and should be paved with enhanced concrete.
- Some “depressed drainage channel medians” may be needed in places in this segment. The depressed medians provide added water quality benefits. The benefits include higher infiltration, vegetated filtering, and the biological uptake of nutrients. They require a different landscape approach similar to some Segment 1 median conditions. Landscape openings in curbs to allow continued run-off into medians, and bio channel landscape design. These kinds of medians may not require irrigation.

Roadside strategy of regular street tree planting and informal shrub hedgerows at edges should continue through this reach of the corridor. In some areas where roadway construction does not significantly change roadside conditions, new tree plantings may be appropriate to create corridor landscape continuity and demonstrate a more equitable landscape distribution.

### *Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

This reach of West Chatfield Avenue, with the exception of areas west of South Upham Way, only needs three traffic lanes; one lane each westbound and eastbound, and a center left-turn lane. Only some narrow paved medians are proposed on the more westerly portions. Most landscape upgrades consequently are proposed for the roadsides. Properties fronting on this corridor include commercial properties, churches, schools, residential back yards, and residential front yards with driveway access onto West Chatfield Avenue, vacant undeveloped land, and park land. The sidewalks proposed for this area also vary, some attached and some detached.

While this area is part of the roadway landscape is Jefferson County's maintenance responsibility, many of the roadside upgrades may occur on private property and irrigation and maintenance responsibility will be assumed by adjacent property owners. Most of the County's maintenance responsibility will be confined to the tree-lawns where detached sidewalks occur.

Commercial properties west of South Upham Way, with mostly developed landscapes, will likely prefer fewer and more widely spaced street trees and lower shrub to maintain visibility. This part of the corridor is already at its planned width with few impacts to landscape likely.

Roadsides fronting on currently undeveloped properties should only receive a tree lawn landscape of trees and irrigated pasture lawn grasses.

Along some of the corridor, the existing road edge and sidewalks are in their ultimate location, with only minor roadside changes recommended. Intermittent street tree planting may be appropriate at right-of-way edges or on private property. This would create some corridor landscape continuity and demonstrate a more equitable landscape distribution, as is proposed at other locations in the corridor.

The only wide median is between South Reed Street and South Quay Street. Unless there is a compelling local initiative this may not be a cost effective median to landscape since it is too small and too isolated.

Residential backyard frontages should be considered for street tree planting and informal hedge row planting strategy proposed elsewhere at similar locations along the corridor.

For churches and schools that front on West Chatfield Avenue, the street tree spacing can be wider to allow more visibility. The landscape at the right-of-way edge may be an extension of the "front yard landscape" and designed in a site specific way. There also may be larger trees near the edge of cut and fill slopes that would require more careful evaluation during the final design phase.

East of South Lamar Street, particularly the south side frontage onto Chatfield State Park, the roadway is more rural in character. No tree lawn planting is recommended for this frontage, only native seeding (not irrigated). On the north side there are a number of larger residential lots backing onto the C-470 bike trail along the north side of West Chatfield Avenue. Intermittent street tree planting is recommended along this area with non-irrigated native grasses. Some informal hedgerow shrub and small tree planting may be appropriate at the right-of-way edge in places.

### **3.1.9 Pedestrian Improvements**

Existing sidewalk location and widths were evaluated and the preferred improvements are shown in the conceptual design plans. Generally, existing narrow sidewalks are shown widened to 8 feet and tree lawns were incorporated, where feasible. Additional sidewalks are shown where none currently exist.

At the public meeting held in August 2003, the public consensus was favorable to widening existing sidewalks to the Jefferson County standard of 8 feet. The public felt it was very important for the project to incorporate sidewalks where none currently exist. The public also deemed tree lawns important. The public generally would like to see sidewalks incorporated even if trees are removed, but are less favorable to taking private property for pedestrian improvements.

Exact sidewalk locations and widths should be re-evaluated during final design depending on vegetation and right-of-way impacts. Sidewalks can be narrowed to a minimum of 5 feet for short lengths to avoid trees that should be saved during final design.

### **3.1.10 Parking Safety**

There are two locations along the West Chatfield Avenue corridor where street parking is allowed. The first is between South Iris Way and South Garrison Street on both sides of West Chatfield Avenue, in front of the Dakota Station Condominiums. During several site visits, it was observed that mainly trailers and campers are parked in this area, likely for extended periods of time. When presented to the public in August 2003, there was favorable response to eliminating this parking to improve the safety and aesthetics of the roadway.

The second area where parking is allowed on West Chatfield Avenue is between South Pierce Street and South Lamar Street in Segment 3. Parking is permitted on the south side of West Chatfield Avenue in front of homes facing the street. The preferred plan maintains this parking for the residents since West Chatfield Avenue will remain two lanes in this area with a 35 mph design speed.

### **3.1.11 Alternative Modes**

There have been requests from Bike JeffCo and another citizen to add bike lanes along the corridor. After discussion during a progress meeting, The County has decided bike lanes will not be incorporated on West Chatfield Avenue. Bicyclists are allowed to ride on the roadway. Current bicycle access in the area is provided using an existing bike path from south Kendall Boulevard to South Lamar Street which connects to the C-470 Bike Path/Trail. Because the retrofit nature of the West Chatfield Avenue project, there are many constraints that will make this additional 4-foot width on each side difficult to obtain. The County determined that more Jefferson County citizens would be served by using any extra width available to provide 8-foot sidewalks rather than using extra width for on-street bike lanes and leaving the existing narrower sidewalk width. Eight-foot sidewalks have been incorporated wherever possible, evaluating the impacts to existing trees and right-of-way. The County determined an 8-foot sidewalk is a higher priority than a tree lawn where right-of-way or existing landscaping constraints prohibit both from being incorporated.

The Regional Transportation District (RTD) provides bus service along West Chatfield Avenue from South Continental Divide Road to South Kendall Boulevard. Busses utilize the same lanes as general traffic. Bus stops can be coordinated during further stages of design with RTD.

### **3.2 Phasing and Prioritization**

It is recommended that the construction of improvements to West Chatfield Avenue be phased in four segments.

- Phase 1 - South Garrison Street to South Wadsworth Boulevard with major safety improvements.
- Phase 2 - South Wadsworth Boulevard to South Kendall Boulevard with safety improvements.
- Phase 3 - West Ken Caryl Avenue to South Kipling Parkway with minor safety improvements and pedestrian improvements.
- Phase 4 - South Kipling Parkway to South Garrison Street with aesthetic and pedestrian improvements.

Phase 1: The eastern portion of Segment 2 between South Garrison Street and South Wadsworth Boulevard is the first segment recommended for improvement. This portion of West Chatfield Avenue is very inconsistent in laneage varying from one to two lanes in each direction causing confusion and safety concerns. The area around South Carr Street is of particular concern. Residents around this intersection complained of frequent accidents. Lack of existing sidewalk between South Dudley Street and South Carr Street presents a safety concern for pedestrians. From a traffic operations standpoint, the segment between South Garrison Street and South Wadsworth Boulevard is the only segment of West Chatfield Avenue that does not have adequate through lanes to accommodate 2025 traffic volumes with the same level of service that is experienced today.

Phase 2: Segment 3, from South Wadsworth Boulevard to South Kendall Boulevard, is the next segment recommended for improvement. The roadway is inconsistent along this corridor with some portions already improved through projects by developers leaving other portions between the improved areas incomplete. Adding a painted median between South Pierce Street and South Lamar Street would allow left turning vehicles both into collector streets and into private residential driveways to decelerate and turn without blocking through lanes. The sharp curve west of South Kendall Boulevard also makes improvements to this segment a high priority since it does not meet Jefferson County design criteria, and has had numerous accidents.

Phase 3: Segment 1, from West Ken Caryl Avenue to South Kipling Parkway, requires minor improvements. Safety upgrades include adding right-turn acceleration and deceleration lanes and improving the west leg of the South Kipling Parkway intersection. Other recommended improvements along this segment include widening the existing sidewalk and adding landscaping.

Phase 4: The western portion of Segment 2 between South Kipling Parkway and South Garrison Street is the last recommended improvement project. The improvements for this portion include widening portions of the existing sidewalk along with aesthetic improvements. Since there are fewer safety concerns along this portion of West Chatfield Avenue than the others, it is the last segment recommended for improvement.

### ***3.3 Public Acceptability***

A Second Public Meeting was held on Wednesday, March 3, 2004 at the Ken Caryl Ranch. The focus of the meeting was to present the preferred alternative for the corridor and to solicit input from the public concerning the recommendations. A press release was issued by Jefferson County to the local media. Invitations were mailed to 1,150 residences and businesses surrounding the project. Thirty signs advertising the meeting were placed along the project corridor. The meeting format was an open house, with project representatives available to address any comments or questions for attending citizens.

Approximately 140 people attended the meeting as indicated by the attendance roster that is attached to the back of this document. Additionally, representatives from Jefferson County Division of Highways and Transportation and Muller Engineering Company were present to solicit input and answer questions.

Attendees were provided a comment sheet to be completed and turned in at the meeting, or by mail prior to March 17, 2004. A total of forty-one comment sheets were received. The meeting was summarized in the Public Meeting Memorandum dated May 4, 2004. The summary of this meeting is in Appendix E. Generally, the public that attended the meetings favored the projects. Many were specifically concerned with the number of near accidents around South Carr Street. The attendees were also interested in additional traffic signals at various intersections and incorporation of noise fences.

### ***3.4 Impact Assessment***

#### ***3.4.1 Environmental***

No environmental evaluations were conducted as a part of this study. When environmental resources are evaluated during final design, impacts to these resources should also be evaluated.

### **3.4.2 Right-of-way**

Conceptual right-of-way limits are shown in the conceptual design plans in Appendix A.

Right-of-way requirements for the improvements indicated in Segment 1 include 73,800 square feet (sf) of commercial land, and 11,000 sf of residential land. Portions of the residential property are vacant, and homeowner's associations own portions. For the western portion of Segment 2, between South Kipling Parkway and South Garrison Street requires right-of-way easements for construction from the homeowner's associations. For the eastern portion of Segment 2, between South Garrison Street and South Wadsworth Boulevard, right-of-way requirements are 2,500 sf of commercial property and 115,000 sf of residential land from private homeowners. For Segment 3, approximately 2,300 sf of residential land is required for the project indicated.

### **3.4.3 Landscape/Vegetation**

Existing landscaping and vegetation will be affected by the proposed improvements. In Segment 1, from West Ken Caryl Avenue to South Kipling Parkway, additional auxiliary lanes will affect roadside trees. Widening of the narrow sidewalk east of West Chatfield Avenue around the curve at Station 181+00 will require the removal of existing trees, even with the proposed retaining wall. At this location on the west side of West Chatfield Avenue, many newly planted trees would be affected by the slope from the proposed sidewalk and may require transplanting. Some trees are very close to through lanes in the depressed medians along this segment and should be evaluated individually during further design. In the raised medians, some trees are unhealthy, or are a poor choice of tree type for this location and should be removed. Sidewalk widening could also affect existing trees. During further design, the sidewalk width and location can be further refined to save as many trees as possible.

In Segment 2, existing trees will be affected by the preferred plan of widening West Chatfield Avenue from two to four through lanes from South Dudley Street to South Wadsworth Boulevard.

In Segment 3, very few existing trees should be affected by the proposed improvements.

Areas for landscaping opportunities are shown in the conceptual design plans with a green hatch. These areas include medians, tree lawns between the back of curb and sidewalk, and areas behind the sidewalk. During further design, landscaping concepts can be refined.

### 3.4.4 Utilities

Gas lines, water lines, sewer lines, electric lines, fiberoptic lines, and other phone and cable lines and facilities are present along the entire West Chatfield Avenue corridor and are shown on the conceptual plans. The area of West Chatfield Avenue west of Station 303+00 (South Ammons Street) has been identified as a designated dipping bedrock area (DDBA). Since improvements in this area may require overexcavation, utilities in this area will likely be impacted.

Critical utilities in the corridor include Denver Water Department (DWD) Conduit 115, a 36-inch water line located along West Chatfield Avenue from South Continental Divide Road to South Kipling Parkway. There is an 8-inch to 10-inch sanitary sewer located between South Estes Street and South Carr Street. There is a 16-inch gas line located from South Carr Street to South Wadsworth Boulevard. There is a 20-inch gas line between South Wadsworth Boulevard and an Xcel natural gas facility at 373+00 to the north of West Chatfield Avenue. The horizontal alignment modification west of South Kendall Boulevard to correct the sharp curve could have impacts to this gas facility. At station 361+00 near South Lamar Street, there is a Denver Water vault and pressure relief valve on the north side of West Chatfield Avenue. Finally, DWD Conduit 116, a 54-inch water line, is located between South Pierce Street and the curve west of South Kendall Boulevard along West Chatfield Avenue.

The overhead lines in Segment 2 and Segment 3 are shown as relocated underground in the preferred plan to improve aesthetics on the corridor. Relocating overhead lines underground was important to the public.

## Chapter Four: Recommended Improvements

### 4.1 Conceptual Level Design Plans

Conceptual design plans including typical sections, plan and profile sheets, and cross sections are provided as Appendix A to this report (bound separately). This conceptual design includes the following elements:

#### *Segment 1 (West Ken Caryl Avenue to South Kipling Parkway)*

- Design speed of 40 mph for this segment.
- Acceleration and deceleration lanes added per requirements of the State Highway Access Code. Lengths per Jefferson County RDCM.
- Retaining walls (length and height shown in plans, maximum height 5 feet) to accommodate the roadway design, where required.
- Curb added for improved safety on existing depressed medians. Retain existing depressed median to save existing trees where possible. Continue to allow drainage into median.
- For existing raised medians, add median cover material and median edging. Retain existing landscaping where possible; during final design determine trees requiring removal.
- Widen existing sidewalk to 8 feet where possible giving consideration to existing right-of-way and existing tree locations. Final sidewalk width and alignment to be completed during final design.
- Storm sewer main added between South Continental Divide Road and South Kipling Parkway.
- This entire segment requires milling and overlay and may require pavement replacement in localized areas. Since this area is within the dipping bedrock area of the project, any pavement replacement will require overexcavation. During final design, a thorough evaluation of the existing pavement should be conducted to determine if existing pavement thickness is adequate for future traffic growth.
- Single-sided 8-foot fence will likely not be incorporated in this segment since through lanes are not being constructed closer to private residential property, but should be evaluated during final design using the most current County Fence Policy.

#### *Segment 2A (South Kipling Parkway to South Garrison Street)*

- Design speed of 40 mph for this segment.
- Between South Iris Way and South Garrison Street, parking along West Chatfield Avenue eliminated creating extra space for tree lawn and 8-foot sidewalk.

- Between South Kipling Parkway and South Garrison Street, painted medians reconstructed to raised medians with landscaping. Existing depressed medians remain.
- Where reconstruction due to widening is not required, this segment requires overlay with the exception of South Iris Way to South Garrison Street, which was recently overlaid. This can be further evaluated during final design.
- Where reconstruction is required, overexcavation will be required due to the dipping bedrock area.
- Single-sided 8-foot fence will likely not be incorporated in this segment since through lanes are not being constructed closer to private residential property, but should be evaluated during final design using current the most current County Fence Policy.

*Segment 2B (South Garrison Street to South Wadsworth Boulevard)*

- Design speed of 40 mph for this segment.
- Horizontal alignment designed to meet 40 mph design speed.
- Vertical alignment designed to meet 40 mph design speed where reconstruction is required.
- Acceleration and deceleration lanes added per requirements of the State Highway Access Code. Lengths per Jefferson County RDCM.
- Retaining walls (length and height shown in plans, maximum height 7 feet) to accommodate the roadway design, where required.
- Between South Garrison Street and South Wadsworth Boulevard, roadway section upgraded to 2 lanes in each direction.
- In restricted portion between South Dudley Street and South Carr Street, 11-foot through lanes and 5-foot attached sidewalk. Fourteen-foot painted median allows left turns into side-streets and private residential drives.
- Between South Carr Street and South Wadsworth Boulevard, roadway widened to the north and 8-foot detached sidewalks incorporated on both sides of West Chatfield Avenue.
- Side-by-side 10-foot left turn lanes incorporated at offset South Carr Street.
- Storm sewer system added between South Garrison Street and Massey Draw and between South Allison Street and South Wadsworth Boulevard.
- Access control to improve safety in the vicinity of South Wadsworth Boulevard and South Carr Street intersections.
- During final design, a thorough evaluation of the existing pavement should be conducted to determine if existing pavement thickness is adequate for future traffic growth. In some locations, a pavement overlay may be warranted.
- Where reconstruction is required west of South Ammons Street (Station 303+00), overexcavation may be required due to the dipping bedrock area.

- Exact locations for 8-foot single-sided wood fence are not shown. Locations for fences will be determined during final design per the latest County Fence Policy. Considerations on whether to include fencing include whether through lanes are moving closer to private residences; if the majority of residents request fencing; and if the fence restricts intersection site triangles.

*Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard)*

- Design speed of 40 mph west of South Pierce Street and 35 mph east of South Pierce Street
- Horizontal alignment designed to meet the design speed. Includes reconstructing curve west of South Kendall Boulevard to meet Jefferson County RDCM criteria.
- Vertical alignment designed to meet 40 mph design speed west of South Pierce Street and 35 mph design speed east of South Pierce Street.
- Acceleration and deceleration lanes added per requirements of the State Highway Access Code. Lengths per Jefferson County RDCM.
- Retaining walls (length and height shown in plans, maximum height 3 feet) to accommodate the roadway design, where required.
- Inconsistencies in West Chatfield Avenue typical section corrected in the vicinity of the South Pierce Street intersection.
- From South Pierce Street to South Kendall Boulevard, typical section updated to meet Jefferson County RDCM criteria for Collector Street. Painted median for left turns added between South Pierce Street and South Lamar Street.
- Eight-foot sidewalk added on both sides of West Chatfield Avenue from South Pierce Street to South Lamar Street. (The C-470 Trail currently exists between South Lamar Street and South Kendall Boulevard).
- Storm sewer system added between South Pierce Street and South Kendall Boulevard.
- This entire segment requires overlay and may require pavement replacement in localized areas. During final design, a thorough evaluation of the existing pavement should be conducted to determine if existing pavement thickness is adequate for future traffic growth.
- Exact locations for 8-foot single-sided wood fence are not shown. Locations for fences will be determined during final design per the latest County Fence Policy. Considerations on whether to include fencing include whether through lanes are moving closer to private residences; if the majority of residents request fencing; and if the fence restricts intersection site triangles.

## **4.2 Construction Costs**

Construction costs have been identified for the conceptual level design based on an initial opinion of probable construction costs, including contingencies, design and construction engineering, and right-of-way. The costs have also been inflated to year 2009 prices, five years from the date of this report. The conceptual level estimates are as follows:

- Segment 1 (West Ken Caryl Avenue to South Kipling Parkway) – \$8.7 million. (Table 5)
- Segment 2a (South Kipling Parkway to South Garrison Street) – \$1.7 million. (Table 6)
- Segment 2b (South Garrison Street to South Wadsworth Boulevard) - \$10.3 million. (Table 7)
- Segment 3 (South Wadsworth Boulevard to South Kendall Boulevard) - \$6.3 million. (Table 8)

**TABLE 5**

**WEST CHATFIELD AVENUE CORRIDOR STUDY  
SEGMENT 1- W. KEN CARYL AVE. TO S. KIPLING PKWY.  
STATION 153+50 TO 238+00  
CONCEPTUAL COST ESTIMATE**

| ITEM NO.   | ITEM  | UNIT | QUANT   | UNIT PRICE   | COST               |
|--|---|------|---------|--------------|--------------------|
| 203  | UNCLASSIFIED EXCAVATION (CIP)                   | CY   | 14,097  | \$8.00       | \$113,000          |
| 203  | BORROW MATERIAL (SPECIAL)                       | CY   | 10,857  | \$10.00      | \$108,570          |
| 403  | HOT BITUMINOUS PAVEMENT (2" OVERLAY)            | TON  | 6,493   | \$40.00      | \$260,000          |
| 403  | HOT BITUMINOUS PAVEMENT ( FULL DEPTH-ASSUME 9") | TON  | 4,065   | \$40.00      | \$163,000          |
| 504  | RETAINING WALL                                  | SF   | 10,310  | \$40.00      | \$412,000          |
| 603  | 18"-24" RCP                                     | LF   | 1,920   | \$42.00      | \$80,640           |
| 603  | 30"-36" RCP                                     | LF   | 1,500   | \$70.00      | \$105,000          |
| 603  | 30"-36" FES                                     | EACH | 1       | \$1,000.00   | \$1,000            |
| 604  | TYPE R INLET (Size undetermined)                | EACH | 10      | \$2,750.00   | \$27,500           |
| 604  | TYPE C INLET                                    | EACH | 2       | \$3,000.00   | \$6,000            |
| 604  | MANHOLE (5' DIA.)                               | EACH | 13      | \$4,000.00   | \$52,000           |
| 604  | MODIFY EXISTING GRADE CONTROL STRUCTURE         | EACH | 8       | \$800.00     | \$6,400            |
| 608  | MODIFY EXISTING SIDEWALK CHASE                  | EACH | 13      | \$750.00     | \$9,750            |
| 608  | SIDEWALK  | SY   | 13,845  | \$35.00      | \$485,000          |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IB)           | LF   | 9,656   | \$10.00      | \$97,000           |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IIB)          | LF   | 8,998   | \$12.00      | \$108,000          |
| 610  | MEDIAN COVER MATERIAL (CONCRETE)                | SF   | 6,638   | \$7.00       | \$46,000           |
| 614  | TRAFFIC SIGNAL ADJUSTMENTS (SANGRE DE CRISTO)   | LS   | 1       | \$50,000.00  | \$50,000           |
| 614  | TRAFFIC SIGNAL ADJUSTMENTS (KIPLING)            | LS   | 1       | \$100,000.00 | \$100,000          |
|  | <b>SUBTOTAL, MAJOR ITEMS</b>                    |      |         |              | <b>\$2,230,860</b> |
|  | CLEARING AND GRUBBING                           | LS   | 1       | 5.00%        | \$112,000          |
|  | EROSION CONTROL                                 | LS   | 1       | 3.00%        | \$67,000           |
|  | REMOVALS, RESETS AND ADJUSTMENTS                | LS   | 1       | 20.00%       | \$446,000          |
|  | SIGNING AND STRIPING                            | LS   | 1       | 6.00%        | \$134,000          |
|  | CONSTRUCTION TRAFFIC CONTROL                    | LS   | 1       | 12.00%       | \$268,000          |
|  | CONCRETE/ABC ITEMS                              | LS   | 1       | 3.00%        | \$67,000           |
|  | LANDSCAPING                                     | LS   | 1       | 15.00%       | \$335,000          |
|  | UTILITY RELOCATIONS                             | LS   | 1       | 5.00%        | \$112,000          |
| <b>TOTAL COST OF CONSTRUCTION BID ITEMS</b>                            |   |      |         |              | <b>\$3,771,860</b> |
|  | CONTINGENCIES                                   | LS   |         | 20.00%       | \$754,000          |
|  | MOBILIZATION & CONSTRUCTION SURVEYING           | LS   |         | 8.00%        | \$302,000          |
|  | DESIGN ENGINEERING/SURVEYING/GEOTECHNICAL       | LS   |         | 12.00%       | \$453,000          |
|  | CONSTRUCTION ENGINEERING                        | LS   |         | 20.00%       | \$754,000          |
| <b>TOTAL CONSTRUCTION COST</b>   |   |      |         |              | <b>\$6,034,860</b> |
|  | RIGHT OF WAY COST                               | SF   | 73,800  | \$12.00      | \$886,000          |
|  | RIGHT OF WAY-COMMERCIAL                         | SF   | 10,965  | \$10.00      | \$110,000          |
|  | RIGHT OF WAY-RESIDENTIAL                        | SF   | 124,100 | \$2.00       | \$248,000          |
|  | TEMPORARY EASEMENTS                             |      |         |              |                    |
| <b>TOTAL RIGHT OF WAY</b>  |   |      |         |              | <b>\$1,244,000</b> |
| <b>TOTAL PROJECT COST (INCL. ROW)</b>                                  |   |      |         |              | <b>\$7,278,860</b> |
| <b>TOTAL YEAR 2009 PROJECT COST WITH 3.5% INFLATION (TOTAL x 1.19)</b> |   |      |         |              | <b>\$8,662,000</b> |

**TABLE 6**

**WEST CHATFIELD AVENUE CORRIDOR STUDY  
SEGMENT 2A- S. KIPLING PKWY. TO S. GARRISON ST.  
STATION 238+00 TO 269+00  
CONCEPTUAL COST ESTIMATE**

| ITEM NO.   | ITEM   | UNIT | QUANT  | UNIT PRICE | COST               |
|--|--|------|--------|------------|--------------------|
| 203  | UNCLASSIFIED EXCAVATION (CIP)                  | CY   | 1,349  | \$8.00     | \$11,000           |
| 203  | BORROW MATERIAL (SPECIAL)                      | CY   | 1,171  | \$10.00    | \$11,710           |
| 403  | HOT BITUMINOUS PAVEMENT (2" OVERLAY)           | TON  | 899    | \$40.00    | \$36,000           |
| 403  | HOT BITUMINOUS PAVEMENT (FULL DEPTH-ASSUME 9") | TON  | 348    | \$40.00    | \$14,000           |
| 504  | RETAINING WALL                                 | SF   | 0      | \$40.00    | \$0                |
| 603  | 18"-24" RCP                                    | LF   | 595    | \$42.00    | \$24,990           |
| 604  | TYPE R INLET (Size undetermined)               | EACH | 4      | \$2,750.00 | \$11,000           |
| 604  | MANHOLE (5' DIA.)                              | EACH | 3      | \$4,000.00 | \$12,000           |
| 608  | SIDEWALK                                       | SY   | 3,661  | \$35.00    | \$128,000          |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IB)          | LF   | 3,169  | \$10.00    | \$32,000           |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IIB)         | LF   | 3,170  | \$12.00    | \$38,000           |
| 610  | MEDIAN COVER MATERIAL (CONCRETE)               | SF   | 6,246  | \$7.00     | \$44,000           |
| 614  | TRAFFIC SIGNALS                                | LS   | 0      | \$0.00     | \$0                |
| <b>SUBTOTAL, MAJOR ITEMS</b>   |  |      |        |            | <b>\$362,700</b>   |
|  | CLEARING AND GRUBBING                          | LS   | 1      | 5.00%      | \$18,000           |
|  | EROSION CONTROL                                | LS   | 1      | 3.00%      | \$11,000           |
|  | REMOVALS, RESETS AND ADJUSTMENTS               | LS   | 1      | 20.00%     | \$73,000           |
|  | SIGNING AND STRIPING                           | LS   | 1      | 6.00%      | \$22,000           |
|  | CONSTRUCTION TRAFFIC CONTROL                   | LS   | 1      | 12.00%     | \$44,000           |
|  | CONCRETE/ABC ITEMS                             | LS   | 1      | 3.00%      | \$11,000           |
|  | LANDSCAPING                                    | LS   | 1      | 15.00%     | \$54,000           |
|  | UTILITY RELOCATIONS                            | LS   | 1      | 5.00%      | \$18,000           |
| <b>TOTAL COST OF CONSTRUCTION BID ITEMS</b>                            |  |      |        |            | <b>\$613,700</b>   |
|  | CONTINGENCIES                                  | LS   |        | 20.00%     | \$123,000          |
|  | MOBILIZATION & CONSTRUCTION SURVEYING          | LS   |        | 8.00%      | \$49,000           |
|  | DESIGN ENGINEERING/SURVEYING/GEOTECHNICAL      | LS   |        | 12.00%     | \$74,000           |
|  | CONSTRUCTION ENGINEERING                       | LS   |        | 20.00%     | \$123,000          |
| <b>TOTAL CONSTRUCTION COST</b>   |  |      |        |            | <b>\$982,700</b>   |
|  | RIGHT OF WAY COST                              | SF   | 0      | \$12.00    | \$0                |
|  | RIGHT OF WAY-COMMERCIAL                        | SF   | 0      | \$10.00    | \$0                |
|  | RIGHT OF WAY-RESIDENTIAL                       | SF   | 50,000 | \$2.00     | \$100,000          |
|  | TEMPORARY EASEMENTS                            |      |        |            |                    |
| <b>TOTAL RIGHT OF WAY</b>  |  |      |        |            | <b>\$100,000</b>   |
| <b>TOTAL PROJECT COST (INCL. ROW)</b>                                  |  |      |        |            | <b>\$1,082,700</b> |
| <b>TOTAL YEAR 2009 PROJECT COST WITH 3.5% INFLATION (TOTAL x 1.19)</b> |  |      |        |            | <b>\$1,895,000</b> |

**TABLE 7**

**WEST CHATFIELD AVENUE CORRIDOR STUDY  
SEGMENT 2B- S. GARRISON ST. TO S. WADSWORTH BLVD.  
STATION 269+00 TO 321+00  
CONCEPTUAL COST ESTIMATE**

| ITEM NO.   | ITEM   | UNIT | QUANT   | UNIT PRICE   | COST                |
|--|--|------|---------|--------------|---------------------|
| 203  | UNCLASSIFIED EXCAVATION (CIP)  | CY   | 29,007  | \$8.00       | \$232,000           |
| 203  | BORROW MATERIAL (SPECIAL)  | CY   | 26,430  | \$10.00      | \$264,300           |
| 403  | HOT BITUMINOUS PAVEMENT (2" OVERLAY)   | TON  | 1,377   | \$40.00      | \$55,000            |
| 403  | HOT BITUMINOUS PAVEMENT (FULL DEPTH-ASSUME 9" AND 12" IN DIPPING BEDROCK AREA) | TON  | 18,316  | \$40.00      | \$733,000           |
| 504  | RETAINING WALL   | SF   | 3,558   | \$40.00      | \$142,000           |
| 603  | 18"-24" RCP  | LF   | 2,730   | \$42.00      | \$114,660           |
| 603  | 30"-36" RCP  | LF   | 1,180   | \$70.00      | \$82,600            |
| 603  | 18"-24" FES  | EACH | 1       | \$400.00     | \$400               |
| 604  | TYPE R INLET (Size undetermined)   | EACH | 12      | \$2,750.00   | \$33,000            |
| 604  | MANHOLE (5' DIA.)  | EACH | 13      | \$4,000.00   | \$52,000            |
| 608  | SIDEWALK   | SY   | 6,170   | \$35.00      | \$216,000           |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IB)  | LF   | 5,324   | \$10.00      | \$53,000            |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IIB)   | LF   | 8,391   | \$12.00      | \$101,000           |
| 610  | MEDIAN COVER MATERIAL (CONCRETE)   | SF   | 11,628  | \$7.00       | \$81,000            |
| 614  | TRAFFIC SIGNAL ADJUSTMENTS (WADSWORTH)   | LS   | 1       | \$100,000.00 | \$100,000           |
|  | <b>SUBTOTAL, MAJOR ITEMS</b>   |      |         |              | <b>\$2,259,960</b>  |
|  | CLEARING AND GRUBBING  | LS   | 1       | 5.00%        | \$113,000           |
|  | EROSION CONTROL  | LS   | 1       | 3.00%        | \$68,000            |
|  | REMOVALS, RESETS AND ADJUSTMENTS   | LS   | 1       | 20.00%       | \$452,000           |
|  | SIGNING AND STRIPING   | LS   | 1       | 6.00%        | \$136,000           |
|  | CONSTRUCTION TRAFFIC CONTROL   | LS   | 1       | 12.00%       | \$271,000           |
|  | FENCING  | LS   | 1       | 10.00%       | \$226,000           |
|  | CONCRETE/ABC ITEMS   | LS   | 1       | 3.00%        | \$68,000            |
|  | LANDSCAPING  | LS   | 1       | 15.00%       | \$339,000           |
|  | UTILITY RELOCATIONS  | LS   | 1       | 5.00%        | \$113,000           |
|  | UNDERGROUND OVERHEAD UTILITIES   | LS   | 1       | \$586,274.51 | \$586,000           |
| <b>TOTAL COST OF CONSTRUCTION BID ITEMS</b>                            |  |      |         |              | <b>\$4,631,960</b>  |
|  | CONTINGENCIES  | LS   |         | 20.00%       | \$926,000           |
|  | MOBILIZATION & CONSTRUCTION SURVEYING  | LS   |         | 8.00%        | \$371,000           |
|  | DESIGN ENGINEERING/SURVEYING/GEOTECHNICAL                                      | LS   |         | 12.00%       | \$556,000           |
|  | CONSTRUCTION ENGINEERING   | LS   |         | 20.00%       | \$926,000           |
| <b>TOTAL CONSTRUCTION COST</b>   |  |      |         |              | <b>\$7,410,960</b>  |
|  | RIGHT OF WAY COST  |      |         |              |                     |
|  | RIGHT OF WAY-COMMERCIAL  | SF   | 2,500   | \$12.00      | \$30,000            |
|  | RIGHT OF WAY-RESIDENTIAL   | SF   | 115,000 | \$10.00      | \$1,150,000         |
|  | TEMPORARY EASEMENTS  | SF   | 32,800  | \$2.00       | \$66,000            |
| <b>TOTAL RIGHT OF WAY</b>  |  |      |         |              | <b>\$1,246,000</b>  |
| <b>TOTAL PROJECT COST (INCL. ROW)</b>                                  |  |      |         |              | <b>\$8,656,960</b>  |
| <b>TOTAL YEAR 2009 PROJECT COST WITH 3.5% INFLATION (TOTAL x 1.19)</b> |  |      |         |              | <b>\$10,302,000</b> |

**TABLE 8**

**WEST CHATFIELD AVENUE CORRIDOR STUDY  
SEGMENT 3- S. WADSWORTH BLVD. TO S. KENDALL BLVD.  
STATION 321+00 TO 380+00  
CONCEPTUAL COST ESTIMATE**

| ITEM NO.   | ITEM  | UNIT | QUANT  | UNIT PRICE   | COST               |
|--|---|------|--------|--------------|--------------------|
| 203  | EMBANKMENT MATERIAL (CIP)                       | CY   | 4,474  | \$8.00       | \$36,000           |
| 203  | BORROW MATERIAL (SPECIAL)                       | CY   | 0      | \$10.00      | \$0                |
| 403  | HOT BITUMINOUS PAVEMENT (2" OVERLAY)            | TON  | 3,045  | \$40.00      | \$122,000          |
| 403  | HOT BITUMINOUS PAVEMENT (FULL DEPTH-ASSUME 12") | TON  | 11,188 | \$40.00      | \$448,000          |
| 504  | RETAINING WALL                                  | SF   | 360    | \$40.00      | \$14,000           |
| 603  | 18"-24" RCP                                     | LF   | 570    | \$42.00      | \$23,940           |
| 603  | 30"-36" RCP                                     | LF   | 855    | \$70.00      | \$59,850           |
| 603  | 42"-48" RCP                                     | LF   | 2,580  | \$110.00     | \$283,800          |
| 603  | 42"-48" FES                                     | EACH | 1      | \$1,500.00   | \$1,500            |
| 604  | TYPE R INLET (Size undetermined)                | EACH | 6      | \$2,750.00   | \$16,500           |
| 604  | MANHOLE (5' DIA.)                               | EACH | 7      | \$4,000.00   | \$28,000           |
| 604  | MANHOLE (6' DIA.)                               | EACH | 10     | \$4,500.00   | \$45,000           |
| 608  | MODIFY EXISTING SIDEWALK CHASE                  | EACH | 2      | \$750.00     | \$1,500            |
| 608  | SIDEWALK  | SY   | 2,847  | \$35.00      | \$100,000          |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IB)           | LF   | 2,214  | \$10.00      | \$22,000           |
| 609  | CURB AND GUTTER (TYPE 2) (SECTION IIB)          | LF   | 7,944  | \$12.00      | \$95,000           |
| 610  | MEDIAN COVER MATERIAL (CONCRETE)                | SF   | 5,883  | \$7.00       | \$41,000           |
| 614  | TRAFFIC SIGNALS (MODIFY SIGNAL PIERCE)          | LS   | 1      | \$50,000.00  | \$50,000           |
| 614  | TRAFFIC SIGNALS (NEW SIGNAL KENDALL)            | LS   | 1      | \$100,000.00 | \$100,000          |
| <b>SUBTOTAL, MAJOR ITEMS</b>   |   |      |        |              | <b>\$1,488,090</b> |
|  | CLEARING AND GRUBBING                           | LS   | 1      | 5.00%        | \$74,000           |
|  | EROSION CONTROL                                 | LS   | 1      | 3.00%        | \$45,000           |
|  | REMOVALS, RESETS AND ADJUSTMENTS                | LS   | 1      | 20.00%       | \$298,000          |
|  | SIGNING AND STRIPING                            | LS   | 1      | 6.00%        | \$89,000           |
|  | CONSTRUCTION TRAFFIC CONTROL                    | LS   | 1      | 12.00%       | \$179,000          |
|  | FENCING   | LS   | 1      | 10.00%       | \$149,000          |
|  | CONCRETE/ABC ITEMS                              | LS   | 1      | 3.00%        | \$45,000           |
|  | LANDSCAPING                                     | LS   | 1      | 15.00%       | \$223,000          |
|  | UTILITY RELOCATIONS                             | LS   | 1      | 5.00%        | \$74,000           |
|  | UNDERGROUND OVERHEAD UTILITIES                  | LS   | 1      | \$586,274.51 | \$586,000          |
| <b>TOTAL COST OF CONSTRUCTION BID ITEMS</b>                            |   |      |        |              | <b>\$3,250,090</b> |
|  | CONTINGENCIES                                   | LS   |        | 20.00%       | \$650,000          |
|  | MOBILIZATION & CONSTRUCTION SURVEYING           | LS   |        | 8.00%        | \$260,000          |
|  | DESIGN ENGINEERING/SURVEYING/GEOTECHNICAL       | LS   |        | 12.00%       | \$390,000          |
|  | CONSTRUCTION ENGINEERING                        | LS   |        | 20.00%       | \$650,000          |
| <b>TOTAL CONSTRUCTION COST</b>   |   |      |        |              | <b>\$5,200,090</b> |
|  | RIGHT OF WAY COST                               |      |        |              | \$0                |
|  | RIGHT OF WAY-COMMERCIAL                         | SF   | 0      | \$12.00      | \$0                |
|  | RIGHT OF WAY-RESIDENTIAL                        | SF   | 2,300  | \$10.00      | \$23,000           |
|  | TEMPORARY EASEMENTS                             | SF   | 24,300 | \$2.00       | \$49,000           |
| <b>TOTAL RIGHT OF WAY</b>  |   |      |        |              | <b>\$72,000</b>    |
| <b>TOTAL PROJECT COST (INCL. ROW)</b>                                  |   |      |        |              | <b>\$5,272,090</b> |
| <b>TOTAL YEAR 2009 PROJECT COST WITH 3.5% INFLATION (TOTAL x 1.19)</b> |   |      |        |              | <b>\$6,274,000</b> |

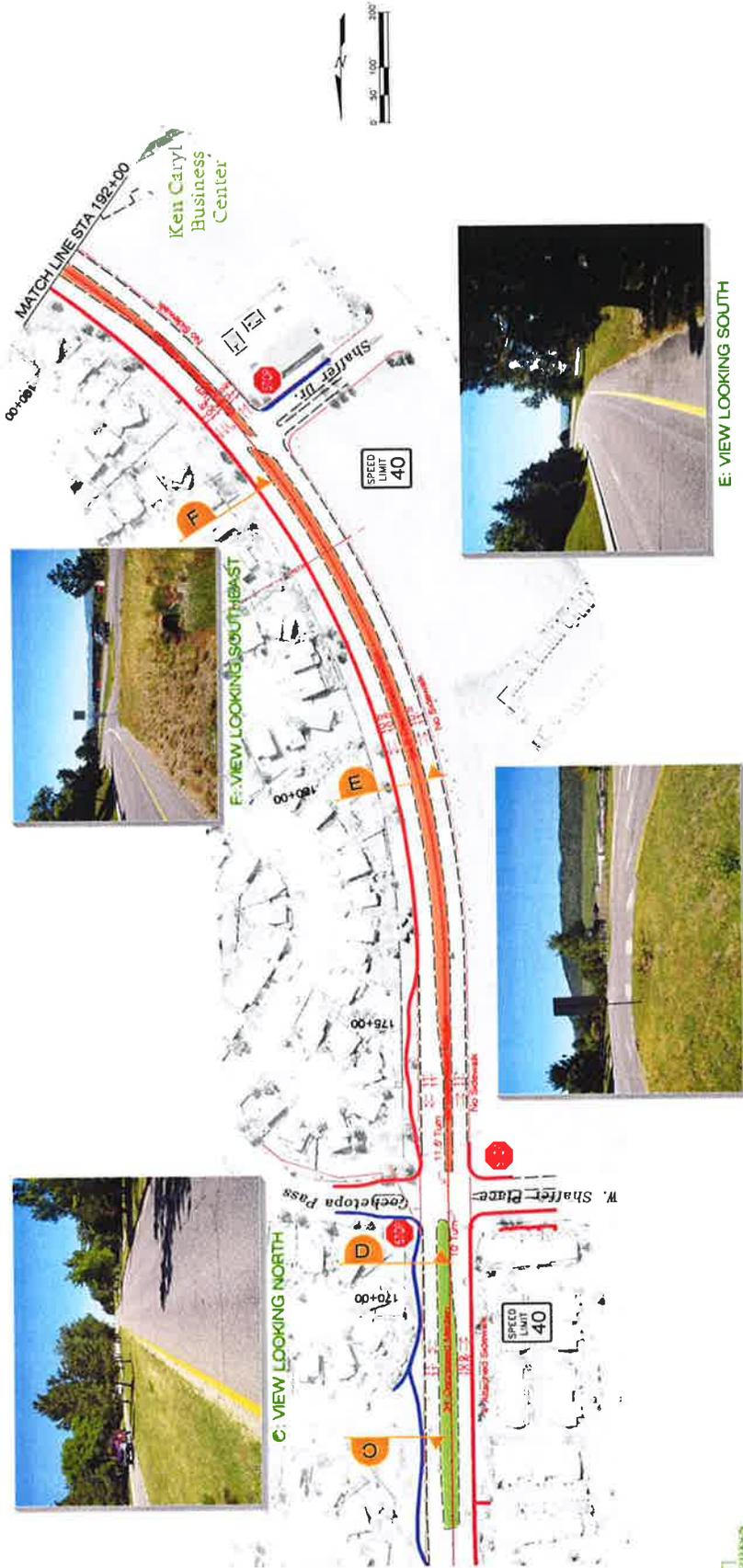
# **Appendix B**

## **Existing Conditions on West Chatfield Avenue**



# Existing Conditions at Chatfield Avenue - Segment 1

W. Ken Caryl Ave. to S. Kipling Pkwy



E: VIEW LOOKING SOUTH



D: VIEW LOOKING SOUTH



F: VIEW LOOKING SOUTH/EAST



C: VIEW LOOKING NORTH



MULLER

JEFFCO  
PROJECT NO.  
5-69-09-3444  
SHEET

CHATFIELD AVENUE CORRIDOR  
APPENDIX B: SEGMENT 1  
EXISTING CONDITION

JEFFERSON COUNTY  
DIVISION OF HIGHWAYS  
AND TRANSPORTATION



APPROVED AGC  
DESIGNED LRP  
5/3/04  
CHECKED  
CLJ

SCALE 1"=200'  
DATE 5/3/04  
DRAWN  
MULLER

MULLER ENGINEERING CO., INC.  
ENGINEERING  
1100 S. STATE ST.  
ST. LOUIS, MO 63103  
LAURENCE, MO 64501  
MULLER PROJECT NO. 01-1007-01

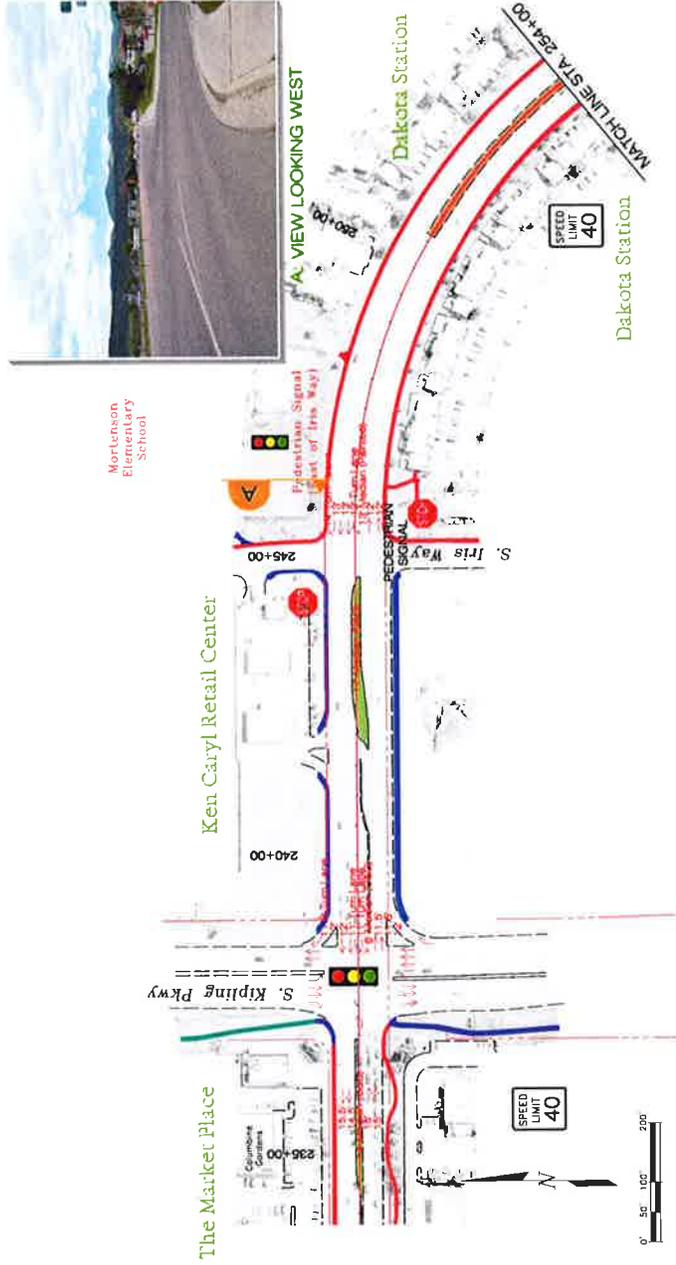
| NO. | DATE | REVISIONS |
|-----|------|-----------|
|     |      |           |
|     |      |           |
|     |      |           |



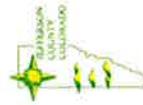
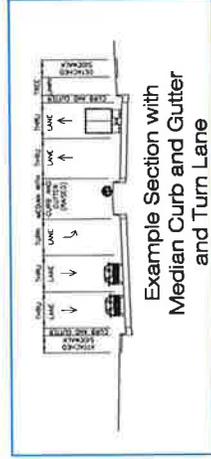
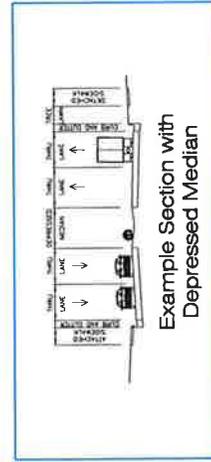


# Existing Conditions at Chatfield Avenue - Segment 2

S. Kipling Pkwy to S. Wadsworth Blvd.



## TERMINOLOGY



MULLER

|     |      |           |                                |         |   |          |   |         |                           |                           |
|-----|------|-----------|--------------------------------|---------|---|----------|---|---------|---------------------------|---------------------------|
| NO. | DATE | REVISIONS | APPROVED                       | SCALE   | AGC                                     | DESIGNED | LRP                                     | CHECKED | CLJ                       | MEC PROJECT NO. 01-027-01 |
|     |      |           |                                | 1"=200' |   | 5/3/04   |   |         |                           |                           |
|     |      |           | MULLER ENGINEERING CO., INC.   |         | JEFFERSON COUNTY                        |          | DIVISION OF HIGHWAYS AND TRANSPORTATION |         | CHATFIELD AVENUE CORRIDOR |                           |
|     |      |           | CONSULTING ENGINEERS           |         | DIVISION OF HIGHWAYS AND TRANSPORTATION |          | EXISTING CONDITION                      |         | APPENDIX B: SEGMENT 2     |                           |
|     |      |           | 1000 W. 14TH AVENUE, SUITE 100 |         | JEFFERSON COUNTY                        |          |   |         | EXISTING CONDITION        |                           |
|     |      |           | LAKEWOOD, CO 80202             |         | DIVISION OF HIGHWAYS AND TRANSPORTATION |          |   |         | EXISTING CONDITION        |                           |
|     |      |           | (303) 988-4933                 |         | JEFFERSON COUNTY                        |          |   |         | EXISTING CONDITION        |                           |
|     |      |           | MULLER                         |         | JEFFERSON COUNTY                        |          |   |         | EXISTING CONDITION        |                           |
|     |      |           | PROJECT NO. 01-027-01          |         | JEFFERSON COUNTY                        |          |   |         | EXISTING CONDITION        |                           |
|     |      |           | SHEET                          |         | JEFFERSON COUNTY                        |          |   |         | EXISTING CONDITION        |                           |
|     |      |           | PROJECT NO. 01-027-01          |         | JEFFERSON COUNTY                        |          |   |         | EXISTING CONDITION        |                           |







# Existing Conditions at Chatfield Avenue - Segment 3

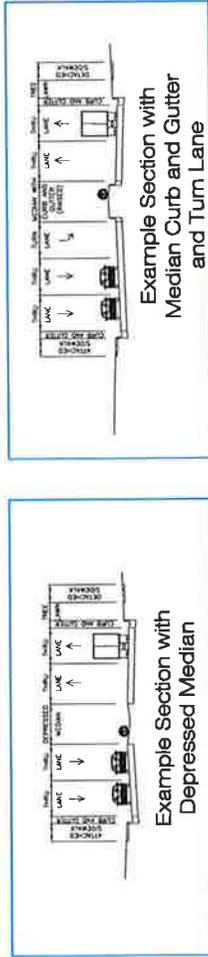
## S. Wadsworth Blvd. to Kendall Blvd



### LEGEND

- Medien with without Landscaping
- Medien with Grass
- Medien with Planting
- 3' to 4' Existing Sidewalk
- 4' to 6' Existing Sidewalk
- 8' Existing Sidewalk
- Existing Traffic Direction (thru Lane or Turn)
- Existing Power Pole
- Existing Light Standard
- Residential Access
- Business Access
- Existing Edge of Pavement
- Existing Overhead Utility Line
- Right of Way Line
- Existing Signal Light at Intersection
- Direction Corresponding Photo Taken From

### TERMINOLOGY



MULLER

|     |      |           |   |  |       |         |          |     |
|-----|------|-----------|---|--|-------|---------|----------|-----|
| NO. | DATE | REVISIONS | MULLER ENGINEERING CO., INC.<br>CONSULTING ENGINEERS<br>777 S. WADSWORTH BLVD.<br>LAKESIDE, CO 80027 986-4939 |  | SCALE | 1"=200' | APPROVED | AGC |
|     |      |           | JEFFERSON COUNTY<br>DIVISION OF HIGHWAYS<br>AND TRANSPORTATION  |  |       |         | 5/3/04   | LRP |
|     |      |           |   |  |       | CLJ     |          |     |
|     |      |           | MEC PROJECT NO. 01-007.01   |  |       |         |          |     |

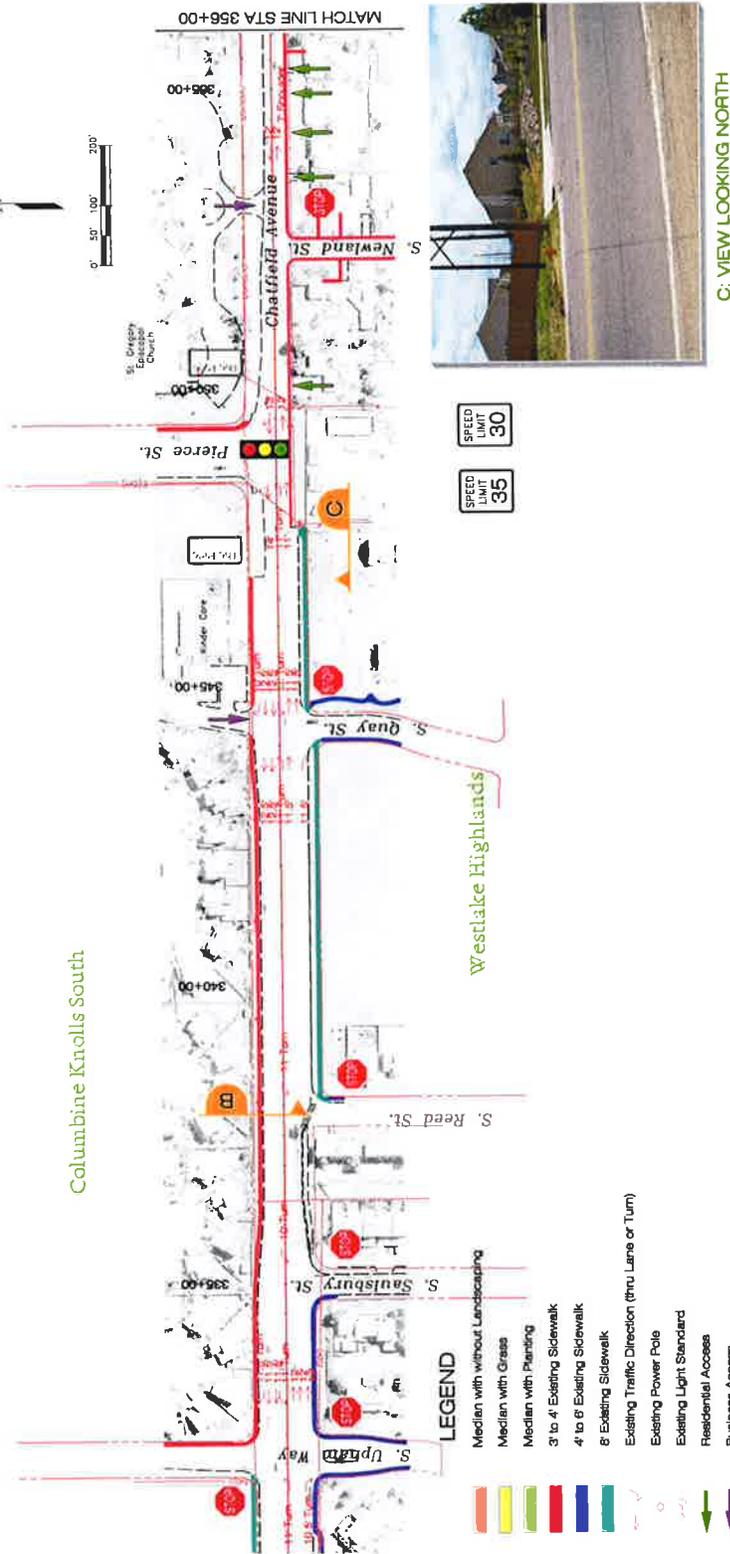
JEFFCO  
PROJECT NO.  
2-9863-044  
SHEET

CHATFIELD AVENUE CORRIDOR  
APPENDIX B: SEGMENT 3  
EXISTING CONDITION



# Existing Conditions at Chatfield Avenue - Segment 3

S. Wadsworth Blvd. to Kendall Blvd



### LEGEND

- Median with without Landscaping
- Median with Grass
- Median with Planting
- 3' to 4' Existing Sidewalk
- 4' to 6' Existing Sidewalk
- 6' Existing Sidewalk
- Existing Traffic Direction (thru Lane or Turn)
- Existing Power Pole
- Existing Light Standard
- Residential Access
- Business Access
- Existing Edge of Pavement
- Existing Overhead Utility Line
- Right of Way Line
- Existing Signal Light at Intersection

Vantage Point Direction Corresponding Photo Taken From



MULLER

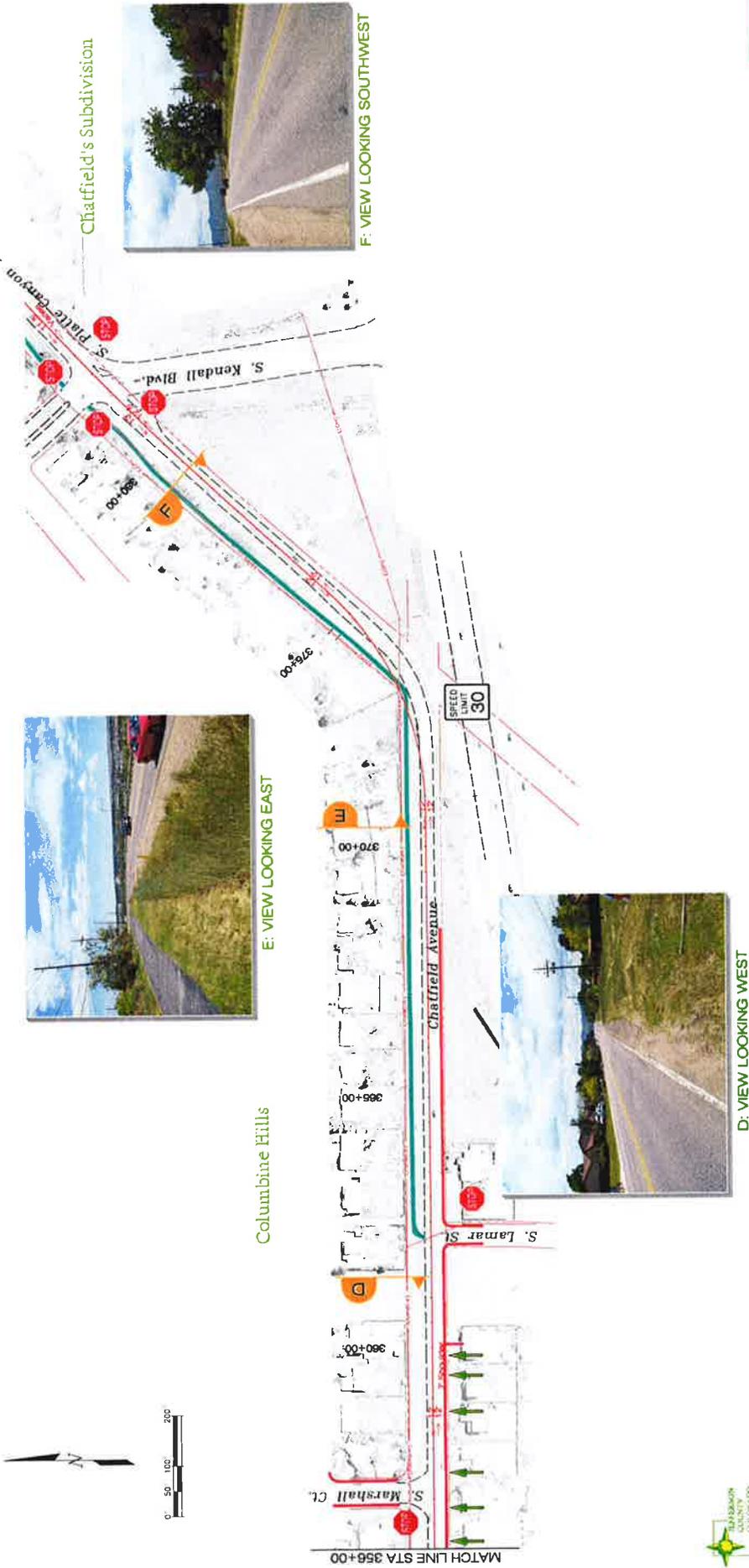
| NO. | DATE | REVISIONS | SCALE | APPROVED | AGC | DATE | SCALE | APPROVED | AGC | DATE |
|-----|------|-----------|-------|----------|-----|------|-------|----------|-----|------|
|     |      |           |       |          |     |      |       |          |     |      |
|     |      |           |       |          |     |      |       |          |     |      |
|     |      |           |       |          |     |      |       |          |     |      |
|     |      |           |       |          |     |      |       |          |     |      |

|  |  |  |                                       |
|--|--|--|---------------------------------------|
| MULLER ENGINEERING CO., INC.<br>CORPORATE OFFICE: 15151 STATE 150<br>LAKESIDE, COLORADO 80108<br>LAKESIDE, COLORADO 80108<br>PHONE: (303) 968-4829<br>FAX: (303) 968-4829<br>MEC PROJECT NO. 01-107-01 | JEFFERSON COUNTY<br>DIVISION OF HIGHWAYS<br>AND TRANSPORTATION | CHATFIELD AVENUE CORRIDOR<br>APPENDIX B: SEGMENT 3<br>EXISTING CONDITION | JEFFCO<br>PROJECT NO.<br>5-03-05-3444 |
|--|--|--|---------------------------------------|

# Existing Conditions at Chatfield Avenue - Segment 3

S. Wadsworth Blvd. to Kendall Blvd



D: VIEW LOOKING WEST

E: VIEW LOOKING EAST

F: VIEW LOOKING SOUTH-WEST

MULLER

|   |      |           |  |       |  |        |   |     |
|---|------|-----------|--|-------|--|--------|---|-----|
| NO.   | DATE | REVISIONS | APPROVED   | SCALE | 1"=200'  | AGC    | APPROVED                                      | AGC |
|   |      |           |  |       | 5/3/04   | LRP    |   |     |
|   |      |           |  |       |  | CHEKED |   |     |
|   |      |           |  |       |  | CLJ    |   |     |
| MULLER ENGINEERING CO., INC.<br>1000 W. 100th St., Suite 100<br>Lakewood, Colorado 80226<br>(303) 948-4129<br>MEC PROJECT NO. 01-027-01 |      |           | JEFFERSON COUNTY<br>DIVISION OF HIGHWAYS<br>AND TRANSPORTATION |       | CHATFIELD AVENUE CORRIDOR<br>APPENDIX B: SEGMENT 3<br>EXISTING CONDITION |        | JEFFCO<br>PROJECT NO.<br>5-03-05-344<br>SHEET |     |

# **Appendix C**

**Summary of Comment Sheets from First Public  
Meeting August 14, 2003**



## Summary of Responses from Public Meeting #1's Public Comment Sheet, Questionnaire, and Comments Posted on "Potential Alternative Solutions" Roll Plots

| ISSUE                                  | Response  | Segment 1<br>Ken Caryl to Kipling                      |                             | Segment 2<br>Kipling to Wadsworth                       |                             | Segment 3<br>Wadsworth to Kendall                     |                             |
|--|---|--|-----------------------------|---|-----------------------------|---|-----------------------------|
|  |   | 22<br>Responses<br>Received<br>via<br>Comment<br>Sheet | Comments<br>on Roll<br>Plot | 148<br>Responses<br>Received<br>via<br>Comment<br>Sheet | Comments<br>on Roll<br>Plot | 8<br>Responses<br>Received<br>via<br>Comment<br>Sheet | Comments<br>on Roll<br>Plot |
| <b>Capacity and Traffic Operations</b> | Enhance corridor to 4-lane section  | 10   |                             | 56  |                             | 1   |                             |
|  | No more lanes than existing   | 5  |                             | 15  |                             | 3   |                             |
| <b>Median Configuration</b>            | Incorporate full landscaped medians (Altern. Solutn. 10-A, 13-B, 16-B)                                | 12   |                             | 15  | 3                           | 1   |                             |
|  | Limit landscaping to provide full access (Altern. Solutn. 10-B, 13-A, 16-A)                           | 3  |                             | 54  | 8                           | 5   |                             |
|  | Sidewalks should be incorporated into project (Altern. Solutn. 11-A, B&C, 12-A, B&C, 17-A, B&C)       | 15   |                             | 68  | 7                           | 4   |                             |
|  | Sidewalk should not be part of the project (Altern. Solutn. 11-D, 12-D, 17-D)                         | 2  |                             | 6   | 0                           | 0   |                             |
| <b>Sidewalks and Streetscape</b>       | A detached sidewalk with a tree lawn is important (Altern. Solutn. 1-A, 4-A, 8-A, 11-B, 12-A&C, 17-B) | 15   | 5                           | 36  | 5                           | 2   |                             |
|  | A detached sidewalk is not important (Altern. Solutn. 1-B&C, 4-B&C, 8-B&C, 11-A&C, 12-B&D, 17-A&C)    | 4  | 4                           | 33  | 3                           | 1   |                             |
|  | Sidewalks should be incorporated even if they remove trees  | 9  |                             | 53  |                             | 2   |                             |
|  | Existing trees should not be removed for a sidewalk   | 6  |                             | 16  |                             | 2   |                             |
|  | Private homeowners' ROW could be used for sidewalks   | 3  |                             | 29  |                             | 2   |                             |
|  | No ROW should be taken for sidewalks  | 14   |                             | 33  |                             | 1   |                             |
|  | Want landscaping along the corridor   | 5  |                             | 14  |                             | 5   |                             |
|  | Prefer xeriscaping due to drought conditions  | 8  |                             | 22  |                             | 1   |                             |
|  | No landscaping for the project  | 5  |                             | 23  |                             | 1   |                             |
|  | Want roundabouts along the corridor (Altern. Solutn. 3-B, 6-B, 9-B, 14-B, 15-B, 19-B)                 | 9  | 7                           | 17  | 6                           | 3   | 1                           |
| <b>Roundabouts</b>                     | Don't want any roundabouts (Altern. Solutn. 3-A, 6-A, 9-A, 14-A, 15-A, 19-A)                          | 11   | 6                           | 57  | 28                          | 3   | 4                           |
|  | Eliminate Parking (Altern. Solutn. 7-B, Alt. 18-B)  | 13   |                             | 55  |                             | 2   |                             |
| <b>On-Street Parking</b>               | Keep Parking (Altern. Solutn. 7-A, 18-A)  | 4  |                             | 15  |                             | 2   |                             |
|  | Overhead power lines should be relocated underground  | 11   |                             | 54  |                             | 3   |                             |
| <b>Overhead Utilities</b>              | Overhead power lines should remain  | 4  |                             | 21  |                             | 1   |                             |

**CHATFIELD AVENUE  
CORRIDOR STUDY**

**SUMMARY OF PUBLIC MEETING NO. 1  
AUGUST 14, 2003**

**JEFFERSON COUNTY**

**SEPTEMBER 18, 2003**

**Prepared By:  
Muller Engineering Company, Inc.  
Irongate 4, Suite 100  
777 South Wadsworth Blvd., #4-100  
Lakewood, Colorado 80226-4331**

**MEC Project No. 03-018.01**

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## APPENDICES

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5. COMMENT SHEETS
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### Discussion

A Public Open House was held on August 14, 2003 to receive citizen input on transportation improvement alternatives on West Chatfield Avenue between West Ken Caryl Avenue and South Kendall Boulevard. No formal presentation was made and the event was held as an open house with project representatives available to address any comments or concerns. The attendants were asked to fill out a Public Comment Sheet and Questionnaire.

### Advertisement

The public meeting was advertised several different ways:

- Fliers were sent out to 1011 residents along the corridor. (A copy of the mailing list is attached to this report)
- 30 signs were posted along Chatfield and side streets throughout the study area
- A press release was submitted on July 15<sup>th</sup>, 2003. A story appeared in the Columbine Courier August 13, 2003 and in the Ken Caryl Ranch newspaper.

### Project Team in Attendance

Gray Clark, Muller Engineering  
Rob Carlson, Muller Engineering  
Lisa Powell, Muller Engineering  
Nancy Lambertson, Muller Engineering  
Chris Kroger, Muller Engineering Company  
Tara Bauer, Muller Engineering  
Frank Miltenberger, FMLA  
Brad Bauer, Jefferson County  
Zeke Zebauers, Jefferson County

### Materials Presented

There were 26 boards presented at the Open House and 3 Large Roll Plots. Copies of these boards are included in the report. The following is a list of the presented material:

Project Purpose and Goals  
What We Need From You  
Project Process and Schedule  
Aerial Map of Project Corridor  
Existing Conditions at Chatfield Avenue – Segment 1  
Existing Conditions at Chatfield Avenue – Segment 2  
Existing Conditions at Chatfield Avenue – Segment 3  
Existing Property Owners Along Chatfield Avenue – Segment 1  
Existing Property Owners Along Chatfield Avenue – Segment 2  
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2003 Traffic Count Data and Level of Service – Segment 1  
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Accident History for Chatfield Corridor Study  
Level Of Service (LOS) Definitions  
Will I Get a Traffic Signal at My Intersection?  
Potential Alternative Solutions – Segment 1 (Large Roll Plot)  
Potential Alternative Solutions – Segment 2 (Large Roll Plot)  
Potential Alternative Solutions – Segment 3 (Large Roll Plot)  
Option A – Carr Street Using 10' double Turn Lanes

Option B – Carr Street Using Roundabouts  
Option C - Carr Realignment Skewed at Chatfield  
Option D - Carr Realignment Using 100' Radius  
Option E - Carr Realignment Using 275' Radius  
Will The County Install a Fence along the Roadway?  
Additional Issues for Consideration

### Summary of Feedback Received

Attached to this memorandum is a copy of the *Public Comment Sheet and Questionnaires* that were filled out by the attendants of the open house. 75 surveys were turned in at the meeting or sent to Muller Engineering by September 9, 2003. The responses were sorted by which segment of the project the respondent indicated their comments were specific to. Segment 1 encompasses Ken Caryl to Kipling, Segment 2 is Kipling to Wadsworth and Segment 3 is Wadsworth to Kendall. In addition, 103 petitions, with comment sheets attached in some cases, were received after the public meeting from homeowners in the Meadbowbrook Heights Area (on the south side of Chatfield between Wadsworth and Carr Street). These comment sheets have been summarized beginning on page 10 of this report, immediately following the comment sheets received at the public meeting for Segment 2 since they are subdivision specific. Citizens at the meetings were also encouraged to leave comments on sticky notes attached directly to the boards. These comments have been incorporated into the report following this summary. An indication of the respondents' preferences follows:

### **Segment 1 (Ken Caryl to Kipling)**

#### **22 Responses via comment sheet:**

##### What subdivision do you live in?

All indicated they were residents in the area and lived in:

- Cimarron – 4 responses
- The Village at Ken Caryl – 3 responses
- Ken Caryl Ranch – 2 responses
- Sunset Ridge – 2 responses
- The Spread – 1 response
- Aspen Meadows – 1 response
- Plains Subdivision – 1 response
- Meadow Ranch – 1 response

##### What are the most IMPORTANT ISSUES to address along the Chatfield Corridor?

- Noise is the primary concern. (9 responses)
- Speeds along the corridor need to be kept down. (6 responses)
- Safety is a primary concern. (3 responses)
- It is dangerous to enter Chatfield from the side streets. (2 responses)
- The intersection of Cochetopa and Schaffer is most important. (2 responses)
- Traffic congestion and flow is important. (2 responses)
- I prefer roundabouts. (2 responses)
- Sight distance is important. (1 response)
- Bike lanes are important. (1 response)
- Bicycle and pedestrian safety is important at the Kipling crossing. (1 response)
- Hard for pedestrians to cross Chatfield. (1 response)
- Concerned with the width of the proposed road. (1 response)
- Do not want to lose trees. (1 response)
- There is too much road rage. (1 response)
- Would like to limit truck traffic. (1 response)

Do you have any SAFETY concerns with the existing Chatfield Avenue?

- Speeding in the area causes concern. (9 responses)
- No safety concerns. (3 comments)
- Intersection of Cochetopa and Schaffer is a concern. (3 responses)
  - Sight distance to the south is poor.
- Bike lanes are needed in addition to sidewalks. (2 responses)
- Poor sight distance and obstructions too close to the road, trees in the middle. (2 responses)
- Not sure if you can make a legal U-turn. (2 responses)
- There is poor sight distance from Sawatch Range and Continental Divide turning east onto Chatfield. (1 response)
- Crossing Chatfield using the Kipling Recreation Path is currently dangerous. (1 response)
- Roadway too narrow. (1 response)

CAPACITY and Traffic Operations-Do you support a 4-lane section?

- Support the 4-laning on Chatfield (10 responses)
  - Needs to be designed to keep speeds down. (1 response)
- No more lanes (5 responses)
  - Will only increase volumes. (2 responses)
  - Traffic should be routed through the business area. (1 response)
  - Ken Caryl should accommodate traffic that is not local or business since it is already designed for heavy traffic. (1 response)
- Comments
  - Worry that Chatfield and Kipling will be a disaster like Bowles and Wadsworth or Belleview and Wadsworth. (1 response)
  - Chatfield is currently more than a minor arterial due to the recent commercial development. (1 response)

Should full landscaped MEDIANS be used or limit landscaping to provide full movement access?

- Prefer full landscaped medians. (12 responses)
  - In favor of limiting access to Cochetopa off of Chatfield. (1 response)
- Full movement access. (3 responses)
  - Especially important between Cochetopa and Continental. There are mature trees that help block the residents from noise. (1 response)
  - Due to drought conditions in the area. (1 response)
- Use a combination of landscaped medians and full access, but favor medians. (1 response)

Should SIDEWALKS AND STREETSCAPE be incorporated?

- Sidewalks should be incorporated into the project. (15 responses)
- Sidewalks should not be incorporated into the project. (2 responses)
  - They are not used enough to upgrade them. (1 response)

Tree Lawn

- A tree lawn between the traffic and pedestrians is important. (15 responses)
- There should not be a tree lawn. (4 responses)

Sidewalks vs. Existing Tree Removal

- Sidewalks are important, even if existing trees must be removed. (9 responses)
  - Limit impact on trees where possible. (2 responses)
- Trees should not be removed for a new sidewalk. (6 responses)

Sidewalks vs. Private ROW take

- Sidewalks should be incorporated even if ROW from residents is required. (3 responses)
  - Depends on a case-by-case basis. (1 response)
- ROW should not be taken for sidewalks. (14 responses)

General Sidewalk Comments

- 4' sidewalks are adequate. Tree lawns would be nice where there is no additional impact. (1 responses)
- Need a sidewalk on the west side of Chatfield by Apria. (1 response)

What type of **LANDSCAPING** should be incorporated?

- Would like to see xeriscaping such as rock gardens and drought resistant plants. (8 responses)
- Would like a landscaped median. (5 responses)
- Don't want new landscaped medians. (5 responses)

Should **RONDBAOUTS** be incorporated? Where?

- Yes. (8 responses)
  - Cochetopa (3 responses)
  - Shaffer (2 responses)
  - Continental Divide (1 response)
  - Sawatch (1 response)
  - All intersections on Segment 1. (2 responses)
  - Instead of 4-way stop. (1 response)
- No. (11 responses)
  - Concerned about pedestrians through a roundabout. (2 responses)

Should **ON-STREET PARKING** be eliminated?

- Yes. (13 responses)
- No. (4 response)

Would you like to see **OVERHEAD UTILITIES** relocated underground?

- Yes. (11 responses)
  - Would not like this to be a priority. (2 responses)
- No. (4 responses)
- Don't know yet. (2 responses)

When planning **PROJECT PHASING**, which elements would you like to see done first?

- 2-lane to 4-lane segment needs to be done first. (3 responses)
- Segment 1. (3 responses)
- Roundabouts. (3 responses)
- Safety. (1 response)
- Bicycle safety. (1 response)
- Sidewalks. (1 response)

Other Comments

- Need new fencing for properties backing to Chatfield from Cochetopa to Continental Divide. (1 response)
- Improvements need to cut traffic noise on Chatfield near Cochetopa. (1 response)
- Where are the bike lanes? (1 response)
- Would like to see sound walls for residential zones. (1 response)

**Comments from the “Potential Alternative Solutions-Segment 1 (Ken Caryl to Kipling)” roll plot:**

ISSUE 1 - ARE ADDITIONAL SIDEWALKS NECESSARY? (Ken Caryl to Shaffer Pkwy.-South Side)

- Option A - Add 8' Detached Sidewalk (1 response)
- Option C - Retain Existing 4' Attached Sidewalk (3 responses)

ISSUE 2 - SHOULD DEPRESSED MEDAINS BE RAISED? (Ken Caryl to Shaffer Pkwy)

- Option A - Depressed Median (3 responses)
- Option B - Raised Median (1 response)

ISSUE 3 - SHOULD A ROUNDABOUT BE CONSIDERED AT THIS INTERSECTION? (Shaffer Place)

- Option A - 2-Way Stop for W. Shaffer Place and Cochetopa Pass (2 responses)
- Option B – Roundabout (2 responses)

ISSUE 4 - SHOULD EXISTING 3' TO 5' SIDEWALK BE WIDENED / TREE LAWN ADDED? (Ken Caryl to Kipling-various locations where sidewalk exists)

- Option A - Widen Walk to 8' Detached Walk (4 responses)
- Option C - Retain Existing 4' Attached Sidewalk (1 response)

ISSUE 5 - IS THE SIDEWALK AROUND THIS CURVE TOO NARROW? (Cochetopa Pass to Sawatch Range Road-north side)

- Option B - Wide Walk to 8' Attached Walk Taking Width from Area outside of Existing Walk. (1 response)
- Option C - Widen Walk to 8' Attached by Taking 5' Width from Median (2 responses)

ISSUE 6 – SHOULD A ROUNDABOUT BE CONSIDERED AT S. CONTINENTAL DIVIDE ROAD?

- Option A – 2-Way Stop for S. Continental Divide Road (4 responses)
- Option B – Roundabout (5 responses)

**OTHER**

- Block noise and buildings with trees. (3 responses)
- Use drought friendly measures in the medians. (2 responses)

**Segment 2 (Kipling to Wadsworth)**

**45 Responses via Comment Sheet:**

What subdivision do you live in?

3 indicated they were a business owner.

39 indicated they were residents in the area and lived in:

- Meadowbrook Heights – 5 responses
- Village at Dakota – 5 responses
- Fairview Heights- 4 responses
- Meadows -- 3 responses
- Dakota Station II – 3 responses
- Columbine Knolls South II – 3 responses
- Columbine Knolls South – 1 response
- Crossings at Chatfield – 1 response
- Chatfield Commons – 1 response
- Wingate South – 1 response

What are the most IMPORTANT ISSUES to address along the Chatfield Corridor?

- The intersection of Garrison and Chatfield is most important and needs a traffic light. (18 responses)
- Need to expand road to 2 lanes in each direction. (8 responses)
- Address the position of the light at Iris because it is confusing for vehicles. (5 responses)
- Traffic speeds need to be slowed down. (5 responses)
- Better traffic flow is important. (5 responses)
- Safety is important. (5 responses)
- 
- Capacity at Carr Street is of primary concern. (3 responses)
- Improve sight distance at Carr Street, especially on north side. (3 responses)
- Safety at Carr Street is important. (2 responses)
- Sight distance on side streets is important, especially going northbound. (2 responses)
- Pedestrians / sidewalks are important. (4 responses)
- Need a sidewalk on the south of Chatfield. (3 responses)
- Vehicle noise needs to be addressed. (3 responses)
- Realignment of Carr N & S of Chatfield. (2 responses)
- The section between Garrison and Wadsworth needs to be fixed. (1 response)
- Would like a roundabout at Garrison. (1 response)
- Too many traffic lights along this stretch. (1 response)

Do you have any **SAFETY** concerns with the existing Chatfield Avenue?

- Speeding. (17 responses)
- 
- Poor sight distance. (13 responses)
- Roadway too narrow at S Carr Street. (14 responses)
- Poor sight distance at Carr Street. (6 responses)
- Yes, most of them. (6 responses)
- Need a light at Garrison. (4 responses)
- Blind curve at Garrison (east). (4 responses)
- No shoulders. (4 responses)
- Sidewalks not continuous. (2 responses)
- 
- Lack of cross walks. (2 responses)
- Speeding through the school zones. (1 response)
- Pedestrian traffic from Mortenson Elementary and Falcon Bluffs MS. (1 response)
- Sidewalks too narrow. (1 response)
- Need an overpass / underpass at Iris. (1 response)
- Increased traffic at Iris. (1 response)
- Lighting. (1 response)
- Road rage. (1 response)
- Steep grades. (1 response)
- Too much traffic. (1 response)

**CAPACITY and Traffic Operations-Do you support a 4-lane section?**

- Yes. (31 responses)
  - Need improvements to Wadsworth intersection for EB RT. (1 response)
- No. (5 responses)
- Not sure. (1 response)

Should full landscaped **MEDIANS** be used or limit landscaping to provide full movement access?

- Full movement access. (22 responses)
- Fully landscaped medians. (12 responses)
- Limit landscaping due to water. (4 responses)

Should **SIDEWALKS AND STREETSCAPE** be incorporated?

- Sidewalks should be incorporated into the project. (36 responses)
- Sidewalks should not be incorporated into the project. (2 responses)

Tree Lawn

- A tree lawn between the traffic and pedestrians is important. (18 responses)
- There should not be a tree lawn. (18 responses)

Sidewalks vs. Existing Tree Removal

- Sidewalks are important, even if existing trees must be removed. (25 responses)
- Trees should not be removed for a sidewalk. (12 responses)

Sidewalks vs. Private ROW take

- Sidewalks should be incorporated even if ROW from residents is required. (19 responses)
- ROW should not be taken for sidewalks. (16 responses)

General Sidewalk Comments

- Needed between Carr St and Jehovah's Witness Hall. (1 response)
- 4' is OK. (1 response)

What type of **LANDSCAPING** should be incorporated?

- Prefer landscaping. (24 responses)
  - Use xeriscaping consistent with Colorado weather. (14 responses)
- No landscaping. (13 responses)

Should **ROUNDBAOUTS** be incorporated? Where?

- Yes. (13 responses)
  - Carr Street (4 responses)
  - Garrison (5 responses)
  - Pierce (1 response)
  - Kipling. (1 response)
- No. (26 responses)
  - Not at Garrison. (2 responses)

Should **ON-STREET PARKING** be eliminated?

- Yes. (31 responses)
  - Safety concerns is primary reason. (4 responses)
- No. (6 responses)

Would you like to see **OVERHEAD UTILITIES** relocated underground?

- Yes. (30 responses)
- No. (9 responses)

When planning **PROJECT PHASING**, which elements would you like to see done first?

- Garrison light. (21 responses)
- Road widening to 4-lanes at Carr. (16 responses)
- Iris light. (4 responses)
- Segment 2. (4 response)
- Sidewalk at Carr Street. (3 responses)
- Kipling to Pierce. (1 response)
- Garrison to Wadsworth. (1 response)
- Carr Street alignment. (1 response)
- Speeding and Noise. (1 response)
- Utilities. (1 response)

**Comments from the “Potential Alternative Solutions-Segment 2 (Kipling to Wadsworth)” roll plot:**

ISSUE 8 – SHOULD THE EXISTING 4’ ATTACHED SIDEWALK BE WIDENED / TREE LAWN CREATED?  
(Kipling to Dudley)

- Option C – Retain Existing 4’ Attached Sidewalk

ISSUE 9 – SHOULD A ROUNDABOUT BE CONSTRUCTED AT GARRISON STREET?

- Option A – 2-Way Stop for Garrison (1 response)
- Option B – Roundabout (4 responses)
- There needs to be a light at Garrison. (18 responses)
- Need Pedestrian Bridge at Garrison. (2 responses)

ISSUE 10 – SHOULD A LANDSCAPED MEDIAN BE ADDED? (Iris to Dudley)

- Option A – Add 17’ Wide Raised Median (2 responses)
- Option B – Maintain Painted / Depressed Median (3 responses)

ISSUE 11 – SHOULD SIDEWALKS BE ADDED ON THIS RESTRICTIVE PORTION OF CHATFIELD? (Dudley to Carr)

- Option A – 5’ Attached Sidewalk (1 response)
- Option B – 5’ Detached Sidewalk (2 responses)

ISSUE 12 – WHAT TYPE OF SIDEWALKS SHOULD BE INCORPORATED? (Carr to Wadsworth)

- Option B – 8’ Attached Sidewalk (1 response)
- Option C – 5’ Detached Sidewalk (3 responses)

ISSUE 13 – SHOULD A RAISED MEDIAN BE ADDED? (Dudley to Wadsworth)

- Option A – Maintain Painted Median (5 responses)
- Option B – Add Raised Median (1 response)

ISSUE 14 – SHOULD A ROUNDABOUT BE INSTALLED AT THE INTERSECTION OF ALLISON / YUKON?

- Option A – 2-Way Stop for Garrison (9 responses)
- Option B – Roundabout (2 responses)
- Prefer a traffic light. (1 response)

**OTHER**

- No Roundabouts. (7 responses)
- Prefer a traffic light at Iris be installed / moved. (7 responses)
- Want a barrier fence at Columbine Knolls South. (4 responses)
- Support a median near 9601 – 9639 W. Chatfield. (2 responses)
- WB RT at Kipling does not need a stop condition. (2 responses)
- Signal timing at Wadsworth needs to be improved. (2 responses)
- WB RT at Kipling needs a stop condition. (1 response)
- Want a pedestrian overpass at Iris. (1 response)
- Like the EB LT onto 9601 – 9639 W. Chatfield. (1 response)
- Oppose the EB LT onto 9601 – 9639 W. Chatfield. (1 response)
- Sight distance at Garrison is poor. (1 response)
- No more lanes on Chatfield. (1 response)
- More than two lanes for this section. (1 response)
- Want a stop light at Carr. (1 response)
- No change along the corridor. (1 response)

## Meadowbrook Heights (Segment 2)

### 103 responses delivered from the Meadowbrook Heights area:

Two separate petition letters were typed up and distributed to residents that included opinions on issues along Chatfield. This solicitation of input was conducted by neighborhood residents and not the County staff. The first letter was regarding Sidewalks, Medians, and Intersections. It supported detached sidewalks along the south side of Chatfield between Carr Street and Wadsworth Boulevard (Issue 12, Option A or C). It also supported inclusion of painted medians to assure left turn access at all side streets (Issue 13, Option A). The letter also stated that they did not support the installation of roundabouts at S. Allison Street (Issue 14, Option B). The second letter was regarding the installation of fences along the south side of Chatfield and supported the installation of a “Noise Abatement Fence” along the south side of Chatfield:

### Summary of Signed Petition Letters

Petition supporting detached sidewalks, painted medians, no roundabouts, and request for a fence. (48 signatures)  
Petition supporting detached sidewalks, painted medians, no roundabouts but no signature for the petition requesting a fence. (20 signatures)  
Petition requesting a fence only. (3 signatures)  
Support for a detached sidewalk only if it will be maintained. (2 responses)  
Support for a sidewalk dependent on only using public land. (2 responses)  
Support for short raised medians to avoid head on collisions. (2 responses)  
No change at Chatfield at all. (1 response)  
Support of attached sidewalk. (1 response)

### Summary of Comment Sheets

#### Do you have any SAFETY concerns with the existing Chatfield Avenue?

- Speeding. (12 responses)
- Sight distance for turning onto Chatfield. (7 responses)
- Need light at Garrison. (5 responses)
- Need light at Carr. (5 responses)
- Noise levels. (5 responses)
- 2-lane section. (5 responses)
- All of the above. (4 responses)
- Road rage. (4 responses)
- No shoulders. (3 responses)
- Heavy traffic. (3 responses)
- Road is too close to my home. (2 responses)
- Illegal left turns off Chatfield near Wadsworth Court to Little People’s Landing. (2 responses)
- EB LT from Carr is dangerous due to sight distance. (2 responses)
- Street signs are blocked by trees. (1 response)
- Access from side streets is difficult. (1 response)
- Head on collisions possibility without a median. (1 response)
- Obstructions too close to road. (1 response)
- Pedestrian crossings. (1 response)
- None. (2 responses)

#### CAPACITY and Traffic Operations-Do you support a 4-lane section?

- Yes. (25 responses)
  - Conditional on noise wall on south side of Chatfield. (1 response)
  - Need an EB RT lane for Wadsworth Boulevard. (1 response)
- No. (10 responses)

Should full landscaped **MEDIANS** be used or limit landscaping to provide full movement access?

- No, full access. (32 responses)
- Yes, landscape medians. (3 responses)
- Prefer medians with lots of access. (1 response)

Should **SIDEWALKS AND STREETSCAPE** be incorporated?

- Yes. (32 responses)
  - Narrower. (3 responses)
- No sidewalks on south side of road. (1 response)
- No. (3 responses)

Tree Lawn

- Prefer tree lawn. (18 responses)
- No tree lawn. (15 responses)

Sidewalks vs. Existing Tree Removal

- Trees can be removed for sidewalk. (28 responses)
- Don't remove trees for the sidewalk. (4 responses)

Sidewalks vs. Private ROW take

- ROW can be taken for sidewalk. (10 responses)
- No ROW for sidewalk. (17 responses)

What type of **LANDSCAPING** should be incorporated?

- Yes, prefer landscaping. (12 responses)
  - Xeriscape or patterned concrete. (8 responses)
- No. (10 responses)

Should **ROUNDBAOUTS** be incorporated? Where?

- Yes. (4 responses)
  - Allison. (2 responses)
  - Carr. (2 responses)
- No. (31 responses)

Should **ON-STREET PARKING** be eliminated?

- Yes, eliminate parking. (24 responses)
- No. (7 responses)
- Only if safety is primary concern. (1 response)
- None needed by apartments west of Garrison. (1 response)

Would you like to see **OVERHEAD UTILITIES** relocated underground?

- Yes. (24 responses)
- No. (12 responses)

When planning **PROJECT PHASING**, which elements would you like to see done first?

- Another traffic lane from Carr to Jehovah's Witness Hall. (10 responses)
- Segment 2. (3 response)
- Wadsworth intersection. (3 responses)
- Wadsworth to Carr. (2 responses)
- Carr roundabout. (1 response)
- Safety and traffic flow are priority. (1 response)
- Underground the utilities. (1 response)
- Sidewalk detachment. (1 response)

### Segment 3 (Wadsworth to Kendall)

#### 8 Responses via comment sheet:

##### What subdivision do you live in?

1 indicated being a business owner or employee in the area.

5 indicated they were residents in the area and lived in:

Columbine Hills - 2

Herrick Dale – 2

##### What are the most IMPORTANT ISSUES to address along the Chatfield Corridor?

- Leave this section 2-lanes. (2 responses)
- There needs to be an extended right turn lane from EB Chatfield to SB Kendall. Currently vehicles use the dirt shoulder. (1 response)
- Leave Kendall a four way stop. (1 response)
- Noise at Saulsbury Street is on primary concern. (1 response)
- Keeping speeds down. (1 response)

##### Do you have any SAFETY concerns with the existing Chatfield Avenue?

- Speeds from Pierce to Kendall. (2 responses)
- Roadway too narrow and shoulders inadequate with traffic on dirt shoulders, especially EB RT at Kendall. (1 response)
- Crosswalk light at Lamar. (1 response)
- None. (1 response)

##### CAPACITY and Traffic Operations-Do you support a 4-lane section?

- Yes, too narrow east of Kipling. (1 response)
- No, Kendall to Mineral should be left alone. (2 responses)
- Kendall to Pierce should be 2-lane with center turn lane and parking on the street. (1 response)

##### Should full landscaped MEDIANS be used or limit landscaping to provide full movement access?

- Yes, landscape the median. (1 response)
- No landscaped median. (5 responses)

##### Should SIDEWALKS AND STREETSCAPE be incorporated?

- Sidewalks should be incorporated into the project. (4 responses)

##### Tree Lawn

- A tree lawn between the traffic and pedestrians is important. (2 responses)
- There should not be a tree lawn. (1 response)

##### Sidewalks vs. Existing Tree Removal

- Sidewalks are important, even if existing trees must be removed. (2 responses)
- Trees should not be removed for a sidewalk. (2 responses)

##### Sidewalks vs. Private ROW take

- Sidewalks should be incorporated even if ROW from residents is required. (2 responses)
- ROW should not be taken for sidewalks. (1 response)

##### General Sidewalk Comments

- Put in bike paths. (1 response)
- Extend path on N side, west from Lamar. (1 response)

##### What type of LANDSCAPING should be incorporated?

- Landscaping is important. (6 responses)
  - Xeriscape. (1 response)
- No new landscaping. (1 response)

Should **RONDBAOUTS** be incorporated? Where?

- Yes (3 responses)
  - Pierce and Kendall are good locations. (1 response)
- No (3 responses)
  - Kendall is poor location. (2 responses)

Should **ON-STREET PARKING** be eliminated?

- Yes. (2 responses)
- No. (2 responses)

Would you like to see **OVERHEAD UTILITIES** relocated underground?

- Yes. (3 responses)
- No. (1 response)

When planning **PROJECT PHASING**, which elements would you like to see done first?

- Segment 3. (2 responses)
- Residential areas. (1 response)
- Segment 3 last! (1 response)

**Comments from the “Potential Alternative Solutions-Segment 3 (Wadsworth to Kendall)” roll plot:**

**ISSUE 15 – SHOULD A ROUNDABOUT BE INSTALLED AT PIERCE?**

- Option A – Maintain Existing Signal (3 responses)
- Option B – Roundabout (1 response)

**ISSUE 19 – SHOULD A ROUNDABOUT BE INSTALLED AT KENDALL?**

- Leave as a four way stop. (1 response)

**OTHER**

- Need to have 30 mph speed limits. (1 response)
- Need EB LT lane at Quay Street into Kinder-Care on opposite side of Chatfield. (1 response)
- Church parking creates a hazard. (1 response)
- Maintain trail crossing at Lamar. (1 response)

**Comments posted on the non-segment specific boards at the meeting:**

Accident History for Chatfield Corridor Study:

- This info is old!!! (1 response)
- You must update the board for current conditions due to the recent growth. (1 response)

Will I Get a Traffic Signal at My Intersection?

- Garrison Signal is warranted now from Warrant 5 – School Crossing. Dangerous for students to cross. (1 response)

2003 Traffic Count Data and Level of Service – Segment 2

- The church turns at S. Dudley Street are not included. (1 response)

Will The County Install a Fence along the Roadway?

- Noise issue will never improve without an 8-10' fence or masonry wall. (1 response)

Carr Street Options

Option E – Carr Realignment Using 275' Radius

- Please don't have Carr Ct as a cul-de-sac. (1 response)

Option D – Carr Realignment Using 100' Radius

- Please don't have Carr Ct as a cul-de-sac. (1 response)
- No medians. (1 response)

Option B -- Carr Street Using Roundabouts

- Our drivers are unfamiliar with roundabouts. (1 response)
- I think the point is to slow traffic. (1 response)
- Too much traffic traveling too fast for a roundabout. (1 response)
- How can a person cross the street in a traffic circle? (1 response)
- No roundabouts! (1 response)
- Traffic would become too congested and slow with roundabouts. (1 response)
- Traffic will slow with roundabouts and that is good. (1 response)

Option A – Carr Street Using double Turn Lanes

- No solid median. Blocks access to our home. (1 response)
- Prefer Option A. (1 response)

# **Appendix D**

**Summary of Comment Sheets from South  
Carr Street Residents' Public Meeting August 12,  
2003**



# MEMORANDUM

The logo for Muller Engineering Company, Inc. features the word "MULLER" in a bold, white, serif font, centered within a black rectangular box.

**DATE HELD:** Tuesday, August 12, 2003  
**DATE MEMO:** Revised Friday, October 03, 2003  
**PROJECT:** West Chatfield Avenue Corridor Study  
**MEETING LOC.:** Jefferson County  
**PURPOSE:** Carr Street Residents Public Meeting  
**ATTENDEES:** Brad Bauer, Jefferson County  
Kevin French, Jefferson County  
Gray Clark, Muller Engineering Company  
Lisa Powell, Muller Engineering Company  
See attached Attendance Roster – 13 names  
**ROUTING:** LRP, NJL, AGC, RGC, File: 03018.01

**Muller Engineering Company, Inc.  
Consulting Engineers**

**Irongate 4, Suite 100  
777 S. Wadsworth Boulevard  
Lakewood, Colorado 80226  
303/988-4969 FAX  
303/988-4939**

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## Discussion

A Public Open House was held on August 12, 2003 to receive citizen input on Carr Street Realignment alternatives. No formal presentation was made and the event was held as an open house with project representatives available to address any comments or concerns. The attendants were asked to fill out a Public Comment Sheet and Questionnaire.

## Advertisement

Nineteen homeowners surrounding Chatfield who could be affected by one or more of the Carr Street realignment alternatives were hand delivered a flier inviting them to the meeting.

## Materials Presented

### Handouts

Frequently Asked Questions  
Public Comment Sheet (Attached)

### Displays (Attached)

Aerial Map of Project Corridor  
2003 Traffic Count Data and Level of Service-Segment 2  
2025 Projected Traffic and Level of Service-Segment 2  
Will the County Install a Fence along the Roadway?  
Carr Realignment Using 275' Radius  
Carr Realignment Using 100' Radius  
Carr Realignment Skewed at Chatfield  
Carr Street Using Roundabouts  
Carr Street Using 10' Double Turn Lanes

*Comment Sheets*

Attached to this memorandum are copies of the two *Public Comment Sheets* that were filled out by the attendants of the open house. One survey was turned in at the meeting on August 12, 2003 and one survey was turned in on August 14, 2003.

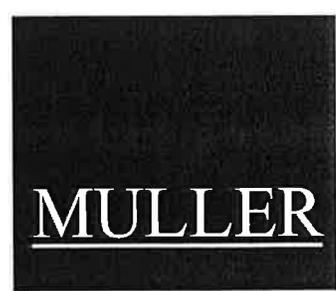
Although not many formal comment sheets were received, the citizens adjacent to Chatfield and Carr who were in attendance generally did not want to have their property purchased as part of a solution and therefore favored the “Carr Street Using 10’ Double Left Lanes” or “Carr Street Using Roundabouts” solution. Many citizens also admitted that there is a safety issue as they have witnessed many accidents along this section of Chatfield. A few citizens voiced concerns about the affect of the project on their drives off of Chatfield.

# **Appendix E**

**Summary of Comment Sheets from Second Public  
Meeting March 3, 2004**



# MEMORANDUM



- TO: Brad Bauer, JeffCo Highways and Transportation
- PROJECT: West Chatfield Avenue Corridor Study  
Ken Caryl Avenue to Kendall Boulevard  
MEC 03-018, JEFFCO 5-69-33-3524
- DATE: May 4, 2004
- FROM: Lisa Powell, PE; Muller Engineering Company
- REGARDING: **Public Meeting #2 March 3, 2004**

**Muller Engineering Company, Inc.  
Consulting Engineers**

**Irongate 4, Suite 100**  
777 S. Wadsworth Boulevard  
Lakewood, Colorado 80226  
303/988-4969 FAX  
303/988-4939

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## **Introduction**

A Public Meeting was held on Wednesday, March 3<sup>rd</sup> at the Ken Caryl Ranch House in Littleton, Colorado for the West Chatfield Avenue Corridor Study, Ken Caryl Avenue to Kendall Boulevard. A press release was issued by Jefferson County to the local media. Invitation letters were mailed to 1150 residences and businesses surrounding the project (addresses attached). Thirty signs advertising the meeting were placed along the project corridor. The meeting format was an open house with project representatives available to address any comments or questions for attending citizens. The focus of the meeting was to present the preferred alternative for the corridor and to solicit input from the public concerning the recommendations.

At least 140 people attended the meeting as indicated by the attendance roster that is attached to the back of this document. Additionally, the following is a list of project representatives that were present:

Brad Bauer, Jefferson County Division of Highways and Transportation  
Rob Carlson, Muller Engineering Company  
Gray Clark, Muller Engineering Company  
Lisa Powell, Muller Engineering Company  
Nancy Lambertson, Muller Engineering Company  
Chris Kroeger, Muller Engineering Company  
Robin Lindsey, Muller Engineering Company

## **Discussion**

The intent of the meeting was to present recommendations for improvements and provide a forum for both input and questions from the public. The recommended improvements shown included both roadway and landscaping improvements along the West Chatfield Avenue corridor.

The following is a list of the boards, displays, and handouts available at the meeting. Reduced copies of the graphics and copies of the handouts are attached to this document.

### *Handouts*

- Answers to Common Questions
- Resolution of Issues Raised at Previous Public Meeting on August 14, 2003

### *Boards*

- Aerial Map of Project Corridor
- Project Process and Schedule
- Accident History for Chatfield Corridor Study
- Will I get a Traffic Signal at my Intersection?
- Level of Service (LOS) Definitions
- 2003 Traffic Count Data and Level of Service

### *Graphics*

- Locally Preferred Concept Plan (1"=60' roll plots on tables)

Attendees were provided a comment sheet to be completed and turned in at the meeting or by mail prior to March 17, 2004. As of March 9, 2004, a total of 41 comment sheets were received. The comment sheets are attached to this document.

### **Public Comments**

The comment sheets and written responses placed on presentation drawings are summarized below:

#### Segment 1 – Ken Caryl Avenue to Kipling Parkway

1. Intersections (13 responses)
  - a. Request addition of new signal at Cochetopa Pass/Shaffer Place (1 response), Sawatch Range/Shaffer Parkway (2 responses) and Continental Divide (1 response) due to excessive wait times and difficulty turning left onto Chatfield.
  - b. Prefer the addition of a roundabout, instead of a signal, at Cochetopa Pass/Shaffer Place (4 responses) and at Sawatch Range/Shaffer Parkway (1 response).
  - c. Request a 4-way stop at Cochetopa Pass/Shaffer Place (1 response) to decrease noise and improve traffic flow.
  - d. Request that the crossspan at Cochetopa Pass be removed to prevent scraping and enable faster turns (3 responses).
2. Landscaping (8 responses)
  - a. Request to retain existing landscaping in medians (4 responses), especially between Sangre De Cristo and Kipling.
  - b. Request to keep the existing sidewalks or move the proposed sidewalks to prevent the loss of existing trees (4 responses).
3. Sound Barriers (3 responses)
  - a. Request for sound control at Shaffer Parkway (1 response) due to traffic from post office.
  - b. Request for larger fence as a sound barrier (1 response).
  - c. Request for sound barrier or additional trees along Chatfield between Continental Divide and Kipling (1 response).
4. Medians (1 response)
  - a. Request that curbed median built to prohibit U-turns at pedestrian crossing at Park Range Road immediately (1 response).

## Segment 2 – Kipling Parkway to Wadsworth Boulevard

At the public meeting, the owner of the property on the southeast corner of South Carr Street and Chatfield Avenue expressed interest in selling their property for improvements to the Carr Street intersection. The purchase of this property along with the property on the northwest corner of Carr Street and Chatfield Avenue would allow for the realignment of Carr Street using Option C “Carr Realignment Skewed at Chatfield” discussed in the memo dated August 14, 2003. Jefferson County Staff met to discuss the possibility of purchasing the two properties for the future realignment of Carr Street. It was determined that the cost-benefit ratio of purchasing the properties to realign Carr would not justify the purchase. It was further discussed that the public generally favored side-by-side left turn lanes presented as the Locally Preserved Concept Plan. The County determined if the side-by-side left turns do not mitigate the accidents at this intersection, further options for the intersection would not be precluded. Possible future options include a traffic signal, restricting left turning movements, and revisiting the skewed Carr Street alignment.

1. Carr Street (13 responses)
  - a. Request addition of traffic signal to intersection (8 responses) to enable children to cross Chatfield and vehicles to turn left.
  - b. Request pedestrian bridge (2 responses) to allow children to cross Chatfield to elementary school.
  - c. Request addition of roundabout to intersection (2 responses).
  - d. Request that roundabout not be added (2 response).
  - e. The homeowner at 8370 W. Chatfield Avenue is willing to sell.
2. Iris Way (9 responses)
  - a. Request the pedestrian signal be moved to the intersection (7 responses).
  - b. Request that traffic be recounted (2 responses) due to new commercial development.
3. Sound Barriers (8 responses)
  - a. Request trees or fence to help reduce noise between Iris and Everett/Phillips Drive (2 responses).
  - b. Request fence to reduce noise for adjacent homes between Dudley and Dover (4 responses).
  - c. Request noise barrier between Carr Street and Wadsworth Boulevard (4 responses).
4. Allison Street/Yukon Way (7 responses)
  - a. Request addition of traffic signal to intersection (4 responses).
  - b. Request addition of roundabout to intersection (1 response).
  - c. Request that roundabout not be added (2 responses).
  - d. Request that speed bumps be added to Allison Street to slow traffic in residential area (1response).
5. Wadsworth Court (6 responses)
  - a. Request for right-in/right-out access off Wadsworth Boulevard to frontage road south of Chatfield (7 responses) to reduce traffic on Wadsworth Court.
  - b. Request to improve Meadow Drive if access is provided off Wadsworth Boulevard (1 response).
  - c. Request for raised median on Chatfield for left-turns onto Wadsworth Court and Wadsworth Boulevard (1 response).
  - d. Request to provide left-turn access to Wadsworth Court from Chatfield Avenue (1 response).
  - e. Request that U-turns not be allowed at Yukon Street (1 response).
6. Medians (3 responses)
  - a. Request raised medians between Iris Way and Garrison Street (3 responses).
7. School Zone (2 responses)
  - a. Request for school zone warning signs at Garrison Street (2 responses).
8. Access to Carr Court (1 response)
  - a. Request for left-turn access to and from Carr Court (1 response) due to no other available access.
9. Street Lighting (1 response)

- a. Request for streetlights on Chatfield west of Wadsworth Boulevard (1 response) due to night blindness experienced by older citizens.

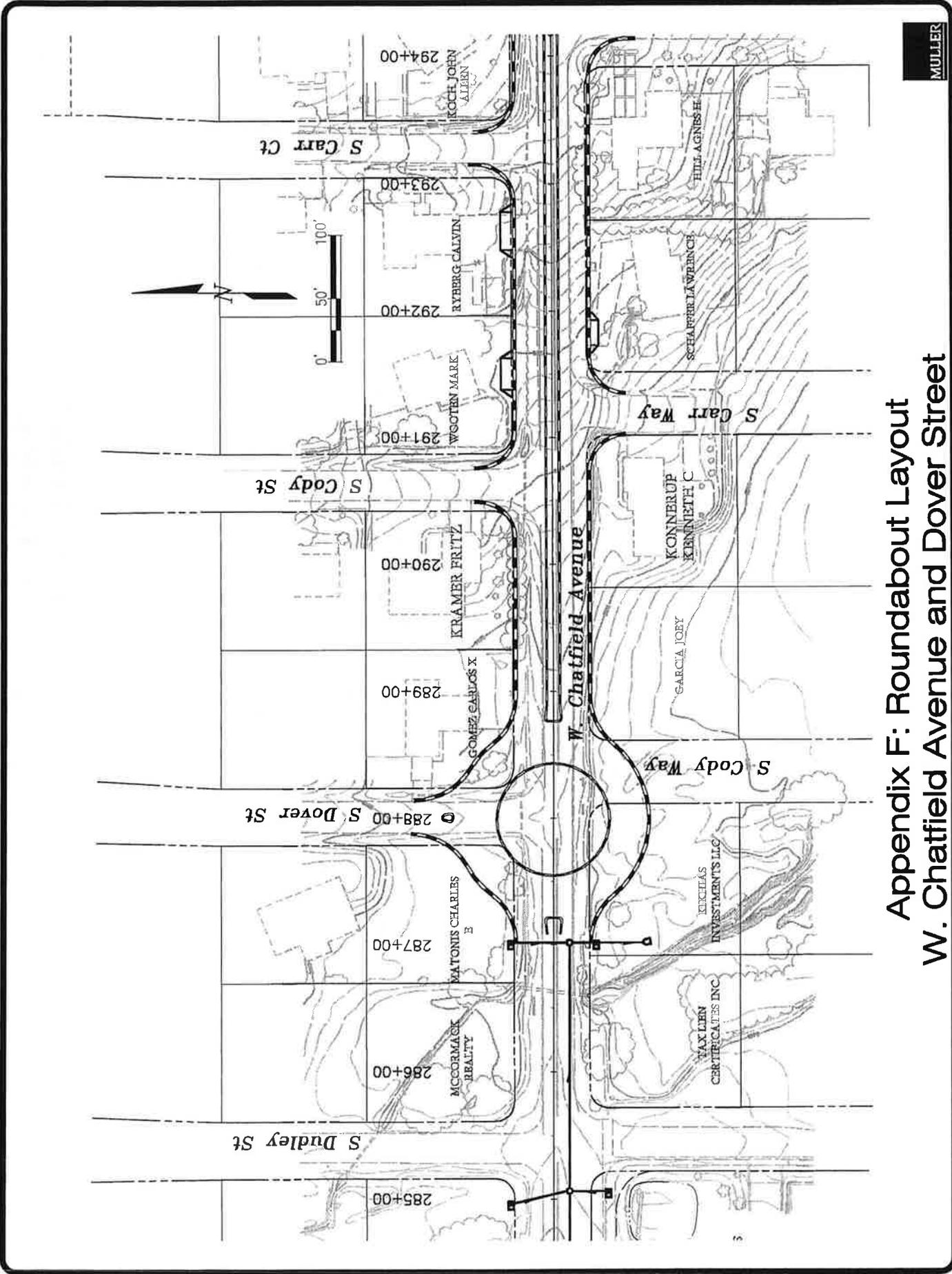
Segment 3 – Wadsworth Boulevard to Kendall Boulevard

1. Kendall Boulevard (8 responses)
  - a. Request addition of traffic signal to intersection (1 response).
  - b. Request that traffic signal not be added (1 response).
  - c. Request addition of roundabout to intersection (3 responses).
  - d. Request that proposed turn lanes be added (1 response)
  - e. Request that speed bumps be added to Kendall Boulevard to slow traffic (2 responses).
2. Sound Barriers (2 responses)
  - a. Request that noise barriers be added along Chatfield Avenue (2 responses).
3. Parking (1 response)
  - a. Request that parking not be allowed on the south side of Chatfield from Pierce to Lamar and that no parking signs be added (1 response).
4. Bicycle Facilities (1 response)
  - a. Request for more bicycle facilities (1 response), especially in the Columbine Knolls area.

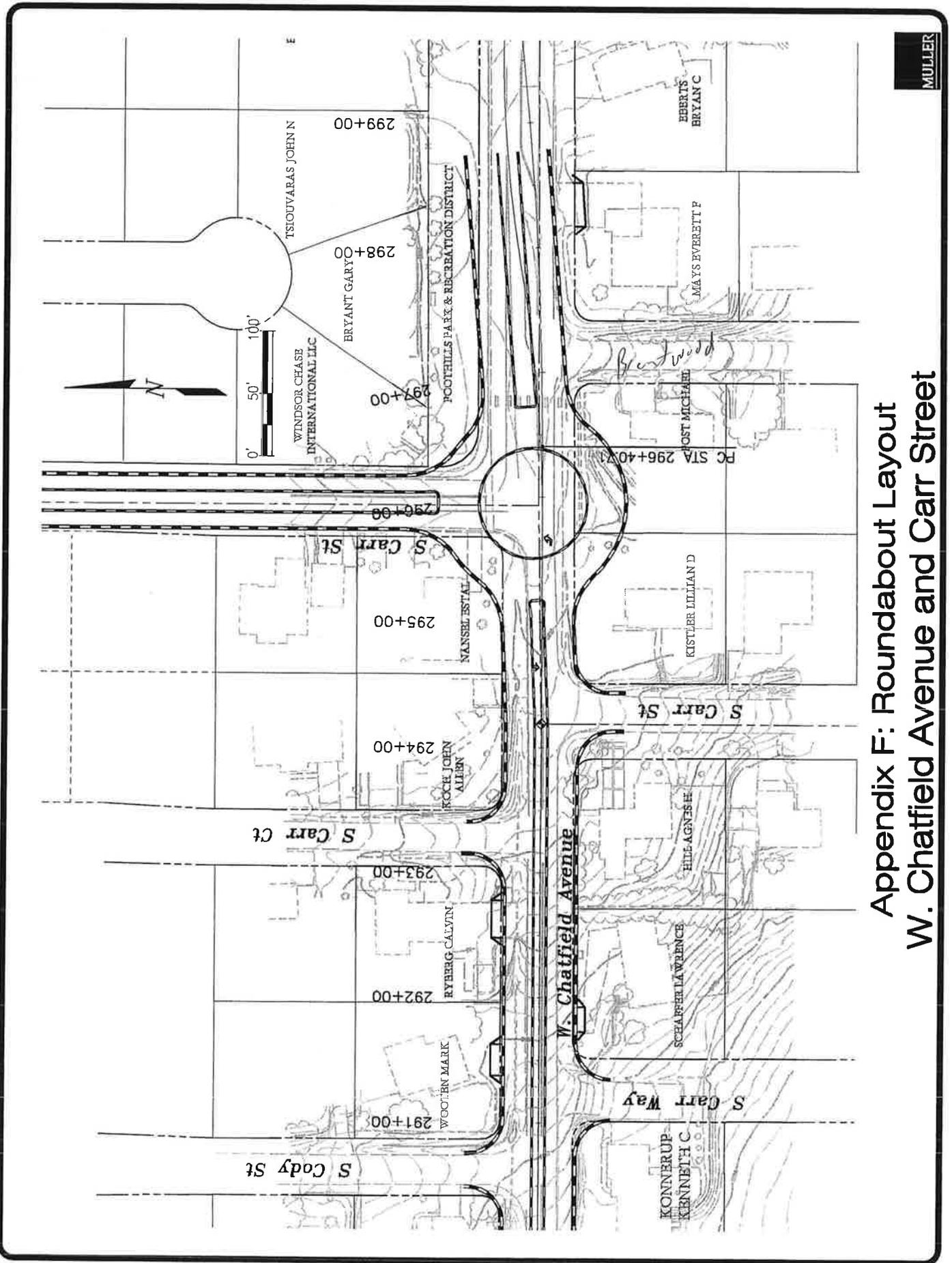
# **Appendix F**

## **Conceptual Roundabout Layouts**



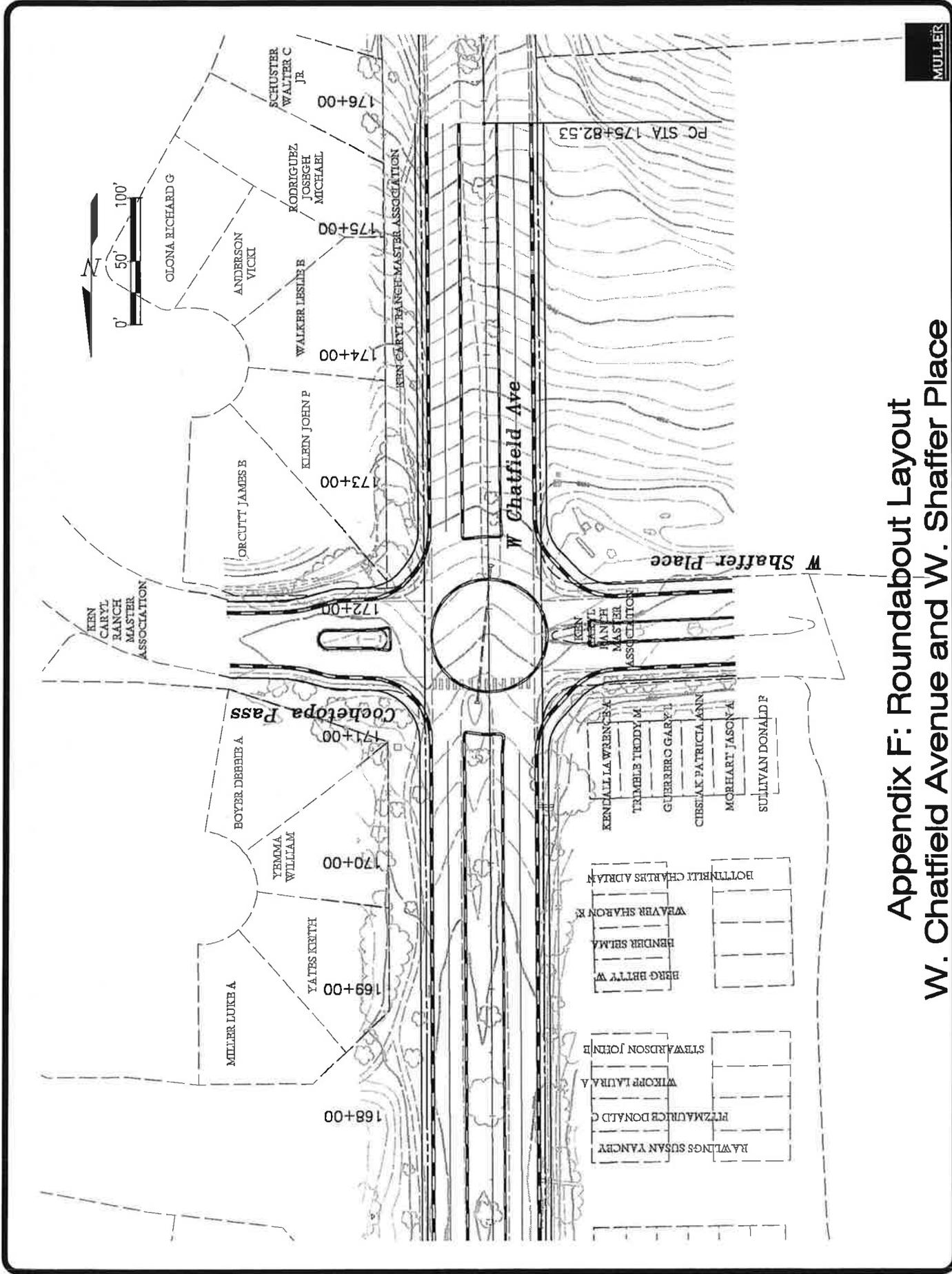


Appendix F: Roundabout Layout  
 W. Chatfield Avenue and Dover Street

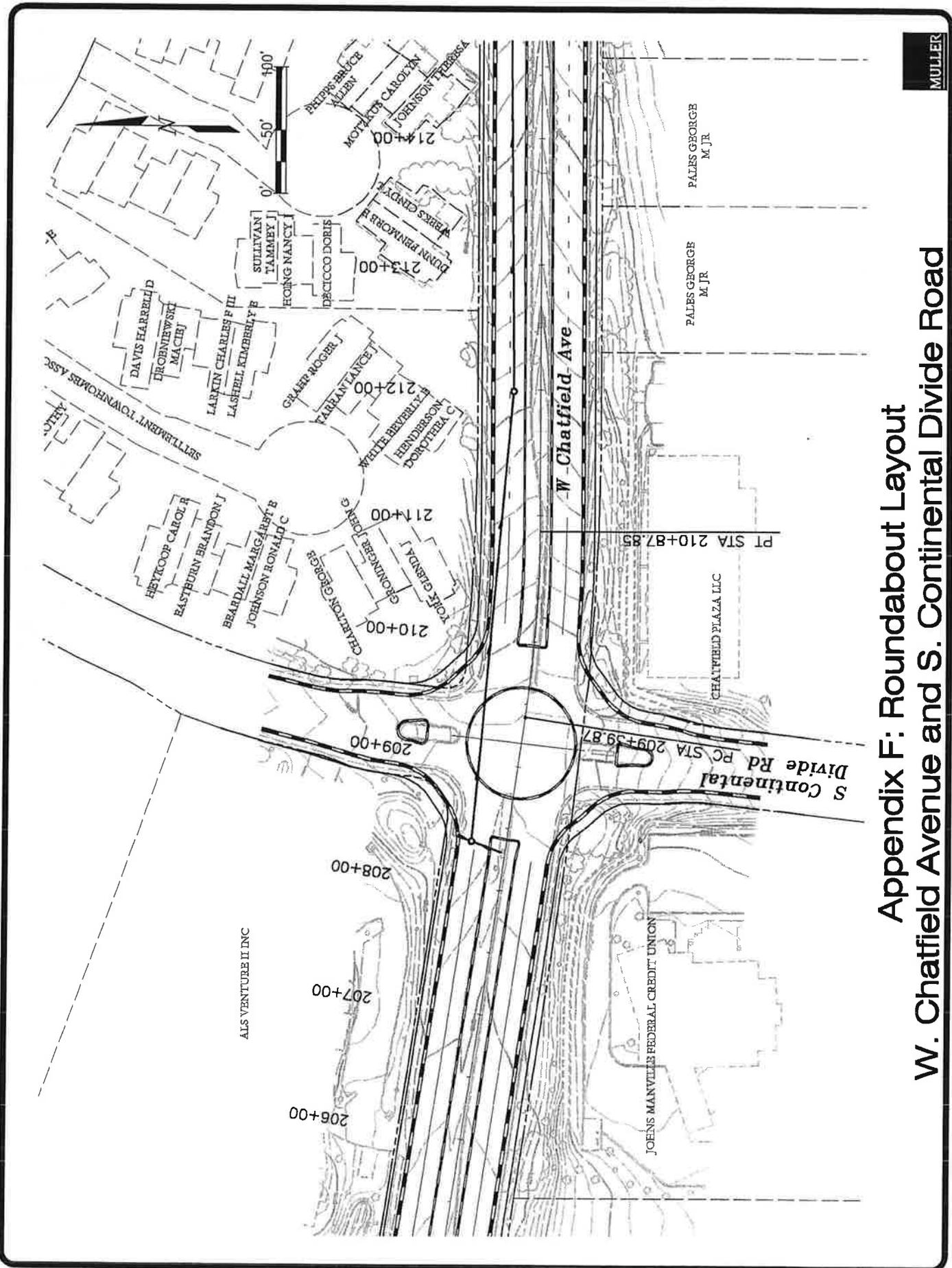


# Appendix F: Roundabout Layout W. Chatfield Avenue and Carr Street

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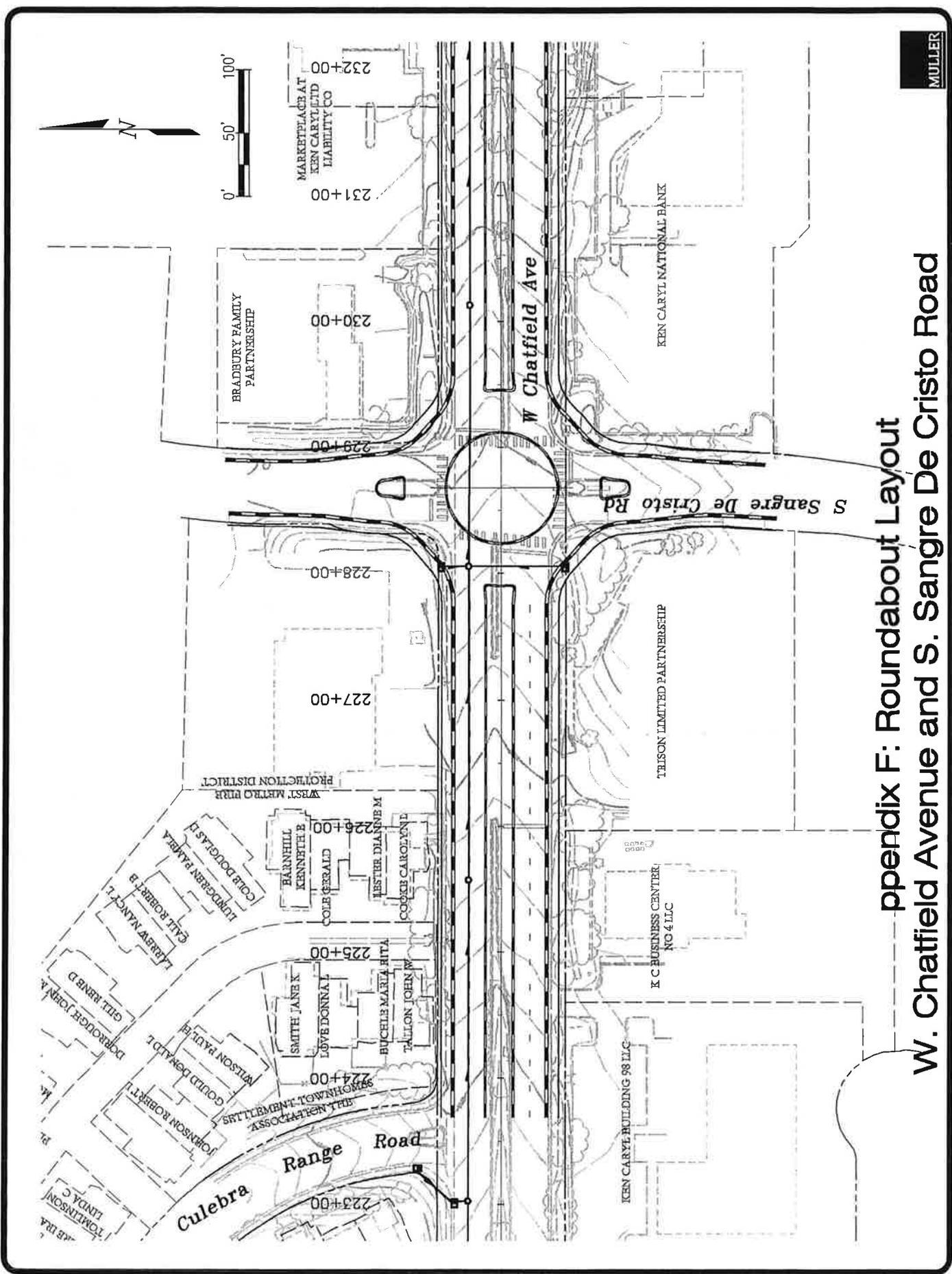
Appendix F: Roundabout Layout  
W. Chatfield Avenue and W. Shaffer Place



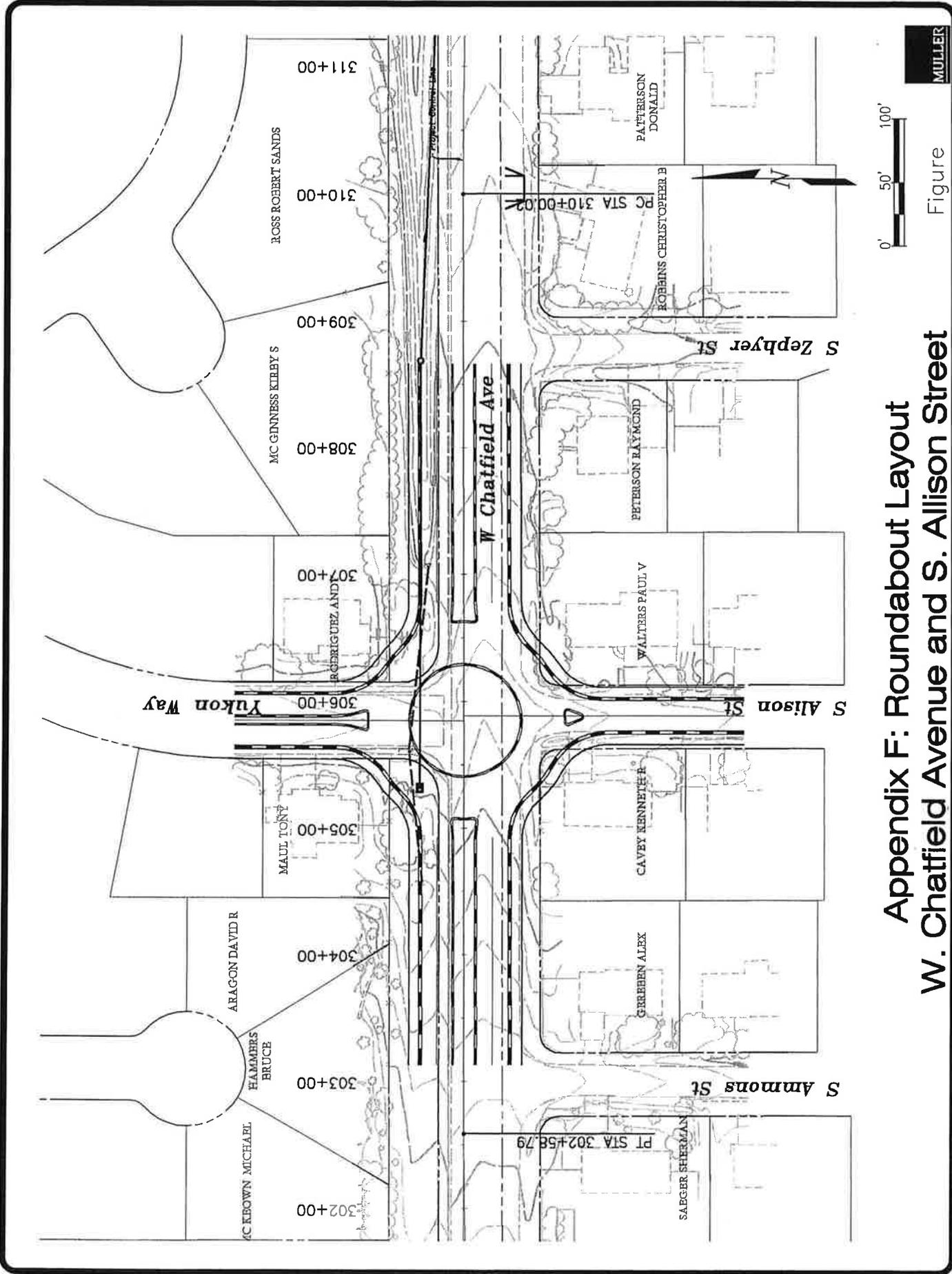
Appendix F: Roundabout Layout  
 W. Chatfield Avenue and S. Continental Divide Road

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# Appendix F: Roundabout Layout W. Chatfield Avenue and S. Sangre De Cristo Road





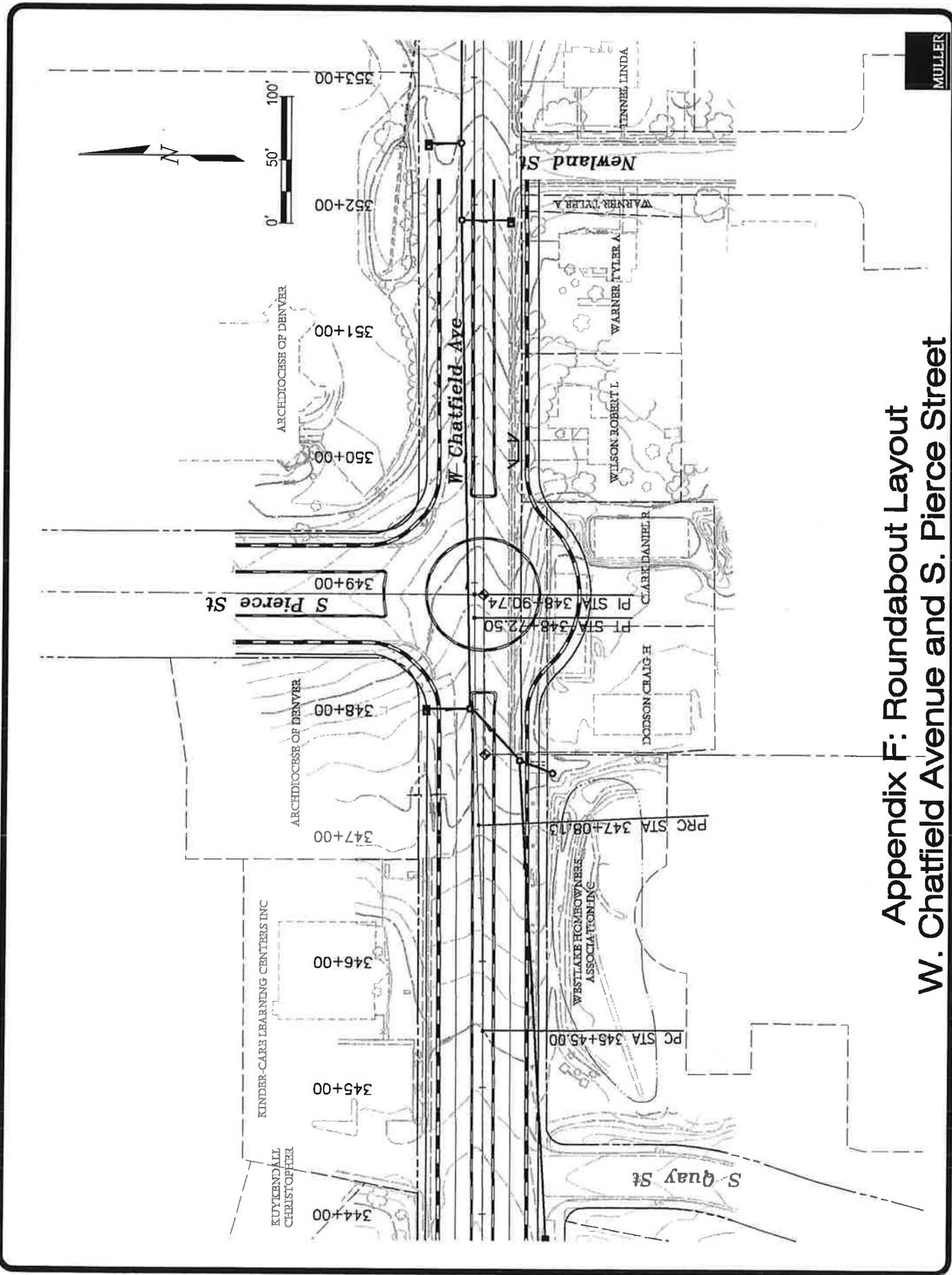


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Figure

Appendix F: Roundabout Layout  
W. Chatfield Avenue and S. Allison Street

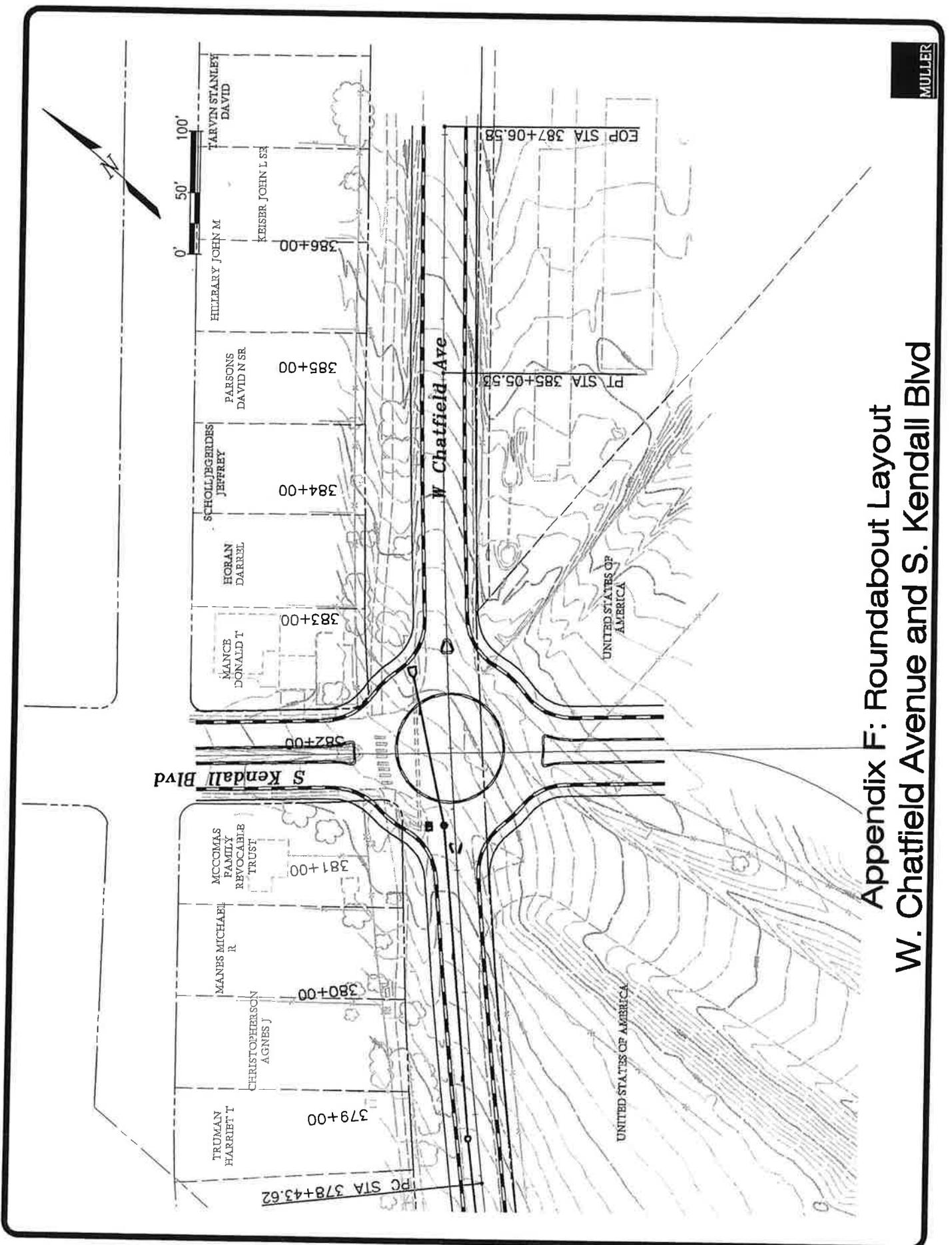


# Appendix F: Roundabout Layout W. Chatfield Avenue and S. Pierce Street

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# Appendix F: Roundabout Layout W. Chatfield Ave and S. Kendall Blvd

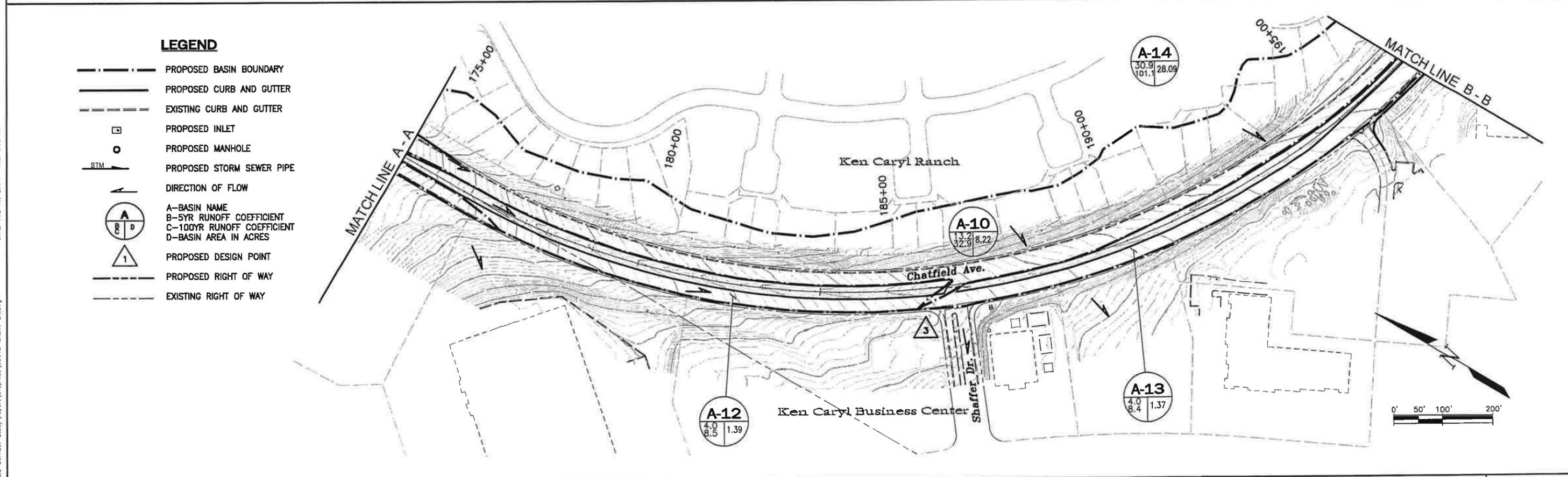
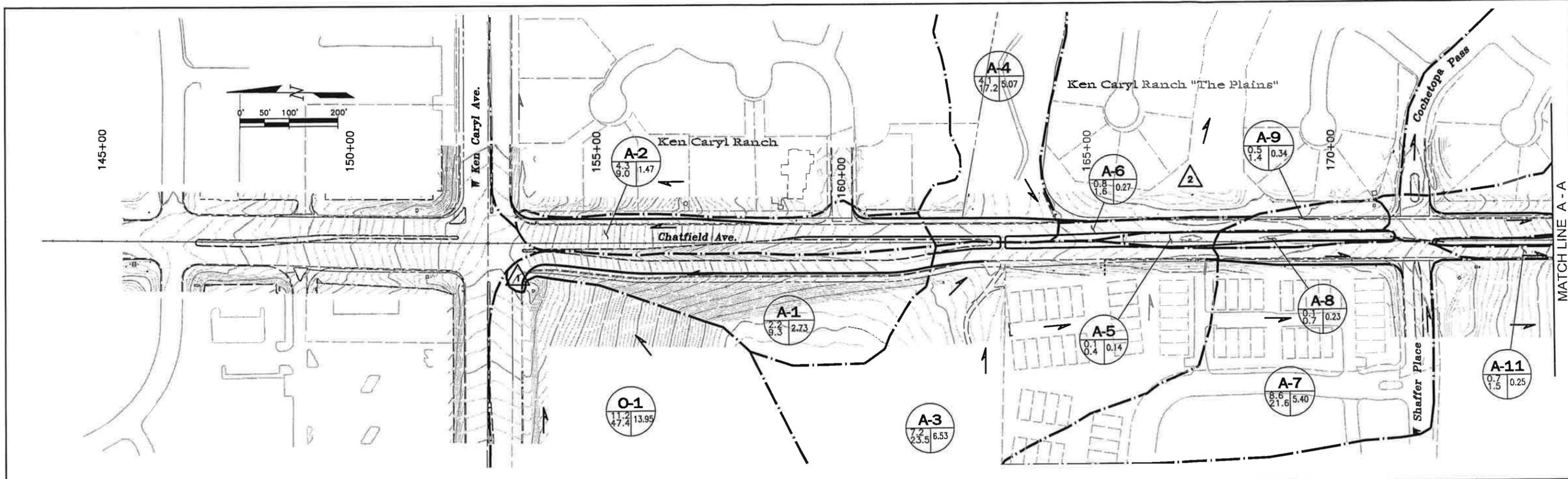
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**Appendix G**  
**Drainage Basin Map**

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**LEGEND**

- PROPOSED BASIN BOUNDARY
- PROPOSED CURB AND GUTTER
- EXISTING CURB AND GUTTER
- PROPOSED INLET
- PROPOSED MANHOLE
- PROPOSED STORM SEWER PIPE
- DIRECTION OF FLOW
- A-BASIN NAME  
B-5YR RUNOFF COEFFICIENT  
C-100YR RUNOFF COEFFICIENT  
D-BASIN AREA IN ACRES
- PROPOSED DESIGN POINT
- PROPOSED RIGHT OF WAY
- EXISTING RIGHT OF WAY

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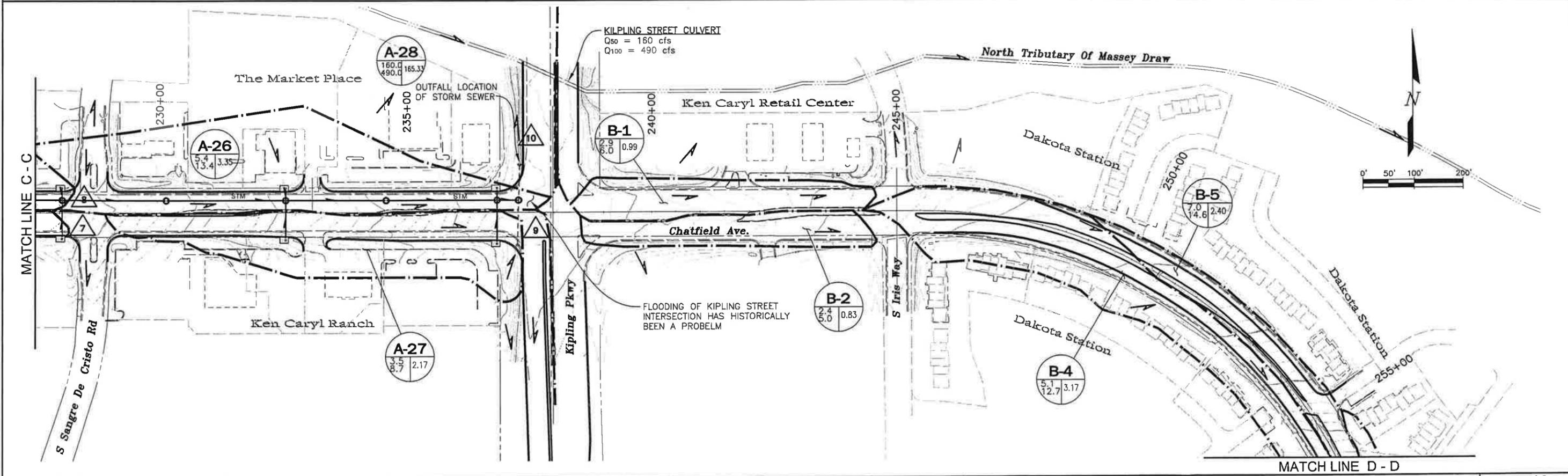
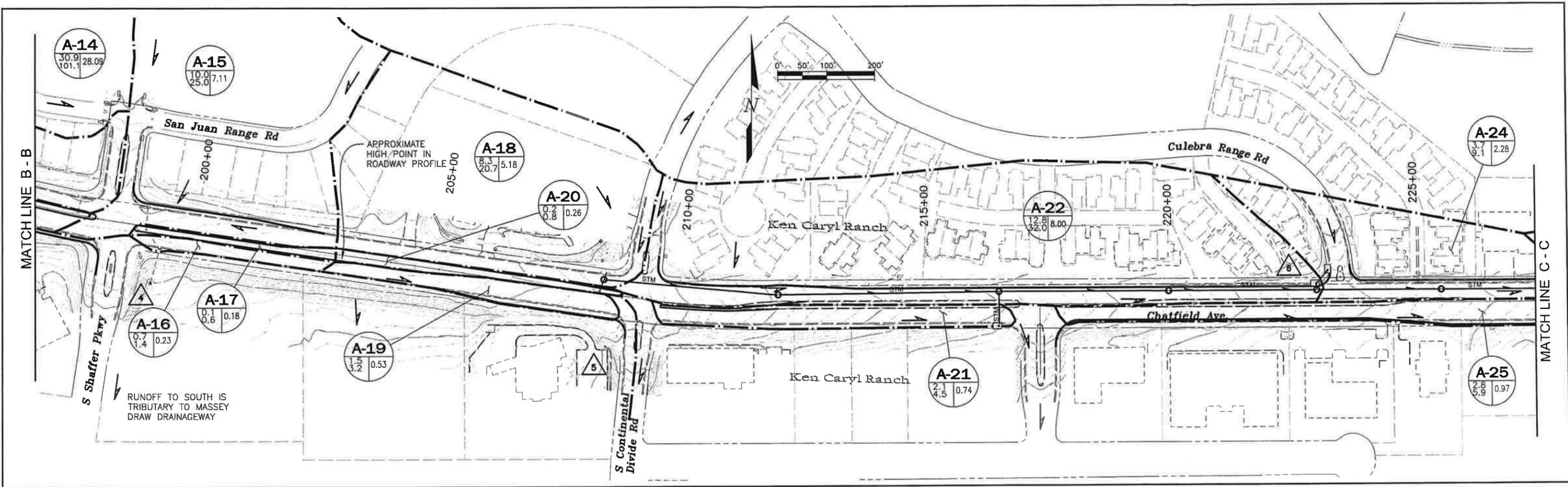
**MULLER ENGINEERING CO., INC.**  
 CONSULTING ENGINEERS  
 IRONGATE 4, SUITE 100  
 777 S. WADSWORTH BLVD.  
 LAKEWOOD, COLORADO 80226  
 (303) 988-4939  
 MEC PROJECT NO. 01-037.01

SCALE: 1"=100'  
 DATE: 5/17/04  
 DRAWN: RKL  
 APPROVED: KAH  
 DESIGNED: KAH  
 CHECKED: KAH

**JEFFERSON COUNTY**  
 DIVISION OF HIGHWAYS AND TRANSPORTATION

CHATFIELD AVENUE CORRIDOR  
 DRAINAGE BASIN MAP  
 APPENDIX G

JEFFCO  
 PROJECT NO. 5-69-09-3444  
 SHEET 1 of 4



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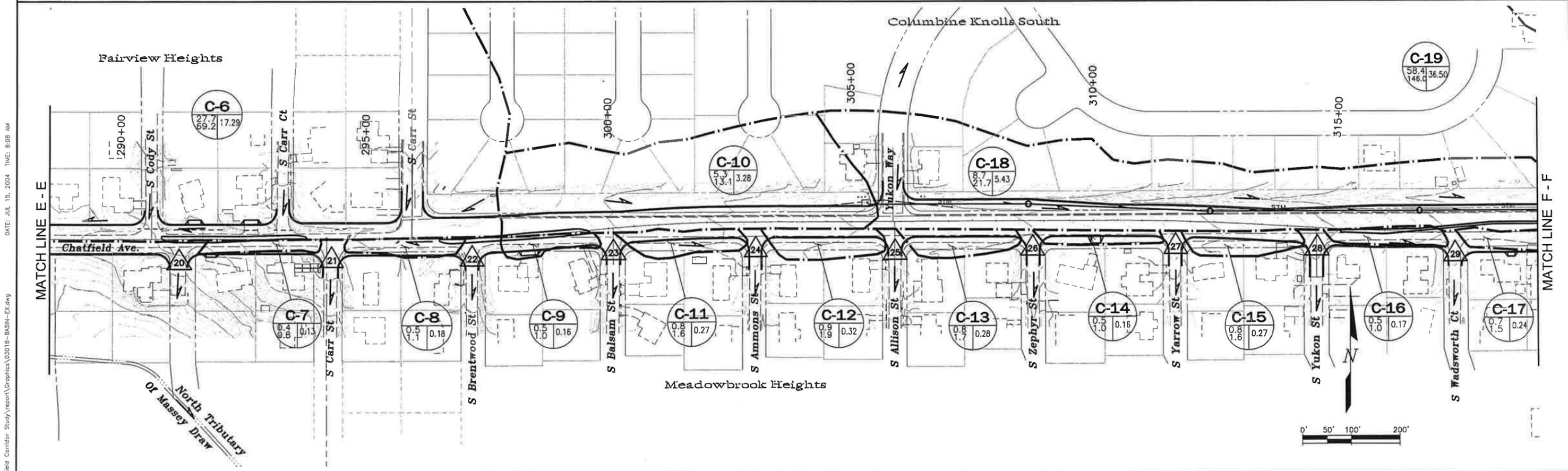
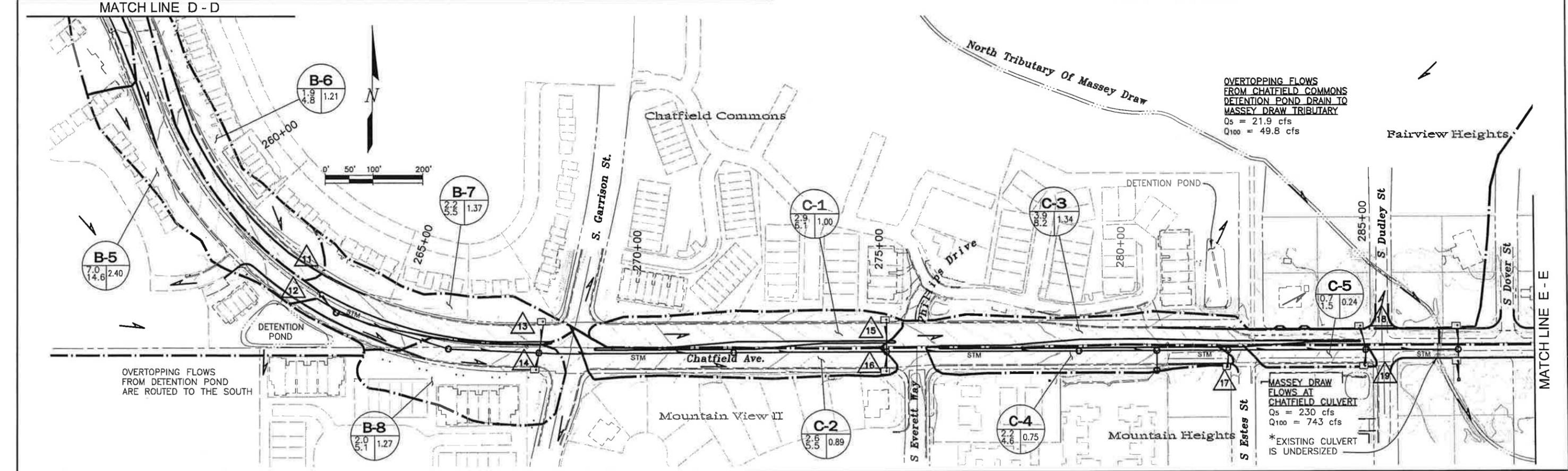
**MULLER ENGINEERING CO., INC.**  
 CONSULTING ENGINEERS  
 IRONGATE 4, SUITE 100  
 777 S. WADSWORTH BLVD.  
 LAKEWOOD, COLORADO 80226  
 (303) 988-4938  
 MEC PROJECT NO. 01-037.01

SCALE: 1"=100'  
 DATE: 5/17/04  
 DRAWN: RKL  
 APPROVED: [Signature]  
 DESIGNED: KAH  
 CHECKED: [Signature]

**JEFFERSON COUNTY**  
 DIVISION OF HIGHWAYS AND TRANSPORTATION

**CHATFIELD AVENUE CORRIDOR**  
**DRAINAGE BASIN MAP**  
**APPENDIX G**

JEFFCO  
 PROJECT NO. 5-69-09-3444  
 SHEET 2 of 4



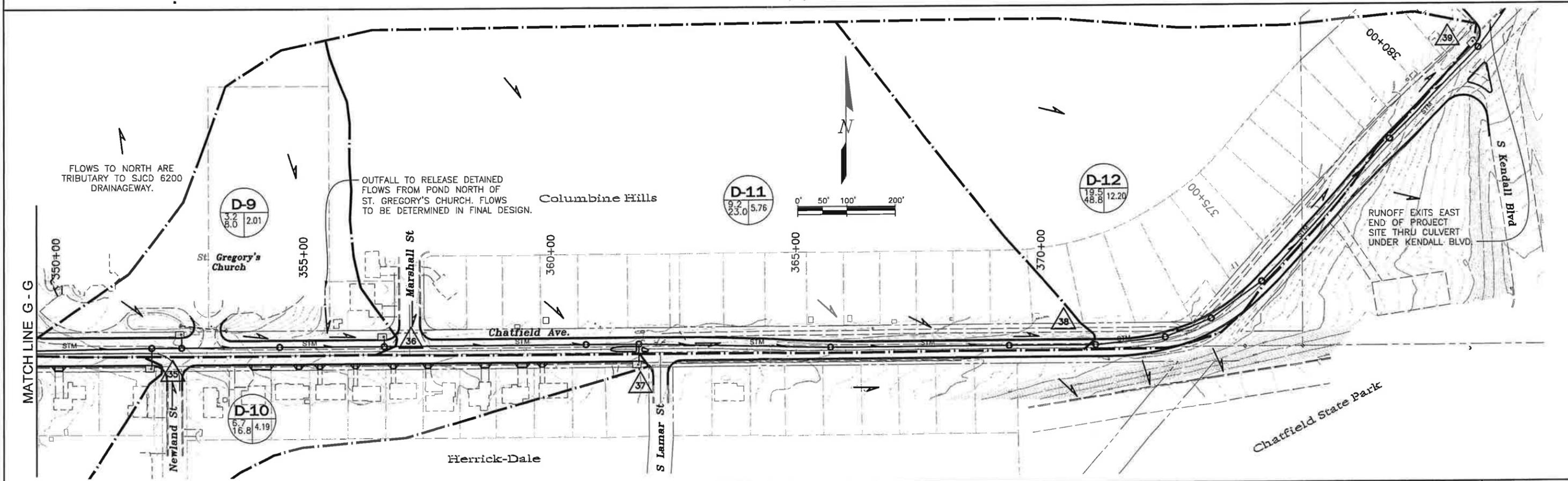
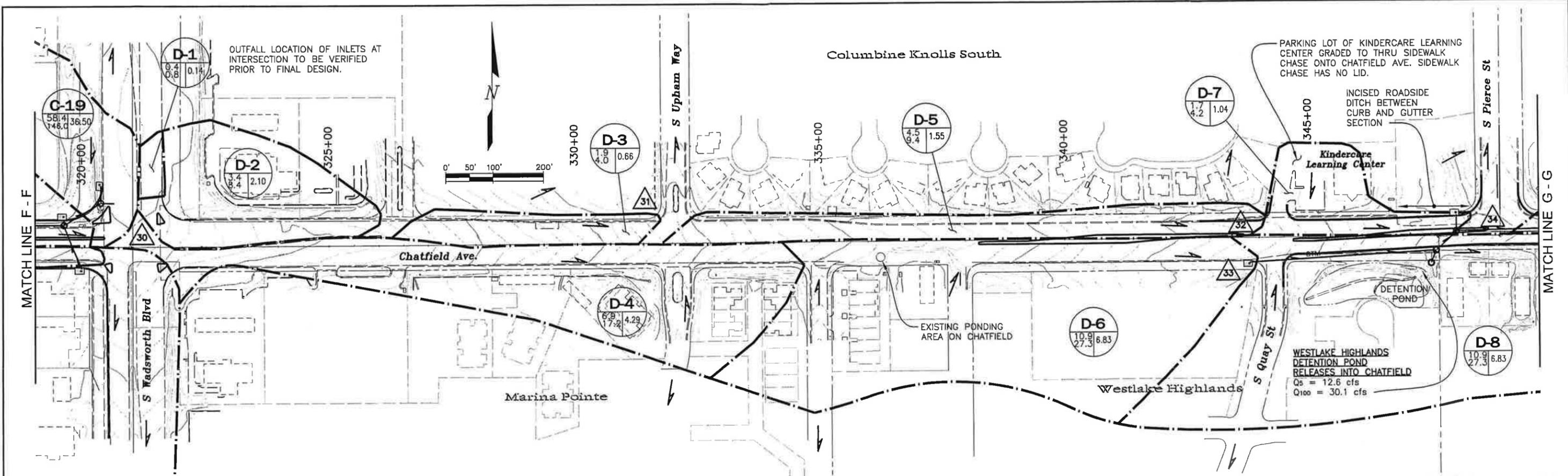
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|     |      |           |       | DRAWN:  | CHECKED:  |
|     |      |           |       | RKL     |           |

**MULLER ENGINEERING CO., INC.**  
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 (303) 988-4939  
 MEC PROJECT NO. 01-037.01

**JEFFERSON COUNTY**  
 DIVISION OF HIGHWAYS  
 AND TRANSPORTATION

**CHATFIELD AVENUE CORRIDOR  
 DRAINAGE BASIN MAP  
 APPENDIX G**

JEFFCO  
 PROJECT NO.  
 5-69-09-3444  
 SHEET 3 of 4



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 IRONGATE 4, SUITE 100  
 777 S. WADSWORTH BLVD.  
 LAKEWOOD, COLORADO 80226  
 (303) 988-4939  
 MEC PROJECT NO. 01-037.01

SCALE: 1"=100'  
 DATE: 5/17/04  
 DRAWN: RKL  
 APPROVED: KA  
 DESIGNED: KA  
 CHECKED:

Jefferson County Colorado  
**JEFFERSON COUNTY**  
 DIVISION OF HIGHWAYS AND TRANSPORTATION

CHATFIELD AVENUE CORRIDOR  
**DRAINAGE BASIN MAP**  
 APPENDIX G

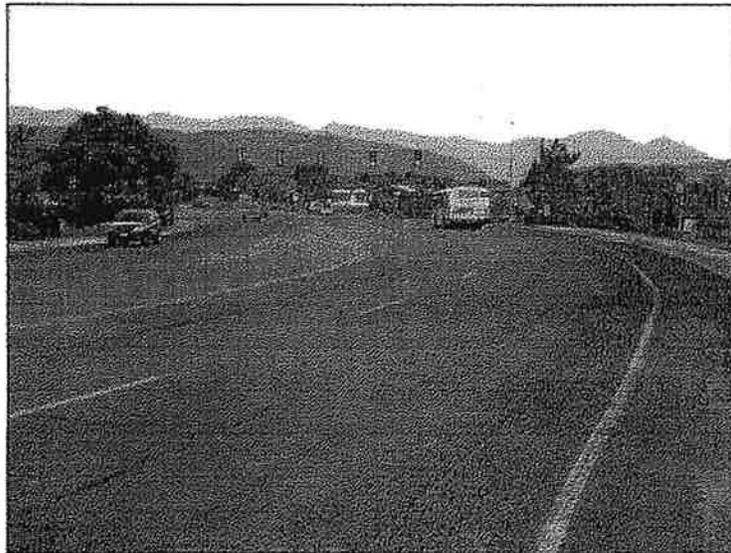
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 SHEET 4 of 4

# **Appendix H**

## **Geologic Reconnaissance and Pavement Distress Evaluation**



**Geologic Reconnaissance  
Literary Review  
Proposed West Chatfield Avenue Rehabilitation  
South Kendall Boulevard to Ken Cary Road  
Jefferson County, Colorado**



**Prepared for:**

**Muller Engineering, Inc.  
777 South Wadsworth Boulevard  
Iron Gate 4, Suite 100  
Lakewood, Colorado 80226**

**Attention: Mr. Gray Clark, P.E.**

**Job No. 03-0078**

**July 10, 2003**

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| Site Geologic Conditions .....   | 3                   |
| Limitations .....                | 4                   |
| Site Geologic Map.....           | (Pocket) Appendix A |

**Geologic Reconnaissance  
West Chatfield Avenue Rehabilitation  
Jefferson County, Colorado**

**PURPOSE AND SCOPE OF STUDY**

This report presents the results of a subsurface exploration program for providing a pavement design and geotechnical recommendations for the proposed West Chatfield Avenue Rehabilitation project from South Kendall Boulevard Avenue to Ken Caryl Road in Jefferson County, Colorado. The proposed general layout is shown in Figure 1.

A site reconnaissance and literary review was conducted to summarize alignment geologic conditions for conceptual pavement rehabilitation purposes. The results of the field reconnaissance and literary review are presented herein.

This preliminary report has been prepared to summarize the data obtained and present our conclusions based on the proposed rehabilitation alignment and available literary documentation. A discussion of geotechnical engineering considerations related to the proposed rehabilitation are included.

**PROPOSED CONSTRUCTION**

We understand that the proposed West Chatfield Avenue rehabilitation will include the widening of the existing 2 to 4 lane roadway to 4 lanes along the entire project alignment. It is our understanding that the proposed rehabilitation will have minimal cuts and fills on the order of 2 feet or less. If the proposed rehabilitation is significantly different from those described above, we should be notified to re-evaluate the recommendations contained in this report.

**SITE CONDITIONS**

The section of West Chatfield Avenue planned for widening from two travel lanes to four travel lanes (two in each direction) is approximately 4.5 miles in length. On the west end of the alignment, West Chatfield Avenue is oriented in a north/south direction where it intersects with West Ken Caryl Avenue. As West Chatfield Avenue extends south of Ken Caryl, it curves to the east, intersecting South Kipling Parkway and S. Wadsworth Boulevard. The study alignment extends to South Kendall Boulevard on the east. Currently this segment of roadway is a mix of roadway types moving through primarily residential areas.

**Subsurface Exploration Program and Pavement Design Recommendations  
Bellevue Avenue Rehabilitation  
Jefferson County, Colorado**

## **GEOLOGIC SETTING**

The project site lies within the Denver Basin complex located along the eastern flank of the Front Range of the Rocky Mountains. This area is underlain by sedimentary bedrock, which subsequently underwent uplift during the Larimide Orogeny. This uplift formed the present Rocky Mountains to the west, resulted in tilting of the originally flat lying sedimentary beds, causing steeply dipping bed orientations to the east. Subsequent differential erosion and mass wasting process over the past several million years has resulted in the existing topography observed today, consisting of more resistant sandstone/limestone hogback ridges located west of the alignment, and associated more erodable shale valleys. This series of geologic events have resulted in bedrock layers underlying the site orientated with a strike generally parallel to the hogbacks located to the west, with a steep dip of 70 to 30 degrees generally to the east.

## **SITE GEOLOGIC CONDITIONS**

*Bedrock Conditions:* The bedrock underlying the surficial soils in the project area is variable and is composed four distinct geologic formations. A project alignment specific geologic map is included in Appendix Pocket A. A summary of the alignment bedrock geology from east portion of the alignment to the west is as follows:

**Paleocene And Upper Cretaceous Aged Denver Formation:** The Denver Formation underlies the east most portion of the project alignment from approximate station 296+00 to 387+00 and generally consists of interbedded claystone, siltstone, and sandstone bedrock.

**Upper Cretaceous Aged Laramie Formation:** The Laramie Formation underlies the central portion of the project alignment from approximate station 285+00 to 296+00 and generally consists of interbedded shale, claystone, siltstone, and sandstone bedrock. Localized occurrences of coal beds also occur.

**Upper Cretaceous Aged Foxhills Sandstone:** The Foxhills Sandstone Formation underlies the central portion of the project alignment from approximate station 284+00 to 285+00 and generally consists of sandstone bedrock containing localized occurrences of interbedded shale.

**Upper Cretaceous Aged Pierre Shale Formation:** The Pierre Shale underlies the majority of the project alignment from approximate station 143+00 to 284+00 and

**Subsurface Exploration Program and Pavement Design Recommendations  
Bellevue Avenue Rehabilitation  
Jefferson County, Colorado**

generally consists of blocky claystone interbedded with localized occurrences of thin bentonite beds (clay deposits of volcanic origin), sandstone, limestone concretions, and iron concretions. The formation is comprised of an upper part, Hygiene sandstone member and lower part. The Pierre Shale is conformably underlain by the Upper Cretaceous Aged Niobrara Formation to the west.

Overburden Soil Conditions: Erosional and mass wasting process over the last two million years have formed a surficial deposit of alluvium/colluvial materials overlying portions of the project alignment. Summaries of the overburden materials overlying the site are as follows:

Upper Holocene Aged Piney Creek Alluvium is mapped along a tributary drainage of the South Platte with crosses the roadway alignment at approximate station 286+50 and generally consists of overburden sands and gravels.

Upper Pleistocene Aged Loess is mapped along the alignment from approximate station 309+00 to 382+25 and generally consists of wind deposited sands and clays.

Pleistocene Aged Slocum Alluvium is mapped in along the project alignment in three areas from approximate stations 144+50 to 155+00, 176+00 to 286+00, and 382+00 to 387+00. The overburden materials generally consist of overburden sand and gravels.

Pleistocene Aged Verdos Alluvium overlying bedrock is mapped along the project alignment in two areas from approximate stations 157+50 to 162+50, and 165+00 to 175+00. The overburden materials generally consist of overburden sands, silts and clays.

Conceptual Geotechnical Rehabilitation Consideration: The west portion of the alignment from approximate station 143+00 to 303+00 falls within the Dipping Bedrock Overlay District as defined by the Colorado Geologic Survey. Inadequate design and construction in this geologic setting has caused extensive damage to roadways, buildings and infrastructure in nearby areas because of the expansive properties of the material. There are varying material types and swell potentials at various elevations of the bedding planes. It is believed that this situation has led to differential vertical movements under pavements and structures located within this steeply dipping bedrock geologic setting.

**Subsurface Exploration Program and Pavement Design Recommendations**  
**Bellevue Avenue Rehabilitation**  
**Jefferson County, Colorado**

Structural deformation in the underlying bedrock as a result of the Larimide Orogeny uplift is generally believed to have intensified shearing and fracturing in the bedrock. Such zones of weakness likely provide paths for water to migrate more easily into the subsurface than is the case with flat-lying formations. This could result in deeper penetration of excess water (depth to wetting), particularly after landscape irrigation has begun and pavements and structures prevent surface evaporation.

Structural deformation to existing lightly to moderately loaded structures underlain by steeply dipping expansive bedrock in the Front Range area has been documented in the past. Generally, damages to structures have occurred in areas underlain by near surface bedrock (less than 5 feet).

The standard care of practice as defined by the Colorado Geologic Survey and Jefferson County for sites located in the Dipping Bedrock Overlay District is for overexcavation of near surface bedrock and replacement in a moisture-density treated state. The purpose of this is to reduce the potential of bedrock heave from propagating to the surface, causing damage to pavement sections. As defined in the Jefferson County Roadway Design and Construction Manual, overexcavation of streets within the Dipping Bedrock Overlay District shall be a minimum of 5 feet regardless of soil type and plasticity index. Similarly, the Colorado Department of Transportation (CDOT) Pavement Design Manual indicates that treatment of expansive soils and bedrock for plasticity indices of subgrade materials as encountered in the test holes shall be a minimum of 5 feet below subgrade elevation. These county and state guidelines will be considered during subsequent field exploration for final pavement recommendations for the alignment. Actual final pavement designed recommendations will be determined based on the site specific subsurface conditions encountered along the project alignment.

**Limitations** This preliminary report has been prepared for Muller Engineering Company, Inc, as it pertains to design of the West Chatfield Avenue Rehabilitation Project as described herein. It may not contain sufficient information for other parties or other purposes. Changes in project plans or schedule should be brought to the attention of the Geotechnical Engineer, in order that the preliminary recommendations may be re-evaluated and, as necessary, modified.

**Subsurface Exploration Program and Pavement Design Recommendations  
Bellevue Avenue Rehabilitation  
Jefferson County, Colorado**

The preliminary conclusions in this report relied upon the site reconnaissance and literary review based on the project alignment as shown on Figure 1. Findings were dependent on the limited amount of indirect evidence obtained at the time of this geotechnical evaluation. Our preliminary recommendations were developed for site conditions as described above. Actual conditions exposed during the proposed field subsurface exploration program may be anticipated to differ, somewhat, from this study.

Expansive clay earth materials are anticipated to be present on the project site. These materials can shrink or swell significantly with changes in moisture content. The behavior of swelling clays is not fully understood. The swell potential of site soils and bedrock can vary significantly, both laterally and vertically. Changes in moisture can occur irregularly, as well, resulting in conditions which cannot always be predicted.

The preliminary recommendations presented in this report are based on the current state-of-the-art for improvements placed on swelling earth materials. Muller Engineering should be aware that there is a risk in construction on these types of soils. Performance of the proposed structures and pavement will depend on implementation of the recommendations in the final geotechnical report and on proper maintenance after construction is completed. Because water is the principal cause of volume change in expansive soils and rock, it is necessary that the changes in moisture content be kept to a minimum. Any indications of distress to project installations should be brought to the attention of the Geotechnical Engineer.

This preliminary report was prepared in accordance with generally accepted soil and foundation engineering practice in the Jefferson County, Colorado, area, at the date of preparation. GROUND makes no other warranties, either express or implied, as to the professional data, opinions or recommendations contained herein.

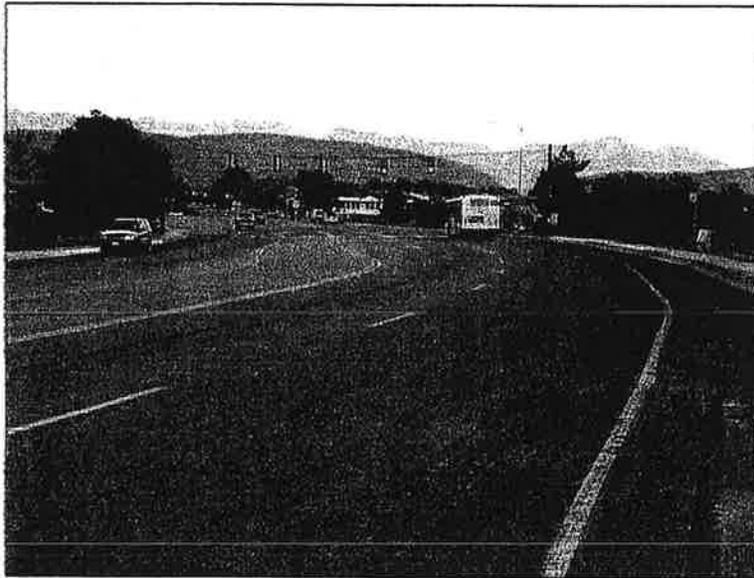
Sincerely,

**GROUND ENGINEERING CONSULTANTS, INC.**

Bryan K. Simpson, P.G

Reviewed by James B. Kowalsky, P.E.

**Preliminary  
Pavement Distress Evaluation  
Proposed West Chatfield Avenue Rehabilitation  
South Kendall Boulevard to Ken Cary Road  
Jefferson County, Colorado**



**Prepared for:**

**Muller Engineering, Inc.  
777 South Wadsworth Boulevard  
Iron Gate 4, Suite 100  
Lakewood, Colorado 80226**

**Attention: Mr. Gray Clark, P.E.**

**Job No. 03-0078**

**February 17, 2004**

**GROUND**

**ENGINEERING CONSULTANTS**

41 Inverness Drive East, Englewood, CO 80112-5412  
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Fax (303) 289-6742

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**Preliminary  
Pavement Distress Evaluation  
West Chatfield Avenue Rehabilitation  
Jefferson County, Colorado**

## **PURPOSE AND SCOPE OF STUDY**

This report presents the results of a preliminary pavement distress evaluation for the proposed West Chatfield Avenue Rehabilitation project from South Kendall Boulevard Avenue to Ken Caryl Road in Jefferson County, Colorado.

A site reconnaissance was conducted to summarize existing pavement distress of the current West Chatfield Avenue alignment for conceptual pavement rehabilitation purposes. The results of the pavement distress evaluation are presented herein.

This preliminary report has been prepared to summarize the data obtained and present our conclusions based on the proposed rehabilitation alignment.

## **PROPOSED CONSTRUCTION**

We understand that the proposed West Chatfield Avenue rehabilitation will include the widening of the existing 2 to 4 lane roadway to 4 lanes along the entire project alignment. It is our understanding that the proposed rehabilitation will have generally minimal cuts and fills on the order of 3 feet or less.

## **SITE CONDITIONS**

The section of West Chatfield Avenue planned for widening from two travel lanes to four travel lanes (two in each direction) is approximately 4.5 miles in length. On the west end of the alignment, West Chatfield Avenue is oriented in a north/south direction where it intersects with West Ken Caryl Avenue. As West Chatfield Avenue extends south of Ken Caryl, it curves to the east, intersecting South Kipling Parkway and S. Wadsworth Boulevard. The study alignment extends to South Kendall Boulevard on the east. Currently this segment of roadway is a mix of roadway types moving through primarily residential areas.

## **PAVEMENT DISTRESS OBSERVATIONS**

A field reconnaissance was conducted along the existing West Chatfield alignment. The existing pavement conditions were variable along the alignment and were categorized by approximate stationing as follows:

**Pavement Distress Evaluation  
West Chatfield Avenue Rehabilitation  
Jefferson County, Colorado**

- Station 387+00 to 268+00. This section of the alignment exhibits significant medium severity to severe transverse and longitudinal cracking with associated medium alligator cracking. Severe edge cracking was also observed in localized areas. See relative photographs 1 through 7 in Appendix A.
- Station 268+00 to 245+00 This section of the alignment appears to have been overlaid recently and exhibits localized low severity transverse cracking. See relative photograph 8 in Appendix A.
- Station 245+00 to 152+00 This section of the alignment exhibits medium to severe transverse and longitudinal cracking with associated medium severity alligator cracking. Severe edge cracking and medium severity potholes were also observed in localized areas. See relative photographs 9 through 13 in Appendix A.
- Approximate Station 152+00 to 145+00 This section of the alignment appears to have been overlaid recently and exhibits localized low severity transverse and longitudinal cracking.

Based on the review and depending on final grade requirements, a majority of the project alignment may be suitable for overlay construction. Removal and replacement of localized failed areas and other treatments may be needed for an effective overlay. Additional investigation to evaluate the section capacity including coring and non destructive testing using the fwd (falling weight deflectometer) is recommended in the next phase of design.

This preliminary report has been prepared for Muller Engineering Company, Inc, as it pertains to design of the West Chatfield Avenue Rehabilitation Project as described herein. It may not contain sufficient information for other parties or other purposes. Changes in project plans or schedule should be brought to the attention of the Geotechnical Engineer, in order that the preliminary recommendations may be re-evaluated and, as necessary, modified.

The preliminary conclusions in this report relied upon the site reconnaissance and literary review based on the project alignment as shown on Figure 1. Findings were dependent on the limited amount of indirect evidence obtained at the time of this

**Pavement Distress Evaluation  
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geotechnical evaluation. Our preliminary recommendations were developed for site conditions as described above. Actual conditions exposed during the proposed field subsurface exploration program may be anticipated to differ, somewhat, from this study.

Expansive clay earth materials are anticipated to be present on the project site. These materials can shrink or swell significantly with changes in moisture content. The behavior of swelling clays is not fully understood. The swell potential of site soils and bedrock can vary significantly, both laterally and vertically. Changes in moisture can occur irregularly, as well, resulting in conditions which cannot always be predicted.

Sincerely,

**GROUND ENGINEERING CONSULTANTS, INC.**



Bryan K. Simpson, P.G



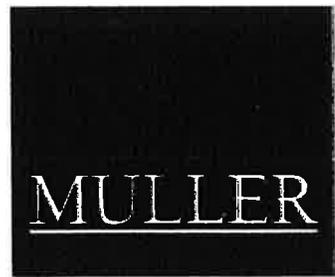
Reviewed by James B. Kowalsky, P.E.

# **Appendix I**

## **Carr Street Memorandum**



# DESIGN MEMORANDUM



- TO: Brad Bauer, Jeffco Highways and Transportation
- PROJECT: Chatfield Corridor Study  
MEC 03-018, JEFKO 5-69-33-3524
- DATE: August 14, 2003 (revised drawings)
- SUBJECT: Carr Realignment
- FROM: Lisa Powell

**Muller Engineering Company, Inc.  
Consulting Engineers**

**Irongate 4, Suite 100  
777 S. Wadsworth Boulevard  
Lakewood, Colorado 80226  
303/988-4969 FAX  
303/988-4939**

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Currently, the south leg of Carr Street and the north leg of Carr Street intersecting at West Chatfield Avenue are offset by 170-feet. Muller has detailed options for realigning Carr St. to bring these two intersections into one four-legged intersection. Any alternative that addresses the problem by realigning Carr will impact homes and properties.

150' right turn only lanes have been accounted for in the width of Carr for both the southern and northern leg alternatives. For the north leg of Carr, curb and gutter has been shown along with 4' sidewalk on the east side of Carr. This matches the existing section of Carr. For the south leg of Carr St., no curb and gutter is shown which also matches the existing section.

Following is a summary of the alternatives and the impacts.

### Carr Realignment Using 275' Radius:

Shown on this drawing are four alternatives. All alternatives on this sheet use 275-foot centerline radii. A 275-foot radius meets Jefferson County Criteria for a normal crown section based on a design speed of 30 mph. (Section 3.4.1. P. 6). Two alternatives detail realigning Carr north of Chatfield and two detail realigning Carr south of Chatfield. One alternative uses a 50-foot tangent before beginning the reverse curves and the other has no tangent coming into the intersection. Below is a table summarizing the anticipated property impacts of each of the four alternatives. ROW information beyond the first tier property owners has been obtained from the plat.

| Alternative                    | House Purchased and Removed | House Purchased and Resold | Property Impact Only |
|--------------------------------|-----------------------------|----------------------------|----------------------|
| Realign North Carr-50' Tangent | 4                           | 0                          | 1                    |
| Realign North Carr-No Tangent  | 3                           | 0                          | 2                    |
| Realign South Carr-50' Tangent | 1                           | 3                          | 1                    |
| Realign South Carr-No Tangent  | 2                           | 0                          | 2                    |

Carr Realignment Using 100-Foot Radius:

Shown on this drawing are another four alternatives. All alternatives on this sheet use 100-foot centerline radii. Jefferson County criteria allows for 100-foot radii on collector roads if maximum grades are reduced. (Section 3.4.1.1 P.6). Two alternatives detail realigning Carr north of Chatfield and two detail realigning Carr south of Chatfield. One alternative uses a 50-foot tangent before beginning the 100-foot curves and the other has no tangent coming into the intersection. Below is a table summarizing the anticipated property impacts of each of the four alternatives.

| Alternative                    | House Purchased and Removed | House Purchased and Resold | Property Impact Only |
|--------------------------------|-----------------------------|----------------------------|----------------------|
| Realign North Carr-50' Tangent | 3                           | 0                          | 1                    |
| Realign North Carr-No Tangent  | 3                           | 0                          | 0                    |
| Realign South Carr-50' Tangent | 1                           | 1                          | 1                    |
| Realign South Carr-No Tangent  | 2                           | 0                          | 2                    |

Carr Realignment Skewed at Chatfield :

Shown on this drawing is an alternative for minimized impact while still realigning Carr. Carr Street is realigned with only affecting the two corner properties. Below is a table summarizing the anticipated property impacts of this alternative:

| Alternative                     | House Purchased and Removed | House Purchased and Resold | Property Impact Only |
|---------------------------------|-----------------------------|----------------------------|----------------------|
| Carr Street Skewed to Chatfield | 2                           | 0                          | 2                    |

Carr Realignment Using Roundabouts :

Shown on this drawing is an alternative using Roundabouts. A roundabout is shown at the north leg of Carr Street and at Dover Street. Vehicles from SB Carr Street to WB Chatfield Avenue could make a right turn on Chatfield Avenue and utilize the roundabout to continue on WB Chatfield Avenue. Below is a table summarizing the anticipated property impacts of this Alternative

| Alternative              | House Purchased and Removed | House Purchased and Resold | Property Impact Only |
|--------------------------|-----------------------------|----------------------------|----------------------|
| Roundabouts on Chatfield | 1                           | 2                          | 0                    |

### Carr Street Using 10' Double Turn Lane :

This drawing shows 110-foot adjacent left turns, 10-feet in width, into the north and south legs of Carr Street. This alternative would not require the purchase of any homes and would only require property purchases, which are required for any alternative widening Chatfield from two to four through lanes.

### Discussion

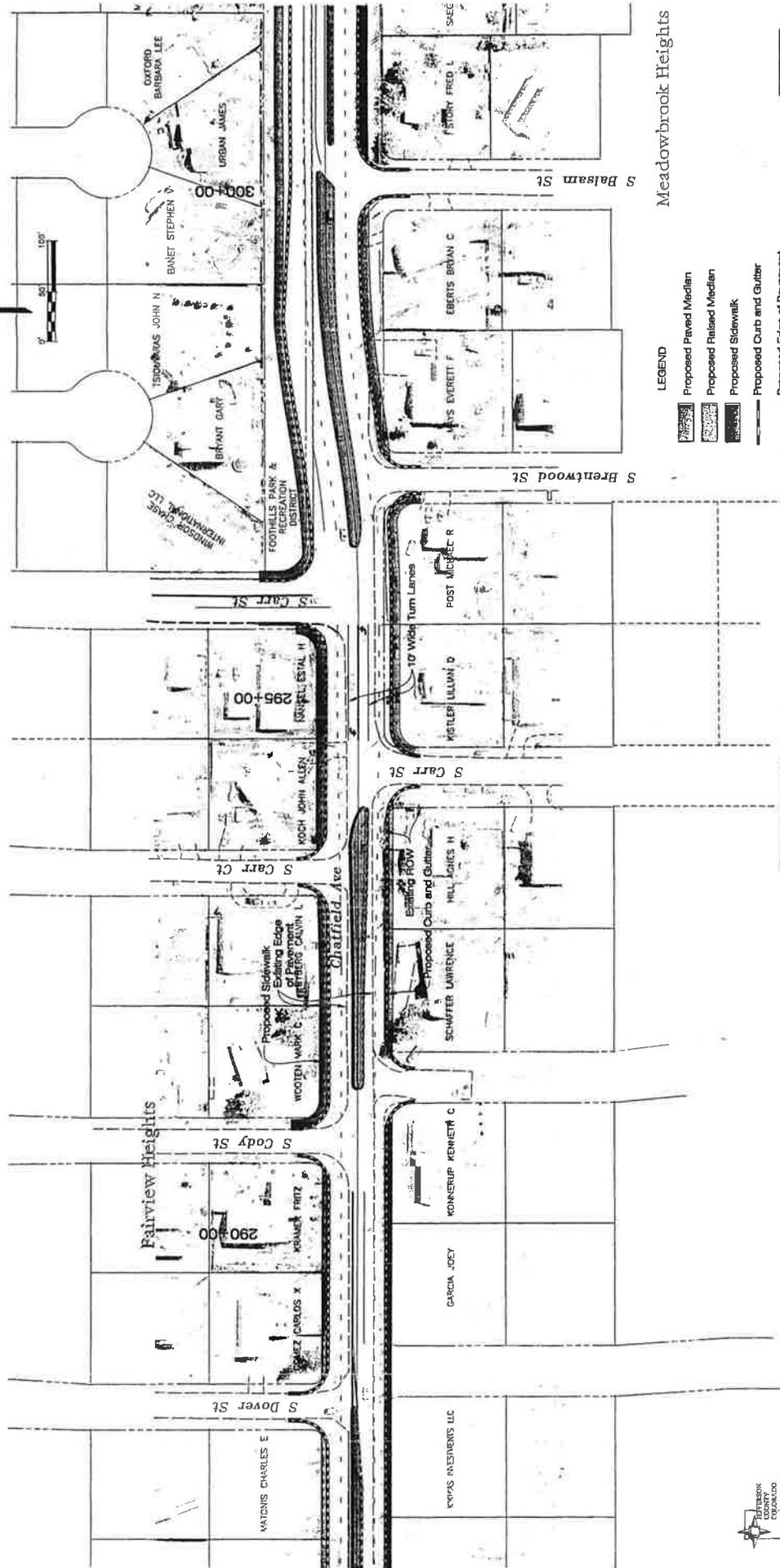
To realign the south and north legs of Carr Street, Jefferson County would need to purchase a minimum of two homes and additional right-of-way. These alternatives have the advantage of allowing for left turns both into and out of Carr Street without the queues of the left turns backing into the adjacent intersection.

The roundabout alternative would require the demolition of one home on the northwest corner of Carr Street and Chatfield Avenue. This alternative has the advantage of allowing easy u-turns for right in-right out traffic on Cody St., Carr Court and the south leg of Carr Street. Closing these streets off to left turns minimizes conflicts and allows more area for landscaping in the median. Because left turn movements are not required for the roundabout option, a split profile could be used in the roadway segment between the two roundabouts. This would minimize retaining walls along the outer edge of the sidewalks, which would be required in order to widen Chatfield from two to four through lanes.

The alternative using 10-foot double turn lanes has the advantage of not requiring the demolition of any homes. The disadvantage of this alternative is that queues from the left turning movements could back into the intersections. The left turn peak hour volume turning into the north leg of Carr is 95 vehicles and into the south leg is 150 vehicles. The 110-foot length storage as shown would not meet the storage requirement for Jefferson County (200-feet required storage) or the State Highway Access Code (150-feet required storage).

# OPTION A

## Carr Street Using 10' double Turn Lanes



- MEADOWBROOK HEIGHTS
- LEGEND
- Proposed Paved Median
  - Proposed Raised Median
  - Proposed Sidewalk
  - Proposed Curb and Gutter
  - Proposed Edge of Pavement
  - Existing Edge of Roadway

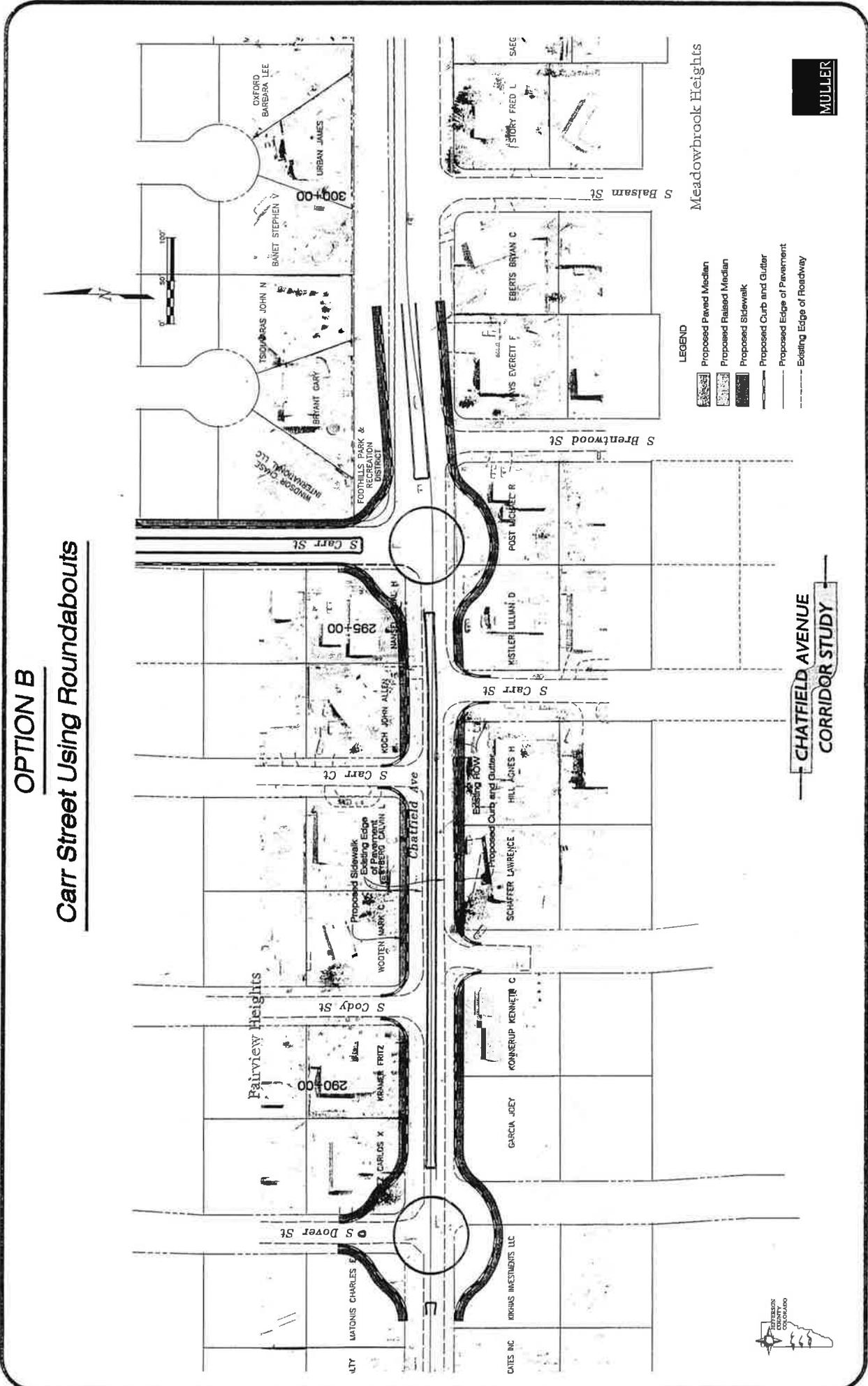
CHATFIELD AVENUE  
CORRIDOR STUDY

MULLER



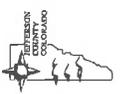
# OPTION B

## Carr Street Using Roundabouts

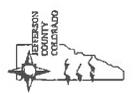
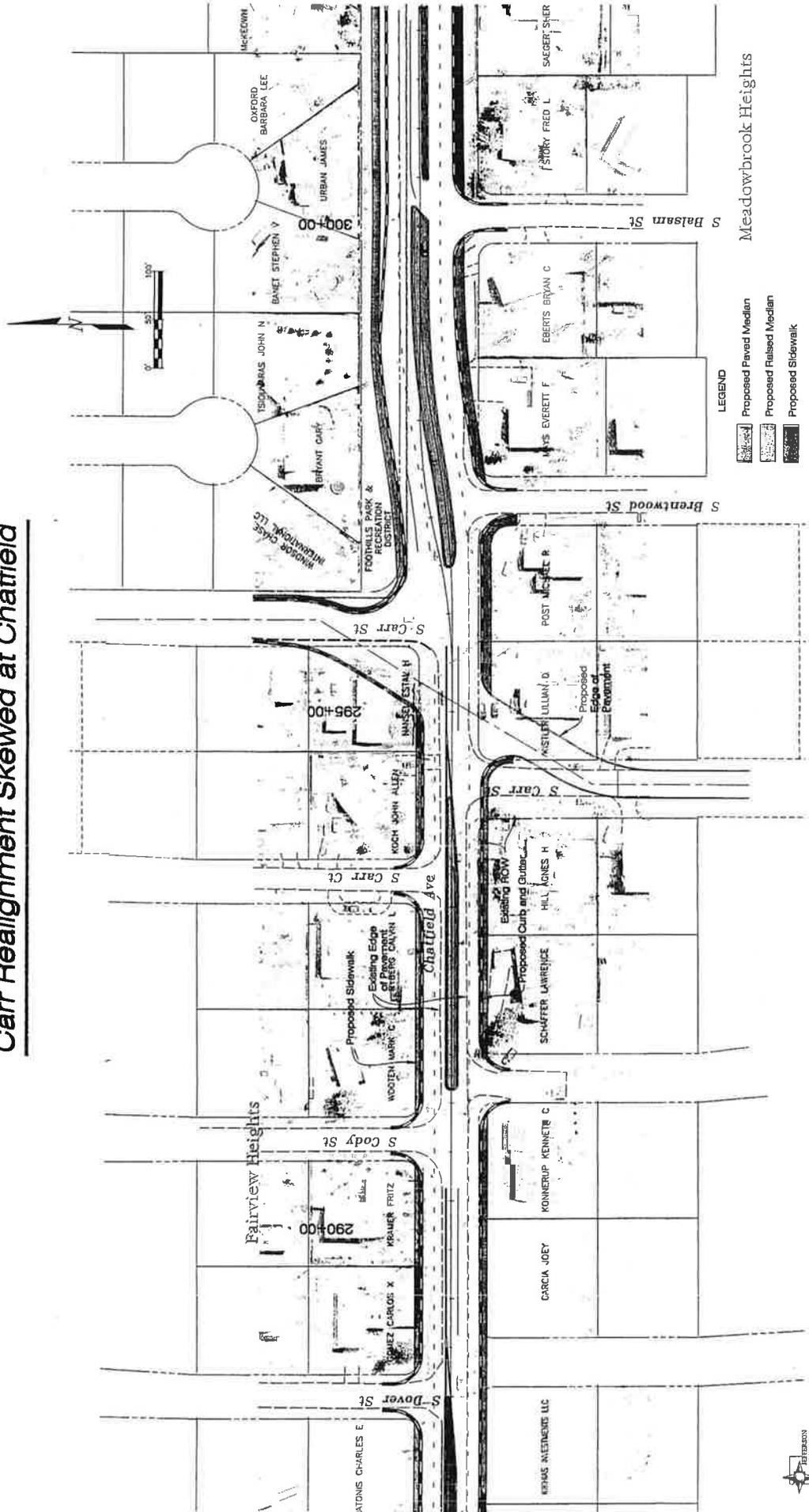


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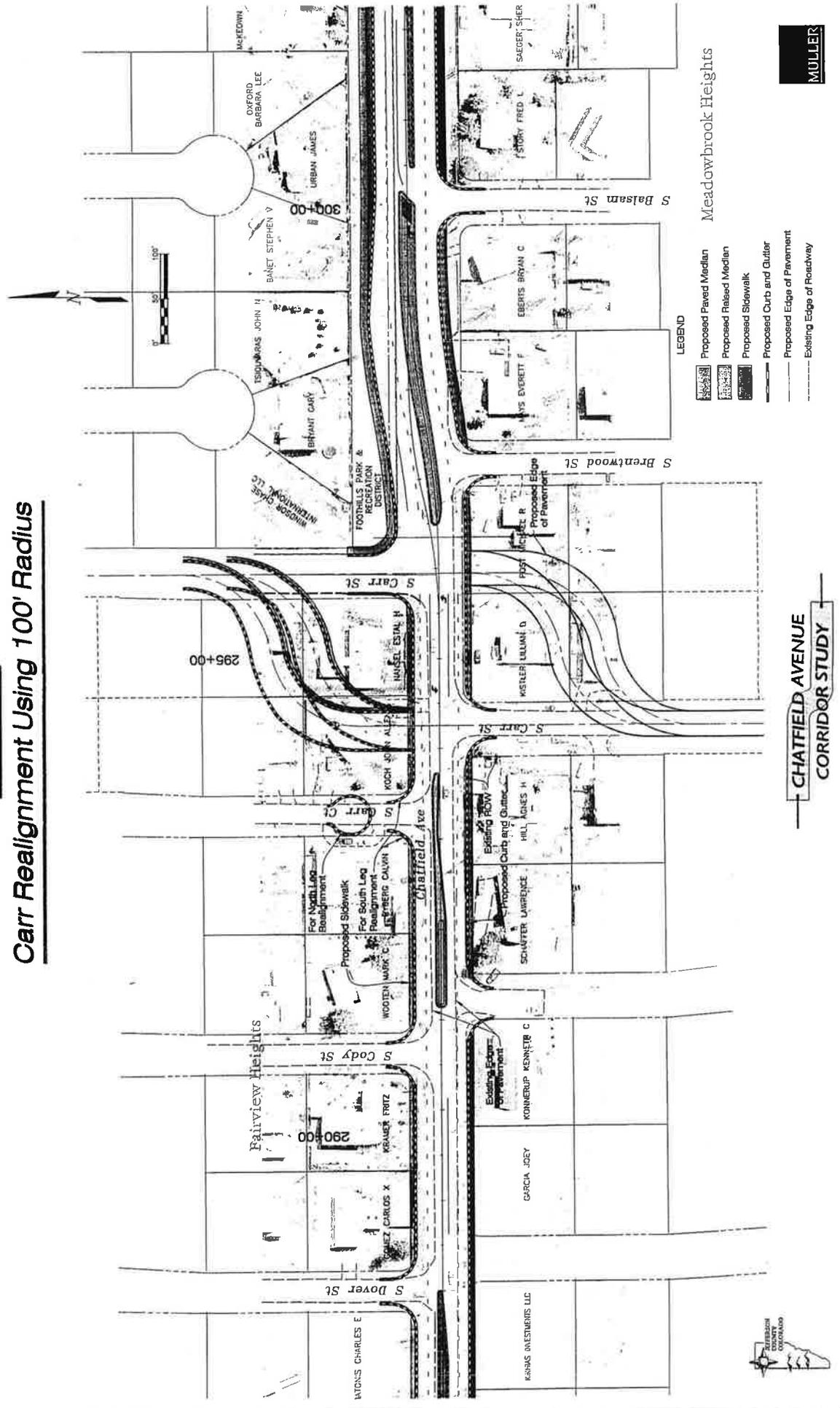
CHATFIELD AVENUE  
CORRIDOR STUDY



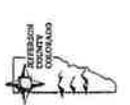
# OPTION C Carr Realignment Skewed at Chatfield



# OPTION D Carr Realignment Using 100' Radius

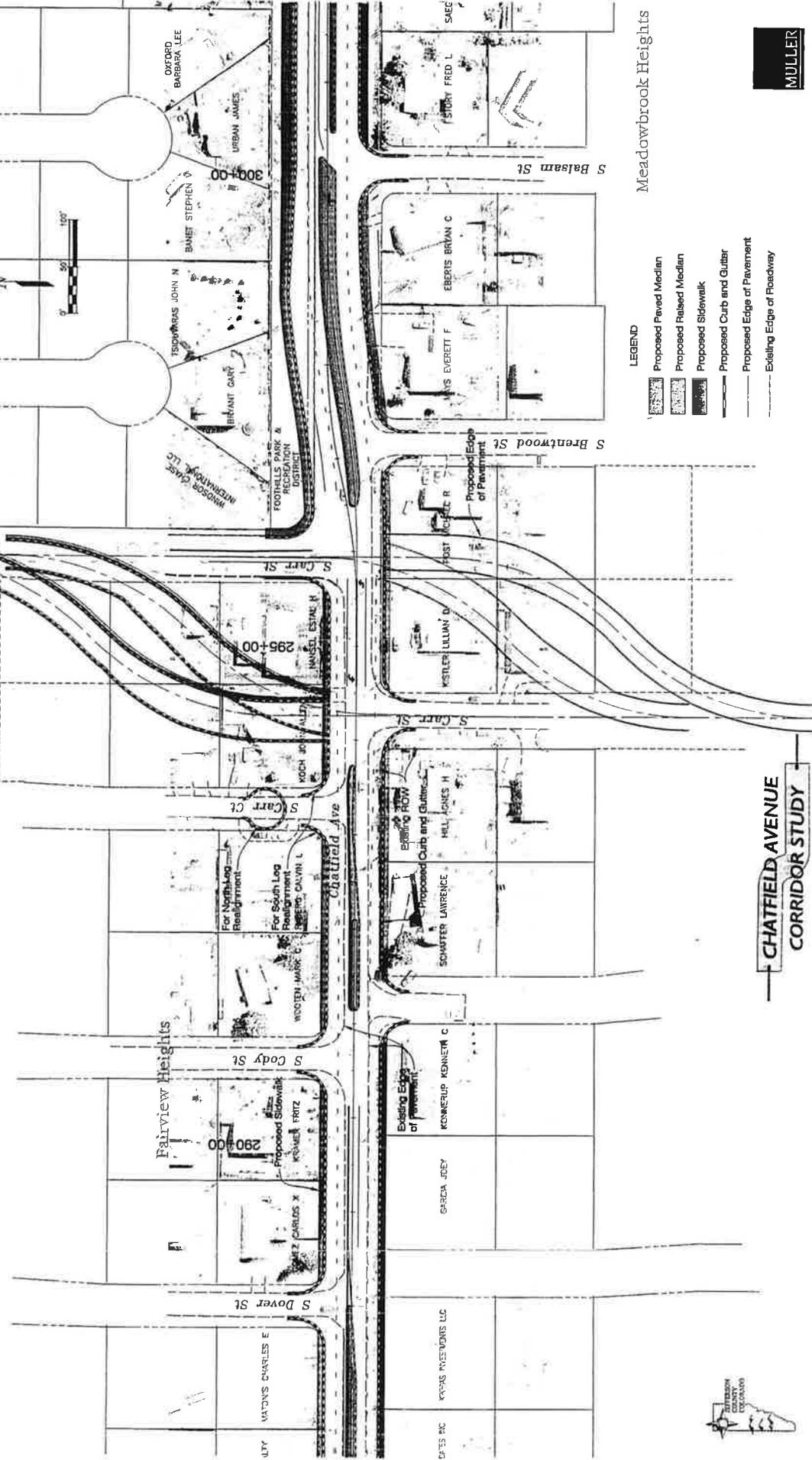


CHATFIELD AVENUE  
CORRIDOR STUDY



# OPTION E

## Carr Realignment Using 275' Radius



- LEGEND**
- Proposed Paved Median
  - Proposed Raised Median
  - Proposed Sidewalk
  - Proposed Curb and Gutter
  - Proposed Edge of Pavement
  - Existing Edge of Roadway

Meadowbrook Heights

CHATFIELD AVENUE  
CORRIDOR STUDY

