



SR 360 WIDENING
CSSTP-0006-00(049) - P.I. No. 0006049
Cobb and Paulding Counties, Georgia

Value Engineering Study Report
Preliminary Design Stage

February 2008



Value Engineering Consultant



Lewis & Zimmerman Associates, Inc.



Lewis & Zimmerman Associates, Inc.

Taking the Chance out of Change

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February 27, 2008

Ms. Lisa L. Myers
Design Review Engineering Manager
Georgia Department of Transportation
No. 2 Capitol Square, Room 266
Atlanta, Georgia 30334

re: Project No. CSSTP-0006-00(049), P.I. #0006049
Widening of SR 120/Charles Hardy Parkway to SR 176/Lost Mountain Road
Value Engineering Study Report

Dear Ms. Myers:

Lewis & Zimmerman Associates, Inc. is pleased to submit four hard copies and one CD-ROM of the referenced value engineering study report. This project is in the GDOT long-range capital plan and its cost is expected to escalate significantly as time passes. Thus, the objective of the VE effort was to identify opportunities to reduce its cost and enhance the value and constructability of the project.

The project's cost is being driven by two major elements: right-of-way and pavement. Therefore, the VE team developed numerous alternatives for reducing these two items. If the typical section can be reduced to a minimum by reducing lane widths from 12 ft. to 11 ft., reducing the size of the gutter pans, and eliminating the 4-ft. buffer between the left-turn lanes placed in a pocket in the median and the through lanes, about \$15.4 million can be saved in these areas.

Other significant cost savings potentially exist with the bridges, sidewalks and earthwork.

We thank you for your assistance during the course of the VE team's work. Please do not hesitate to call upon us if you or any of the reviewers have any questions regarding the information presented in this report.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.

Howard B. Greenfield, PE, CVS
Vice President

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PROJECT DESCRIPTION

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EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. for the Georgia Department of Transportation (GDOT). The subject of the study was the widening of SR 360 from SR 120/Charles Hardy Parkway to SR 176/Lost Mountain Road (Federal Aid Project CSSTP-0006-00(049), P.I. # 0006049) being designed for GDOT by Mulkey Engineers & Consultants. The project was at the Preliminary Engineering stage of completion and is part of GDOT's long-term capital plan.

The VE workshop was conducted February 12 – 15, 2008, in GDOT's Atlanta Headquarters Office. Comprising the VE team were a highway engineer, a bridge engineer, a construction specialist and a Certified Value Specialist facilitator. The team used the following six-phase VE Job Plan to guide its deliberations:

- Information Gathering Phase
- Function Analysis Phase
- Creative Idea Generation Phase
- Evaluation/Judgment of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

PROJECT DESCRIPTION

Traffic in the SR 360 corridor from SR 120 in Paulding County to SR 176 in Cobb County is expanding due to extensive residential and commercial development. The corridor connects two cities, Marietta and Dallas. This project widens SR 360 from a two-lane road to a four-lane divided highway with a raised median and additional right and left turn lanes to alleviate the congestion and make the city-to-city corridor more accessible.

The project is 6.2 miles long with 50% in Paulding County and 50% in Cobb County. The project will start about 1,287 feet west of SR 120 and end about 751 feet east of SR 176. There will be eight signalized intersections, five replacements and three new. In addition, there will be several median breaks for some of the roads teeing into SR 360 and for U-turns between intersections.

The typical section will consist of four 12-foot lanes (two in each direction), 24-foot-wide raised median with 30-in.-wide curb and gutter sections at the outside edges and median, and sidewalks in urban shoulders. The design speed is 45 mph. On the east side of SR 176, the lanes will be 11 ft. wide, with a 7-ft.-wide sidewalk behind the curb and gutter with a retaining wall to minimize the impacts to the church and avoid impacts to an historic resource in the northeast quadrant of the intersection. At this intersection, two left-turn lanes for the southbound to eastbound movement and westbound to southbound movements will be provided.

The proposed right-of-way will be approximately 150 feet wide. Some areas may require varying right-of-way widths to avoid or minimize impacts. Construction of the widened roadway will require some embankment areas and some cut areas, which will expand the need for right-of-way, and in some cases, require the displacement of existing structures. A total of 27 residences and eight businesses will be displaced. A retaining wall will be constructed in front of a dentist's office to avoid taking this property.

Eleven streams will be crossed, necessitating two bridges and nine culverts. The first bridge will replace an existing triple box culvert (10 ft. x 9 ft. high) over Powder Springs Creek. It will consist of a three-span structure with precast, prestressed concrete AASHTO girders and a cast-in-place concrete deck with cast-in-place concrete traffic barriers at the perimeter. The second will span another stream, although its construction has yet to be decided.

As part of the project, existing utilities, including a water trunk line feeding Paulding County, electric, gas and telephone lines will be relocated. Both a closed, piped drainage system and ditch system to the outside of the urban shoulder will be provided for storm water control. Grass and mulch will also be provided. Where fill slopes are less than 4 horizontal to 1 vertical, W-beam guardrail will be placed behind the sidewalk, which will be moved two feet from the back of the concrete curb.

This project is a long-term project in the GDOT capital plan and as such has not been funded for construction. The total project cost is \$187.5 million in 2018 dollars.

OBJECTIVES

Although the project is in the long-term capital program, there is a desire to complete the engineering in the most cost-effective manner. Thus, GDOT engaged this VE study to identify opportunities to improve the value of the project by saving costs, enhancing safety and improving constructability.

RESULTS OF THE STUDY

All of the alternatives developed by the VE team are summarized on the following Summary of Value Engineering Alternatives table and detailed in the Study Results section of the report. Two elements are driving the cost of the project: the pavement and the right-of-way. Thus, the VE team focused most of its efforts on identifying ways to reduce both, sometimes simultaneously.

The primary way to reduce the amount of pavement is to reduce lane widths from 12 ft. to 11 ft. Alternative Numbers (Alt. Nos.) P-1 (reducing the width of all lanes), P-2 (reducing the width of the through lanes only), P-3 (reducing the width of the inside through lanes only), and P-4 (reducing the width of the turn lanes only) provide different approaches for accomplishing this. Since this roadway will be built as an urban section with curbs and gutters at the edges of the pavement, which provides additional maneuvering room, and the fact that truck traffic is very low, all of these remain viable options with a maximum of about \$5.6 million to be saved. Included in this savings is some right-of-way costs because, as the lanes are narrowed and the outside edge of the typical section is moved toward the center, less land is required.

Other options for reducing the pavement involve reducing the length of turn lanes and eliminating one or more U-turns with their associated deceleration lanes.

Reducing the right-of-way can be accomplished in several ways. First, the gutter pan can be reduced from 24 in. to either 12 in. or 18 in., as shown in Alt. Nos. ROW-1 and ROW-2, respectively. This again results in compressing the typical section toward the center to reduce the amount of land required. Second, GDOT may decrease the median width from 24 ft. to either 22 ft. or 20 ft., as illustrated in Alt. Nos. ROW-4 and ROW-5, respectively. The third option is reduce the urban shoulder from 16 ft. to 12 ft. wide, as shown in Alt. No. ROW-8.

If all of the lanes are reduced to 11 ft. wide, the gutter pans reduced to 12 in. wide, and the median reduced to 19 ft. wide by eliminating the 4-ft. buffer between the left-turn lane in the median and the inside through lane, a combination of selected alternatives, then the total typical section is reduced by 11 ft. This produces a combined \$15.4 million (8.2%) cost savings for the project, which is captured in Alt. No. ROW-10.

Another expensive element of the project is the sidewalks. Given the fact that very few houses or commercial facilities front on SR 360, the value of the sidewalks is questioned. By eliminating most of the sidewalks, significant costs can be saved, as noted in Alt. S-3. Another option is to use asphalt in lieu of concrete for the sidewalk construction to save about \$2.7 million, as shown in Alt. No. S-2.

As currently shown, a 4 horizontal to 1 vertical (4:1) slope is used frequently for both cut and fill areas. Alt. Nos. E-1 and E-3 suggest using 2:1 slopes with guardrails at the edge of the embankments to reduce the earthwork and impact to adjacent properties. These might be more cost avoidance alternatives because drainage ditches have yet to be added to the cross sections, which will move the land impacts out even further. This, in turn, could lead to additional property takes.

In reviewing the alternatives, note that some are mutually exclusive or interrelated. Therefore, the total potential cost savings achievable will be dependent upon the combination of ideas selected for implementation.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: **SR 360 WIDENING - Project No.: CSSTP-0006-00(049), P.I. No.: 0006049**
Cobb and Paulding Counties, Georgia

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
PAVEMENT (P)						
P-1	Use 11-ft.-wide lanes for all lanes in lieu of 12-ft.-wide lanes	\$ 5,586,728	\$ -	\$ 5,586,728		\$ 5,586,728
P-2	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes for through lanes only	\$ 4,269,516	\$ -	\$ 4,269,516		\$ 4,269,516
P-3	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes for the SR 360 inside through lanes only	\$ 2,134,655	\$ -	\$ 2,134,655		\$ 2,134,655
P-4	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes for all turn lanes only	\$ 1,316,765	\$ -	\$ 1,316,765		\$ 1,316,765
P-6	Reduce taper and storage length for left-turn lanes	\$ 1,570,637	\$ 788,738	\$ 781,899		\$ 781,899
P-7	Take out U-turn at Station 191+00	\$ 205,656	\$ 7,239	\$ 198,417		\$ 198,417
P-8	Take out U-turn at Station 53+00	\$ 310,500	\$ 7,908	\$ 302,592		\$ 302,592
P-9	Take out U-turn at Station 307+50	\$ 432,884	\$ 10,324	\$ 422,560		\$ 422,560
RIGHT-OF-WAY (ROW)						
ROW-1	Use 18-in.-wide curb and gutter sections in lieu of 30-in.-wide sections	\$ 2,798,813	\$ -	\$ 2,798,813		\$ 2,798,813
ROW-2	Use 24-in.-wide curb and gutter sections in lieu of 30-in.-wide sections	\$ 1,399,574	\$ -	\$ 1,399,574		\$ 1,399,574
ROW-3	Use retaining walls to reduce right-of-way impacts	\$ 792,149	\$ 701,970	\$ 90,179		\$ 90,179
ROW-4	Reduce the width of the median from 24 ft. to 22 ft. wide	\$ 1,655,346	\$ -	\$ 1,655,346		\$ 1,655,346
ROW-5	Reduce the width of the median from 24 ft. to 20 ft. wide	\$ 3,310,695	\$ -	\$ 3,310,695		\$ 3,310,695
ROW-7	Delete the 4-ft.-wide buffer strips at the left-turn pockets in the median	\$ 1,698,871	\$ -	\$ 1,698,871		\$ 1,698,871
ROW-8	Reduce the width of the urban shoulder from 16 ft. to 12 ft.	\$ 5,157,262	\$ -	\$ 5,157,262		\$ 5,157,262
ROW-10	Reduce the back of outside curb to back of outside curb distance to the minimum (combines P-1, ROW-1 & ROW-7)	\$ 15,836,265	\$ 401,153	\$ 15,435,112		\$ 15,435,112



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: SR 360 WIDENING - Project No.: CSSTP-0006-00(049), P.I. No.: 0006049
Cobb and Paulding Counties, Georgia

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
GENERAL (G)						
G-1	Improve intersections at Poplar Spring Road with Old Atlanta Road and Macland Circle and remove intersections of Old Atlanta Road and Macland Circle with SR 360	\$ 1,061,791	\$ 687,001	\$ 374,790		\$ 374,790
G-2	Cul-de-sac Bullard Road on south side of SR 360 and delete tee intersection	\$ 611,942	\$ 86,900	\$ 525,042		\$ 525,042
BRIDGES (B)						
B-1	Use a precast concrete arch culvert in lieu of a bridge at Powder Springs Creek	\$ 5,035,048	\$ 3,406,877	\$ 1,628,171		\$ 1,628,171
B-2	Use a single-span bridge in lieu of a three-span bridge at each bridge location	\$ 2,840,852	\$ 2,655,511	\$ 185,341		\$ 185,341
SIDEWALKS (S)						
S-1	Place sidewalks on one side of road only	\$ 2,148,695	-	\$ 2,148,695		\$ 2,148,695
S-2	Use asphalt in lieu of concrete for sidewalks	\$ 4,303,884	\$ 2,173,078	\$ 2,130,806		\$ 2,130,806
S-3	Install a sidewalk on the north side of SR 360 from Bullard Road to SR 176 and along the east side of Bullard Road in lieu of throughout the project	\$ 4,394,250	\$ 538,059	\$ 3,856,191		\$ 3,856,191
EMBANKMENT (E)						
E-1	Use 2:1 cut slopes in lieu of 4:1 cut slopes in selected locations	\$ 4,319,746	\$ 2,630,576	\$ 1,689,170		\$ 1,689,170
E-3	Use 2:1 fill slopes in lieu of 4:1 fill slopes in selected locations, move the sidewalk closer to the edge of road, and add W-beam guard rail along the edge of the embankment	\$ 3,151,189	\$ 581,850	\$ 2,569,339		\$ 2,569,339

STUDY RESULTS

INTRODUCTION

The results are the major feature of this value engineering study since they portray the benefits that can be realized by GDOT, the users, and Mulkey Engineers and Consultants, the designer. The results will directly affect the project design and require coordination between GDOT and the design team to determine the disposition of each alternative.

During the VE workshop, many ideas for potential value enhancement were conceived and evaluated by the team for technical merit, applicability to the project, implementability considering the project's status, and the ability to meet GDOT's project value objectives. Research performed on those ideas considered to have the potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. For each alternative developed, the following information is provided:

- A summary of the original design,
- A description of the proposed change to the project,
- Sketches and design calculations, if appropriate,
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design (where appropriate),
- An evaluation of the advantages and disadvantages of the alternative, and
- A brief narrative to compare the original design and the proposed change and provide a rationale for implementing the change into the project.

The capital cost comparisons used unit quantities contained in the project cost estimate prepared by the designers, whenever possible. If prices were not available, cost databases from GDOT and team members were consulted.

Each alternative developed is identified with an alternative number (Alt. No.) that can be tracked through the value engineering process, thus facilitating referencing among the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of VE Alternatives table. The Alt. No. contains one of the following letter prefixes indicating the project element being addressed:

- Pavement = P
- Right-of-Way = ROW
- General = G
- Bridge = B
- Sidewalk = S
- Earthwork = E

Summaries of the alternatives are provided on the Summary of VE Alternatives table which divide the Study Results section.

KEY ISSUES

This project has been placed in GDOT's long-range capital plan. Its cost is significant especially for pavement and right-of-way, which will only escalate over time.

STUDY OBJECTIVES

GDOT has a variety of projects competing for limited funds and thus desires to obtain the maximum value for each dollar spent. The objective of this VE study was to identify specific changes to the project that will reduce cost, yet provide the needed additional capacity for this rapidly growing corridor and connector of two cities.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 25 alternatives with cost saving opportunities. The following highlights the alternatives with significant cost impacts that are detailed in the remainder of this section.

Two elements are driving the cost of the project: the pavement and the right-of-way. Thus, the VE team focused most of its efforts on identifying ways to reduce both, sometimes simultaneously.

The primary way to reduce the amount of pavement is to reduce lane widths from 12 ft. to 11 ft. Alternative numbers (Alt. Nos.) P-1 (reducing the width of all lanes), P-2 (reducing the width of the through lanes only), P-3 (reducing the width of the inside through lanes only), and P-4 (reducing the width of the turn lanes only) provide different approaches for accomplishing this. Since this roadway will be built as an urban section with curbs and gutters at the edges of the pavement, which provides additional maneuvering room, and the fact that truck traffic is very low, all of these remain viable options, with a maximum of about \$5.6 million to be saved. Included in this savings are some right-of-way costs because, as the lanes are narrowed and the outside edge of the typical section is moved toward the center, less land is required.

Other options for reducing the pavement involve reducing the length of turn lanes and eliminating one or more U-turns with their associated deceleration lanes.

Reducing the right-of-way can be accomplished in several ways. First, the gutter pan can be reduced from 24 in. to either 12 in. or 18 in., as shown in Alt. Nos. ROW-1 and ROW-2, respectively. This again results in compressing the typical section toward the center to reduce the amount of land required. Second, there is decreasing the median width from 24 ft. to either 22 ft. or 20 ft., as illustrated in Alt. Nos. ROW-4 and ROW-5, respectively. The third option is reduce the urban shoulder from 16 ft. to 12 ft. wide, as shown in Alt. No. ROW-8.

If all of the lanes are reduced to 11 ft. wide, the gutter pans reduced to 12 in. wide, and the median reduced to 19 ft. wide by eliminating the 4-ft. buffer between the left-turn lane in the median and the

inside through lane, a combination of selected alternatives, then the total typical section is reduced by 11 ft. This produces a combined \$15.4 million (8.2%) cost savings for the project, which is captured in Alt. No. ROW-10.

Another expensive element of the project is the sidewalks. Given the fact that very few houses or commercial facilities front on SR 360, the value of the sidewalks is questioned. By eliminating most of the sidewalks, significant costs can be saved, as noted in Alt. S-3. Another option is to use asphalt in lieu of concrete for the sidewalk construction to save about \$2.7 million, as shown in Alt. No. S-2.

As currently shown, a 4 horizontal to 1 vertical (4:1) slope is frequently used for both cut and fill areas. Alt. Nos. E-1 and E-3 suggest using 2:1 slopes with guardrails at the edge of the embankments to reduce the earthwork and impact to adjacent properties. These might be more cost avoidance alternatives because drainage ditches have yet to be added to the cross sections, which will move the land impacts out even further. This, in turn, could lead to additional property takes.

In reviewing the alternatives, note that some are mutually exclusive or interrelated. Therefore, the total potential cost savings achievable will be dependent upon the combination of ideas selected for implementation.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, each part of an alternative or design suggestion should be considered on its own merit. There may be a tendency to disregard an alternative because of a concern about one part of it. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by GDOT or the design team are encouraged.

All alternatives and design suggestions were developed independently of each other to provide a broad range of options to consider for implementation. Therefore, some are mutually exclusive, so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated, thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

All alternatives should be carefully reviewed in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: **SR 360 WIDENING - Project No.: CSSTP-0006-00(049), P.I. No.: 0006049**

Cobb and Paulding Counties, Georgia

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
PAVEMENT (P)						
P-1	Use 11-ft.-wide lanes for all lanes in lieu of 12-ft.-wide lanes	\$ 5,586,728	\$ -	\$ 5,586,728		\$ 5,586,728
P-2	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes for through lanes only	\$ 4,269,516	\$ -	\$ 4,269,516		\$ 4,269,516
P-3	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes for the SR 360 inside through lanes only	\$ 2,134,655	\$ -	\$ 2,134,655		\$ 2,134,655
P-4	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes for all turn lanes only	\$ 1,316,765	\$ -	\$ 1,316,765		\$ 1,316,765
P-6	Reduce taper and storage length for left-turn lanes	\$ 1,570,637	\$ 788,738	\$ 781,899		\$ 781,899
P-7	Take out U-turn at Station 191+00	\$ 205,656	\$ 7,239	\$ 198,417		\$ 198,417
P-8	Take out U-turn at Station 53+00	\$ 310,500	\$ 7,908	\$ 302,592		\$ 302,592
P-9	Take out U-turn at Station 307+50	\$ 432,884	\$ 10,324	\$ 422,560		\$ 422,560
RIGHT-OF-WAY (ROW)						
ROW-1	Use 18-in.-wide curb and gutter sections in lieu of 30-in.-wide sections	\$ 2,798,813	\$ -	\$ 2,798,813		\$ 2,798,813
ROW-2	Use 24-in.-wide curb and gutter sections in lieu of 30-in.-wide sections	\$ 1,399,574	\$ -	\$ 1,399,574		\$ 1,399,574
ROW-3	Use retaining walls to reduce right-of-way impacts	\$ 792,149	\$ 701,970	\$ 90,179		\$ 90,179
ROW-4	Reduce the width of the median from 24 ft. to 22 ft. wide	\$ 1,655,346	\$ -	\$ 1,655,346		\$ 1,655,346
ROW-5	Reduce the width of the median from 24 ft. to 20 ft. wide	\$ 3,310,695	\$ -	\$ 3,310,695		\$ 3,310,695
ROW-7	Delete the 4-ft.-wide buffer strips at the left-turn pockets in the median	\$ 1,698,871	\$ -	\$ 1,698,871		\$ 1,698,871
ROW-8	Reduce the width of the urban shoulder from 16 ft. to 12 ft.	\$ 5,157,262	\$ -	\$ 5,157,262		\$ 5,157,262
ROW-10	Reduce the back of outside curb to back of outside curb distance to the minimum (combines P-1, ROW-1 & ROW-7)	\$ 15,836,265	\$ 401,153	\$ 15,435,112		\$ 15,435,112

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **P-1**

DESCRIPTION: **USE 11-FT. LANE WIDTHS FOR ALL LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design uses the GDOT standard of 12-ft.-wide lanes at all locations.

ALTERNATIVE: (Sketch attached)

Use 11-ft.-wide lanes at all locations along SR 360/Maclang Road. Side roads are to remain as designed to match existing lane tie-in widths.

ADVANTAGES:

- Reduces cost
- Reduces right-of-way
- Reduces materials
- Reduces displacements (impacts unknown)

DISADVANTAGES:

- Perceived “tight” or narrow turn lanes

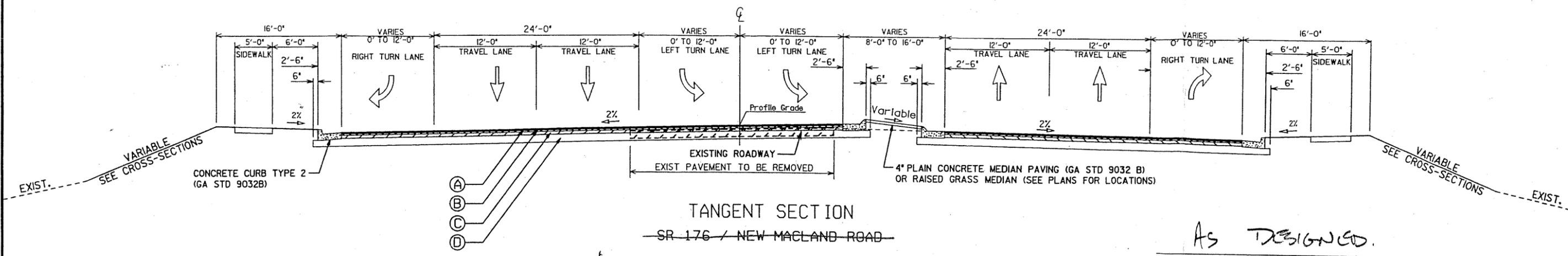
DISCUSSION:

The truck traffic percentage is low on this corridor. This in combination with a 45 mph design speed indicates that there is no need for 12-ft.-wide lanes. Eleven-ft.-wide lanes meet all Federal Highway Administration (FHWA) requirements for this route. With gutters at the edge of each edge lane, there is an extra margin of safety.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 5,586,728	—	\$ 5,586,728
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 5,586,728	—	\$ 5,586,728

ACT. No. P-1
SHT. 2 of 4

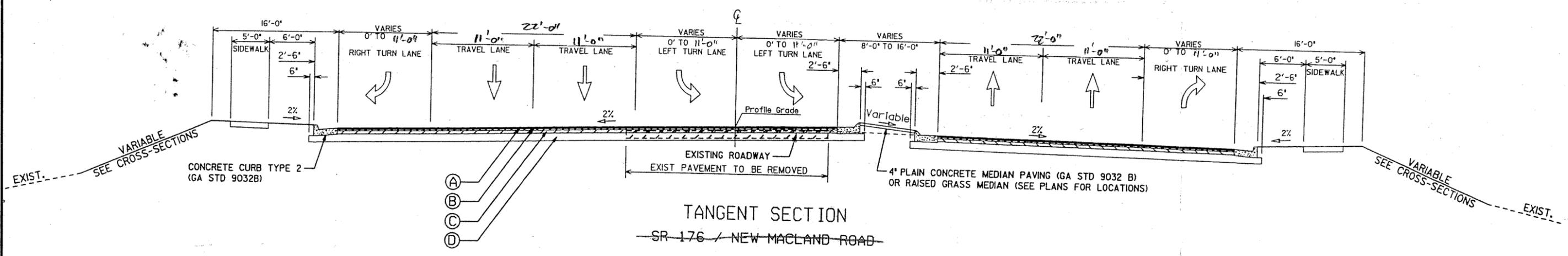
TS-??



TANGENT SECTION
SR 176 / NEW MACLAND ROAD

AS DESIGNED.

TS-??



TANGENT SECTION
SR 176 / NEW MACLAND ROAD

ALTERNATIVE

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS

DRAWING No.
5-06

CALCULATIONS



PROJECT: **WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: P-1

SHEET NO.: 3 of 4

→ ASSUME 75% OF THE PROJECT LENGTH HAS 1 LT TURN LANE
& 1 RT TURN LANE.

→ ASSUME THE ABOVE ADEQUATELY COVERS THE LIMITED
LOCATIONS WHERE THERE ARE DUAL LT TURN LANES.

$$\text{PROJECT LENGTH} = \text{STA } 30+89.04 - \text{STA } 23+37.67 = 30,751.37'$$

USE 30,750'

$$\text{AREA} = \frac{1}{9} (1') \left(\overset{\text{Theo.}}{4} + \overset{\text{RT}}{0.75} + \overset{\text{LT}}{0.75} \right) (30,750) = \underline{\underline{18,792 \text{ SY}}}$$

$$\text{ROW} = \left(\frac{4.75}{5.5} \right) (18,792)(9) = 146,065 \text{ SF}$$

COUNTY LINE @ STA 174+55 ±

$$\frac{\text{STA } 174+55 - 23+37.67}{30,751.37} = 49.1 \%$$

49% PAULDING

51% COBB

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **P-2**

DESCRIPTION: **USE 11-FT. LANE WIDTHS FOR THROUGH LANES ONLY**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design uses the GDOT standard of 12-ft.-wide lanes at all locations.

ALTERNATIVE: (Sketch attached)

Use 11-ft.-wide through lanes along SR 360/Macland Road. The side roads are to remain as designed to match existing lane tie-in widths.

ADVANTAGES:

- Reduces cost
- Reduces right-of-way
- Reduces materials
- Reduces displacements (impacts unknown)
- Turn lanes remain wide

DISADVANTAGES:

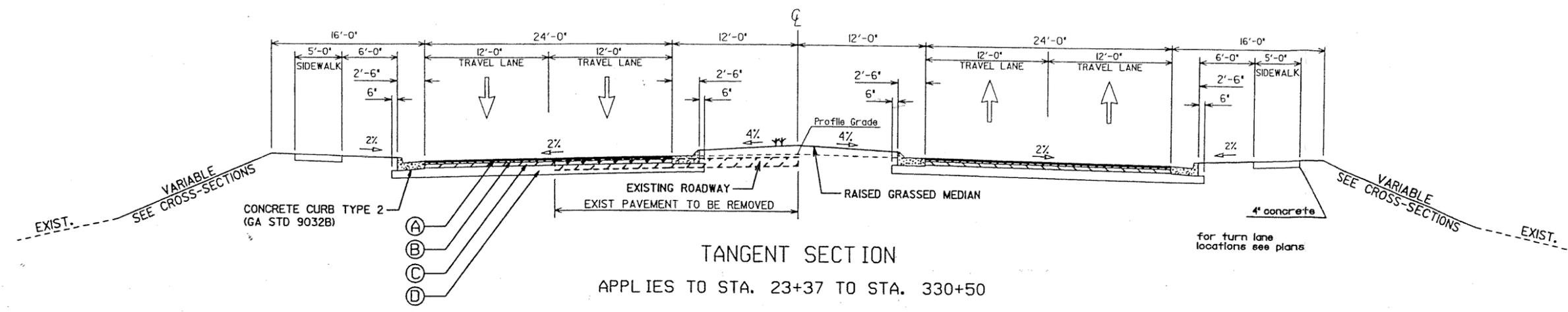
- None apparent

DISCUSSION:

The truck traffic percentage is low on this corridor. This in combination with a 45 mph design speed indicates that there is no need for 12-ft.-wide lanes. Eleven-ft.-wide lanes meet all FHWA requirements for this route.

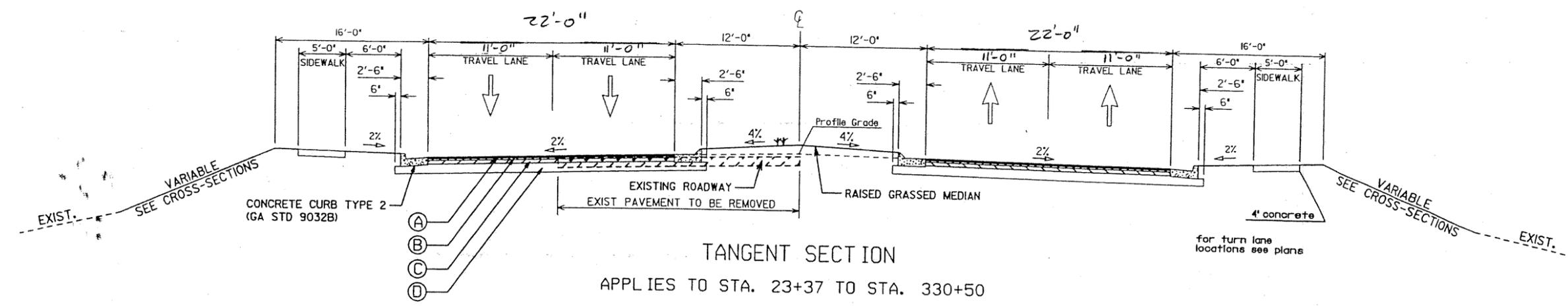
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,269,516	—	\$ 4,269,516
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 4,269,516	—	\$ 4,269,516

TS-01



TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50

AS DESIGNED



TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50

ALTERNATIVE

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS

DRAWING NO.
5-01

CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.:

P-2

SHEET NO.:

3 of 4

→ CHANGES TO Slope TOUCH-DOWN LOCATIONS Not
Accounted For.

PROJECT LENGTH = 30,750'

$$\text{AREA SAVED} = (30,750')(4') = \underline{123,000 \text{ SF}} = \underline{13,667 \text{ SY}}$$

→ (49%) COBS
(51%) PAULDING

VALUE ENGINEERING ALTERNATIVE



**PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD
Cobb and Paulding Counties, Georgia**

ALTERNATIVE NO.: P-3

**DESCRIPTION: USE 11-FT.-WIDE LANES FOR THE SR 360 INSIDE
THROUGH LANES ONLY**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

The original design uses the GDOT standard of 12-ft.-wide lanes at all locations.

ALTERNATIVE: (Sketch attached)

Use 11-ft.-wide lanes for the inside through lanes along SR 360/Maclang Road. All other lanes and side roads are to remain as designed.

ADVANTAGES:

- Reduces cost
- Reduces right-of-way
- Reduces materials
- Outside “truck” lane remains wide

DISADVANTAGES:

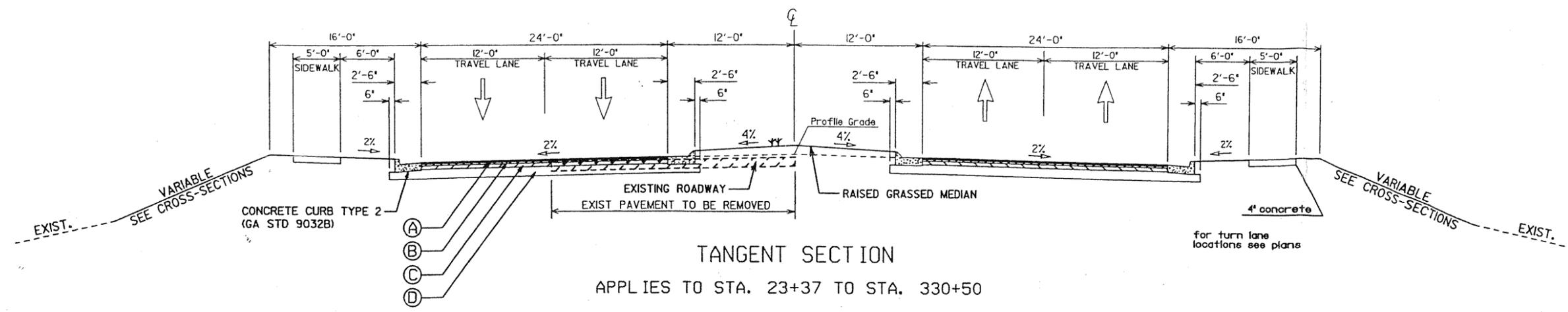
- Not as great a cost savings as using all 11-ft. lanes

DISCUSSION:

Truck traffic percentage is low on this corridor. This in combination with a 45 mph design speed indicates that there is no need for 12-ft.-wide lanes. If there is a concern with the truck traffic, this allows the outside lane to remain at a 12-ft. width and converts the inside lane to an allowable width per FHWA.

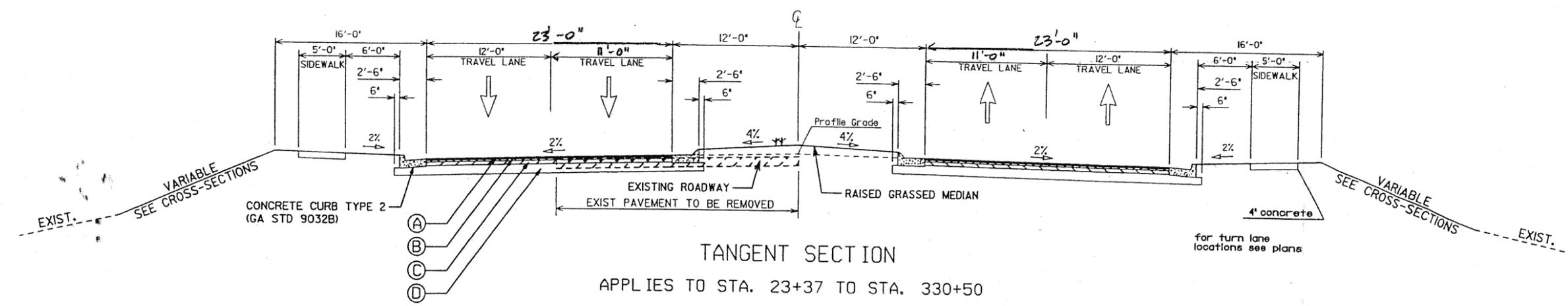
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,134,655	—	\$ 2,134,655
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 2,134,655	—	\$ 2,134,655

TS-01



TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50

AS DESIGNED



TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50

ALTERNATIVE

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS

DRAWING No.
5-01

CALCULATIONS



PROJECT: **WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: P-3

SHEET NO.: 3 of 4

→ CHANGES TO SLOPE TOUCH-DOWN LOCATIONS NOT ACCOUNTED FOR.

PROJECT LENGTH = 30,750'

$$\text{AREA SAVED} = (30,750') (2') = \underline{61,500 \text{ SF}} = \underline{6833 \text{ SY}}$$

49% COBB
51% PAULDING.

VALUE ENGINEERING ALTERNATIVE



**PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **P-4**

**DESCRIPTION: REDUCE ALL TURN LANES FROM 12 FT. WIDE TO
11 FT. WIDE**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design uses the GDOT standard of 12-ft.-wide lanes at all locations.

ALTERNATIVE: (Sketch attached)

Reduce all turn lane widths to 11 ft. wide along SR 360/Maclang Road. All other lanes and side roads are to remain as designed.

ADVANTAGES:

- Reduces cost
- Reduces right-of-way
- Reduces materials
- High-speed lanes remain 12 ft. wide

DISADVANTAGES:

- Perceived “tight” or narrow turn lanes
- Through lane widths could also be reduced

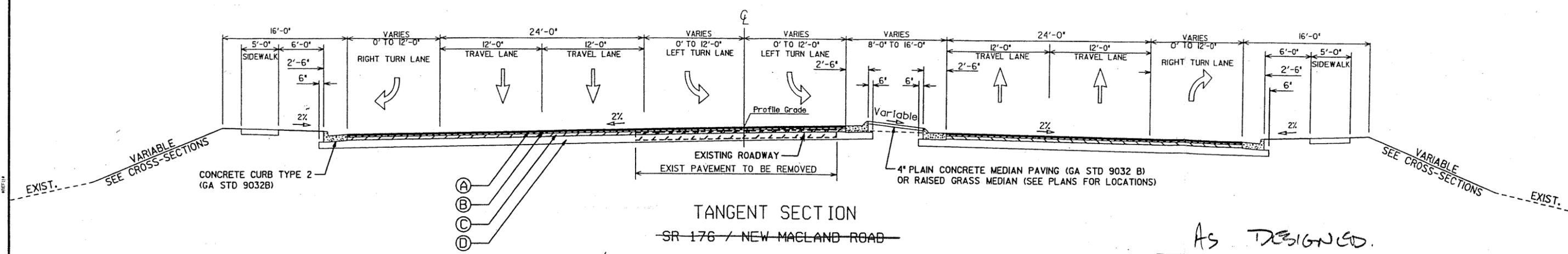
DISCUSSION:

In this alternative, just the slower speed turn lanes are reduced in width while the faster speed through lanes are maintained. With the gutter pan at the outside of the turn lanes, there is an additional margin of safety even if the asphalt pavement is narrowed. However, given the low truck traffic volumes and a design speed of 45 mph, the 12-ft. through lanes are not required. Thus, better options exist than this concept, which saves some costs.

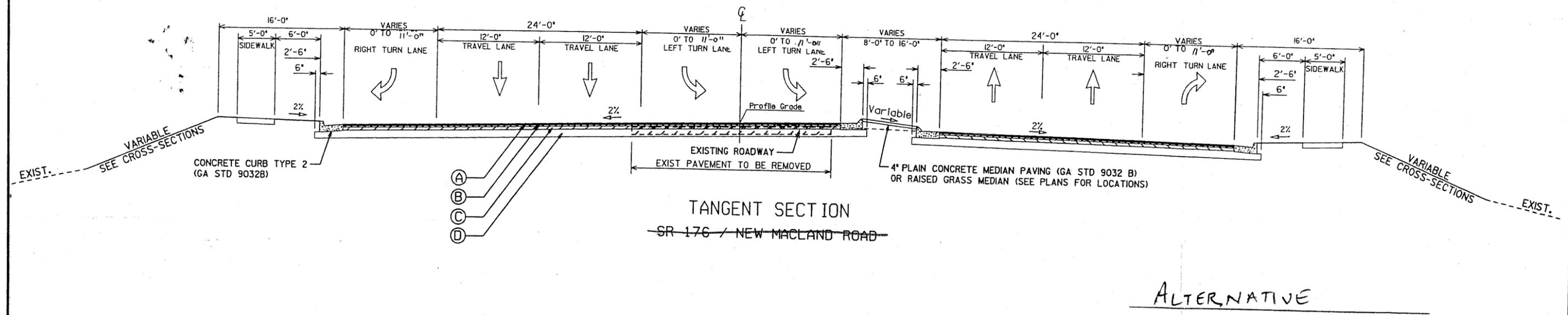
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,316,765	—	\$ 1,316,765
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 1,316,765	—	\$ 1,316,765

ACT. No. P-4
SHT. 2 of 4

TS-??



TS-??



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DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS

DRAWING No.
5-06

CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.:

P-4

SHEET NO.:

3 of 4

$$\text{PROJECT LENGTH} = 30,750'$$

TURN LANE LENGTHS \approx 75% of Project.

$$\text{AREA} = \frac{1}{9}(2)(.75)(30,750) = 5125 \text{ SY}$$

$$\text{R/W} = (0.75)(30,750) = 23,063 \text{ SF}$$

Corbs 51%

PAVING 49%

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **P-6**

DESCRIPTION: **REDUCE TAPER AND STORAGE LENGTHS FOR LEFT-
TURN LANES**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

Throughout the project, the left-turn lane lengths seem to be extreme in most cases. The left-turn lanes are placed in the 24-ft.-grassed median and are separated from the through lanes with a 4-ft.-wide painted buffer strip. This results in an 8-ft.-wide nosing (edge of gutter to edge of gutter) and opening.

ALTERNATIVE: (Sketch attached)

Use minimum storage lengths and taper lengths according to detail “M-3” to allow for fewer pavement areas where possible based on the traffic counts. The following listed left turns (median openings) can be shorted to the minimum: STA 37+00 (sht 05 and 06), STA 52+60 (sht 08 and 09), STA 64+80 (sht 10-12), STA 81+20 (Macland Road/Old Mill Road-sht 14), STA 121+00 (U-turn traveling westbound), STA 135+00 (Lake Road/Smith Road), STA 157+20 (U-turn), STA 191+00 (U-turn), STA-201+00 (U-turn), STA 210+40 (sht 13-37-church) (STA 263+00 (Lire Tree Lane), and STA 307+00 (U-turn).

ADVANTAGES:

- Reduces pavement sections
- Less concrete for median; increases the amount of grassed area
- Saves cost

DISADVANTAGES:

- Reduces vehicle storage area

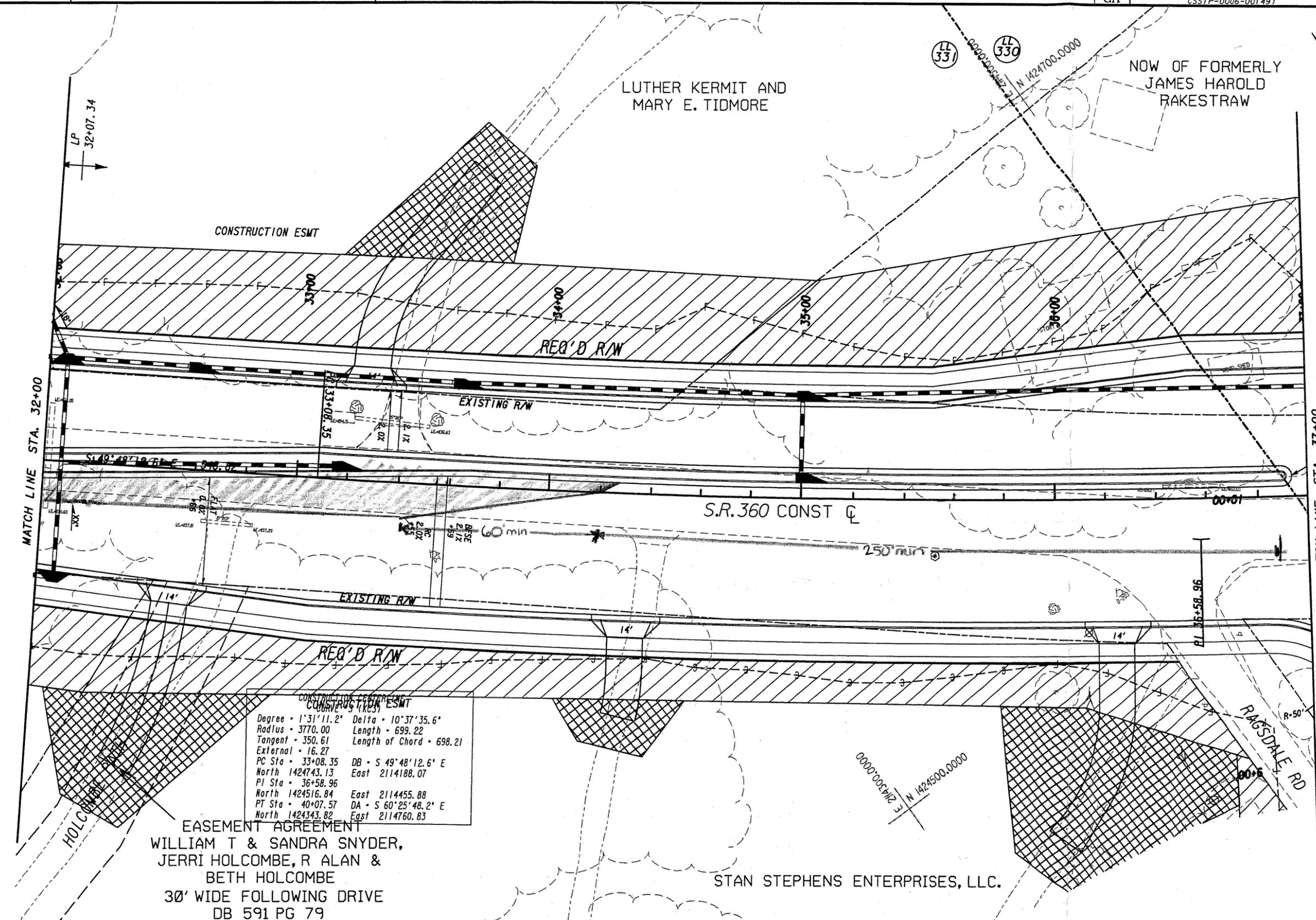
DISCUSSION:

In various locations, the left-turn lane storage and taper lengths far exceed what is required. Based on traffic diagrams for current and projected volumes, there are areas that do not need to be maximized. Reducing their lengths will result in a cost savings for pavement and increase the green area in the median, which has been virtually eliminated with all the left-turn lanes.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,570,637	—	\$ 1,570,637
ALTERNATIVE	\$ 788,738	—	\$ 788,738
SAVINGS	\$ 781,899	—	\$ 781,899

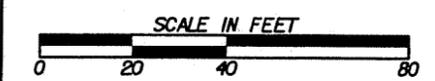
ALT P-6
Sht 2 of 6

ALTERNATIVE
DESIGN



PROPERTY AND EXISTING R/W LINE	---
REQUIRED R/W LINE	---
CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	▨
EASEMENT FOR CONSTR OF SLOPES	▩
EASEMENT FOR CONSTR OF DRIVES	▧

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REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLAN**

FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

DRAWING No. **13-05**

CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.:

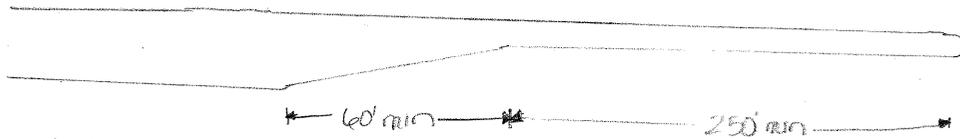
P-6

SHEET NO.:

3 of 6

Detail M-3 ↓

Design Speed of 45 mph = Decel Length ↓
250' min



CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: P-6

SHEET NO.: 4 of 6

SY

$260' + 60' = 320'$
(storage length) (taper length)

240' + concrete median additive
less 240' pavement

8ft + nose
of median

Tapers & Storage

$80' + 120 \rightarrow 200'$ save skt 04

$180 \times 16 \rightarrow 1280$ SF saved point
↑ difference of storage ↑ width of nose
(142 SY)

(186 SY)

$240 - 60 \rightarrow 140' \times 12 = 1680$ SF

$70 \times 16 = 1120$ SF saved from median skt 05

(124 SY)

$215 \times 16 \rightarrow 3440$ SF skt 07

$175 \times 12 \rightarrow 2100$

(615 SY)

$145 \times 16 \rightarrow 2320$ SF skt 08

$120 \times 12 = 1440$ SF

(417 SY)

$150 \times 12 = 1800$ SF skt 09+10
 $300 \times 16 \rightarrow 4800$ SF

(733 SY)

$300 \times 16 \rightarrow 4800$ SF skt 11+12
 $150 \times 17 \rightarrow 1800$ SF

(733 SY)

4800 SF
 1800 SF skt 13

(733 SY)

$230 \times 16 \rightarrow 3680$ SF skt 14
 $180 \times 12 \rightarrow 2160$

(646 SY)

$290 \times 16 \rightarrow 4640$ SF skt 25
 $180 \rightarrow 2160$ SF

(755 SY)

CALCULATIONS



PROJECT: **WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: *p-6*

SHEET NO.: *5 of 6*

$275 \times 16 \rightarrow 4400 \text{ SF}$ *sht 24* *489.5y*

$280 \times 16 \rightarrow 4480 \text{ SF}$ *sht 25* *498.5y*

$120 \times 12 \rightarrow 1440 \text{ SF}$ *sht* *160.5y*

$350 \times 16 \rightarrow 5600 \text{ SF}$ *sht 38* *178.5y*
 $\frac{250}{100}$
not minimum 20440

495
 $245 \times 16 \rightarrow 3920 \text{ SF}$ *sht 39* *436.5y*

*4717 ft
of median/
pavement
exchange*

$330 \times 16 \rightarrow 5280 \text{ SF}$ *sht 50* *587.5y*
sht 55

$200 \times 16 \rightarrow 3200 \text{ SF}$ *356.5y* $\rightarrow 7790.5y$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **P-7**

DESCRIPTION: **REMOVE U-TURN AT STATION 191+00**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (Sketch attached)

A U-turn is provided at Station 191+00.

ALTERNATIVE: (Sketch attached)

Delete the U-turn at Station 191+00.

ADVANTAGES:

- Reduces costs
- Reduces construction schedule
- Increases grassed area in median which is now about 75% concrete

DISADVANTAGES:

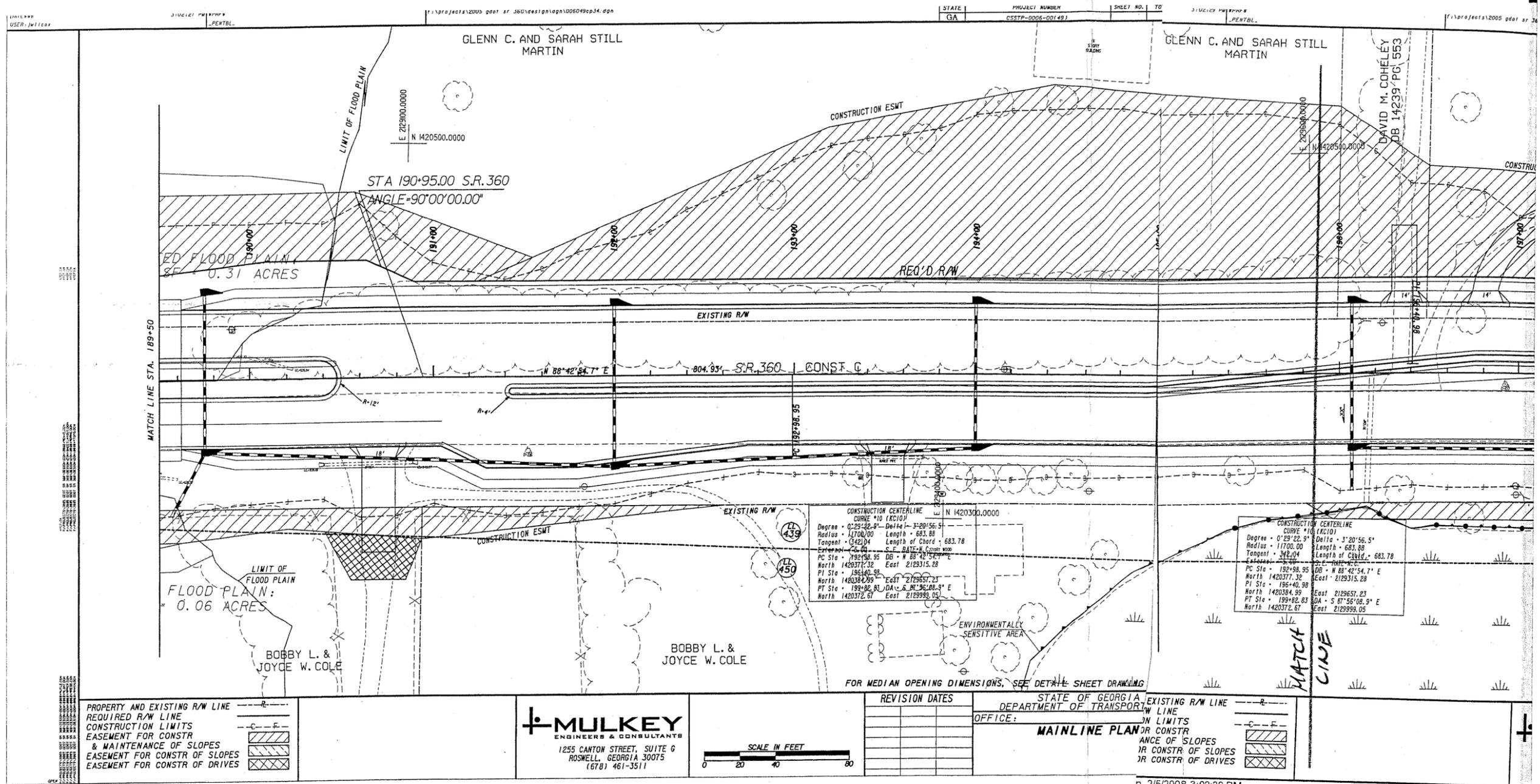
- Less convenient for six residences on the westbound side and five residences on the eastbound side

DISCUSSION:

Removing this U-turn will increase the distance between median openings to 2,320 ft. People desiring to access 11 residential properties will have to drive further to reach a median opening in order to make a U-turn to access the properties from the opposite direction. However, costs are saved and more of the median will be green space.

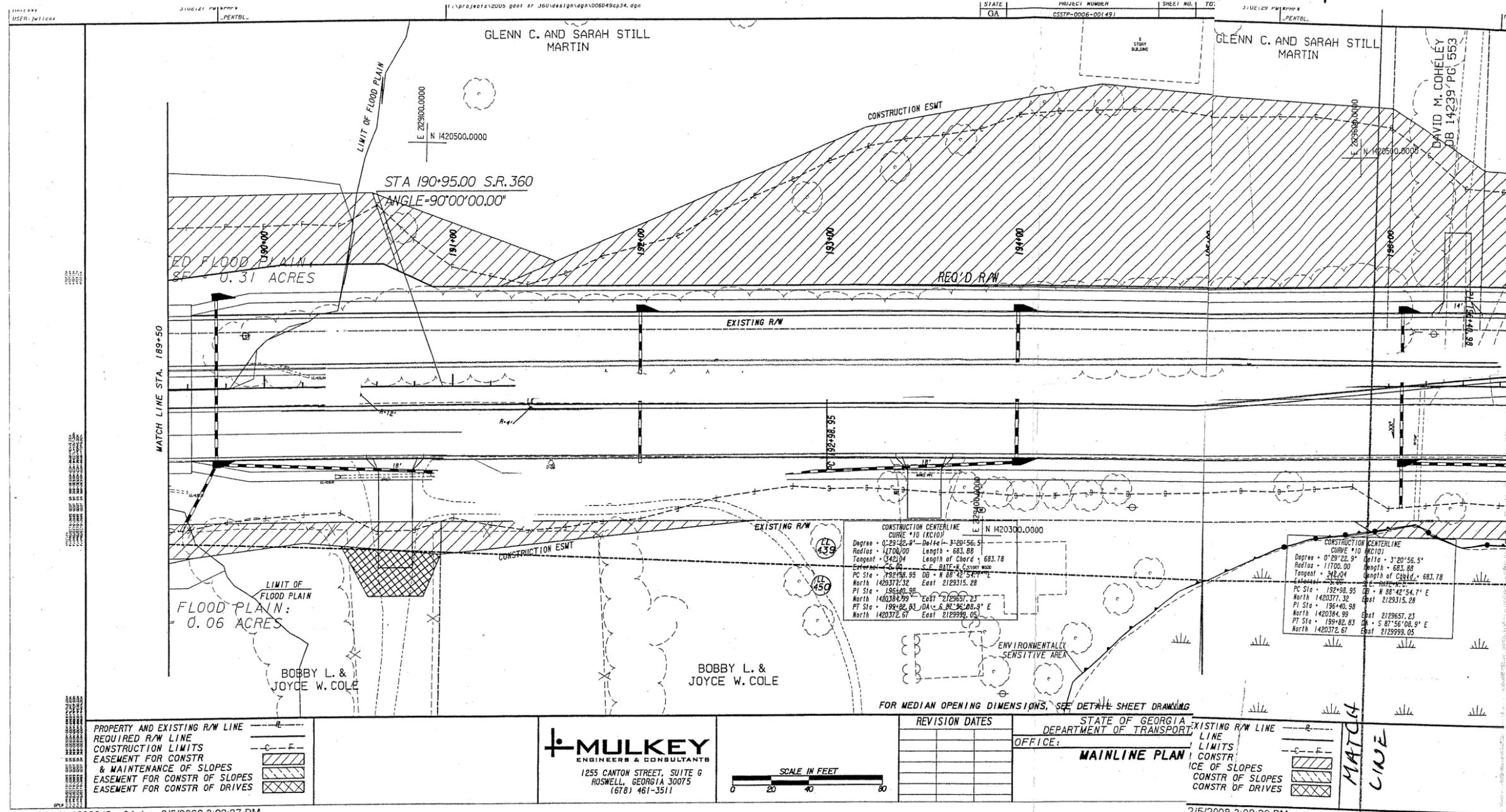
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 205,656	—	\$ 205,656
ALTERNATIVE	\$ 7,239	—	\$ 7,239
SAVINGS	\$ 198,417	—	\$ 198,417

ALTERNATIVE NO.
P-7
SHEET 2 OF 7



AS DESIGNED

ALTERNATIVE No.
P.7
SHEET 4 OF 7



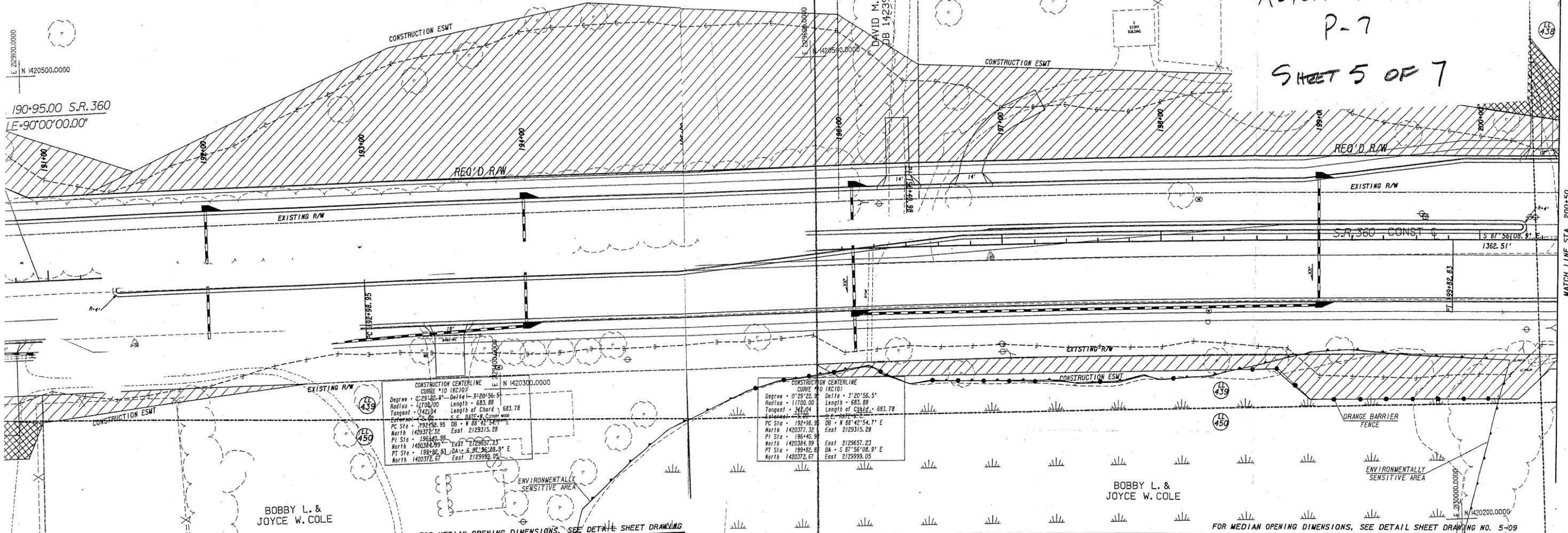
ALTERNATIVE DESIGN

GLENN C. AND SARAH STILL MARTIN

GLENN C. AND SARAH STILL MARTIN

DAVID M. COHELEY
DB 14239/PG 553

ALTERNATIVE NO.
P-7
SHEET 5 OF 7



CONSTRUCTION CENTERLINE CURVE #10 (K10)

Degree	0°29'22.9"	Delta	3°20'56.5"
Radius	11700.00	Length	683.88
Tangent	3421.04	Length of Chord	683.78
External	5.00		
PC Sta	192498.95	DB	N 88°42'54.7" E
North	1420372.32	East	2129315.28
PI Sta	196400.98		
North	1420384.99	East	2129657.23
PT Sta	199402.88	DB	S 87°56'08.9" E
North	1420372.67	East	2129999.05

CONSTRUCTION CENTERLINE CURVE #10 (K10)

Degree	0°29'22.9"	Delta	3°20'56.5"
Radius	11700.00	Length	683.88
Tangent	3421.04	Length of Chord	683.78
External	5.00		
PC Sta	192498.95	DB	N 88°42'54.7" E
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BOBBY L. & JOYCE W. COLE

BOBBY L. & JOYCE W. COLE

FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING

FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

MULKEY
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ROSWELL, GEORGIA 30075
(678) 461-3511



REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLAN**

EXISTING R/W LINE	---
LINE LIMITS	---
CONSTR	---
ICE OF SLOPES	---
CONSTR OF SLOPES	---
CONSTR OF DRIVES	---

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REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLAN**

DRAWING NO.
13-35

ALTERNATIVE DESIGN

MATCH
LINE

MATCH LINE STA. 200+50



SUBJECT: ALTERNATIVE No. P-7

JOB NO:

BY: DATE:

CHKD: DATE:

SHEET 6 OF 7

PAGE

SHEET

AS DESIGNED

$$\text{PAVEMENT } [70(24) + 12(430) + 1.5(12)(170) + \frac{50+170}{2}(12)] / 9 = 1020 \text{ SY}$$

ALTERNATIVE DESIGN

$$\text{CURB \& GUTTER } 2(70) = 140 \text{ LF}$$

$$\text{GRASSING} = 9(953) / 43560 = 0.20 \text{ AC}$$

$$\text{AG. LIME} = 400(.2/65) = 1.23 \text{ TN}$$

$$\text{LIQ. LIME} = 270(.2/65) = 0.83 \text{ GL}$$

$$\text{MIXED GR. FERT} = 60(.2/65) = 0.18 \text{ TN}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **P-8**

DESCRIPTION: **REMOVE U-TURN AT STATION 53+00**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (Sketch attached)

A U-turn is provided at Station 53+00.

ALTERNATIVE: (Sketch attached)

Delete the U-turn at Station 53+00.

ADVANTAGES:

- Reduces costs
- Reduces construction schedule
- Increases grassed area in median which is now about 75% concrete

DISADVANTAGES:

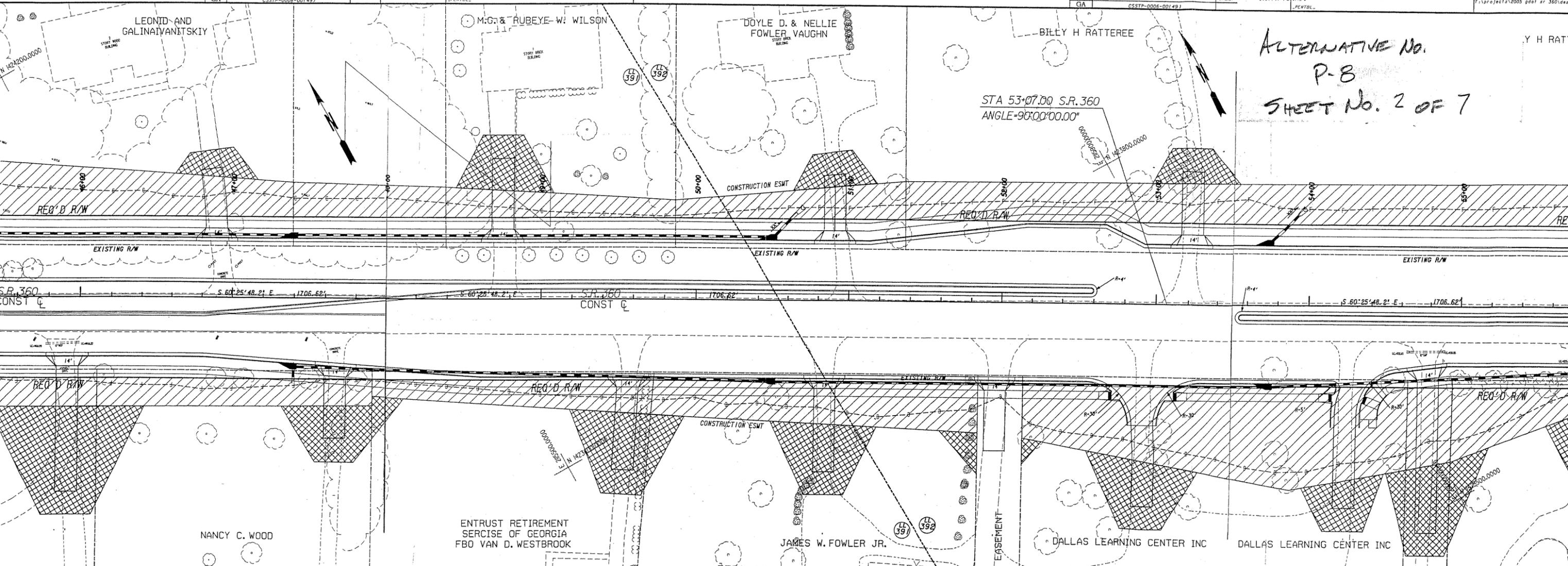
- Less convenient for six residences on the westbound side, six residences on the eastbound side and the Dallas Learning Center on the eastbound side

DISCUSSION:

Removing this U-turn will increase the distance between median openings to 2,793 ft. People desiring to access 12 residences and the Dallas Learning Center will have to drive further to reach a median opening in order to make a U-turn to access the properties from the opposite direction. However, costs are saved and more of the median will be green space.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 310,500	—	\$ 310,500
ALTERNATIVE	\$ 7,908	—	\$ 7,908
SAVINGS	\$ 302,592	—	\$ 302,592

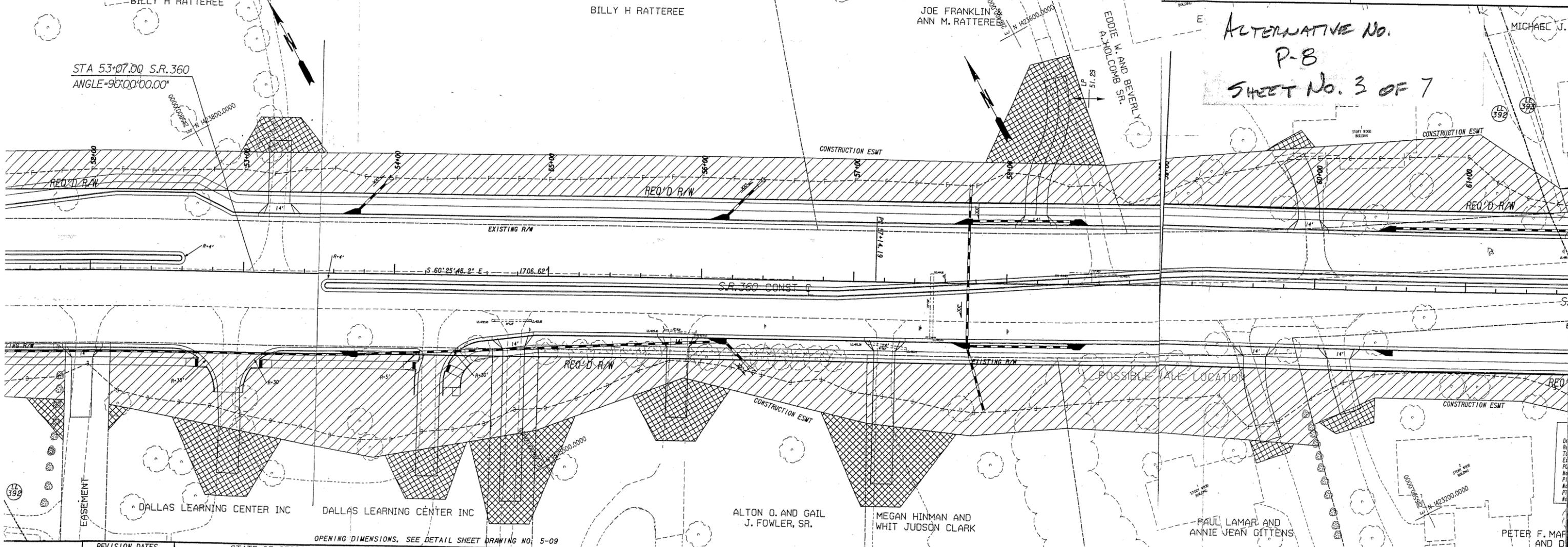
ALTERNATIVE No. P-8
SHEET No. 2 OF 7



<p>REVISION DATES</p> <table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>									<p>STATE OF GEORGIA AND EXISTING R/W LINE DEPARTMENT OF TRANSPORTATION R/W LINE OFFICE: MAINLINE PLAN</p> <p>CONSTRUCTION LIMITS T FOR CONSTR TENANCE OF SLOPES T FOR CONSTR OF SLOPES T FOR CONSTR OF DRIVES</p>	<p>MULKEY ENGINEERS & CONSULTANTS 1255 CANTON STREET, SUITE G ROSWELL, GEORGIA 30075 (678) 461-3511</p>	<p>SCALE IN FEET</p>	<p>REVISION DATES</p> <table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>									<p>STATE OF GEORGIA EXISTING R/W LINE DEPARTMENT OF TRANSPORTATION R/W LINE OFFICE: MAINLINE PLAN</p> <p>CONSTRUCTION LIMITS T FOR CONSTR TENANCE OF SLOPES T FOR CONSTR OF SLOPES T FOR CONSTR OF DRIVES</p> <p>OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09</p>

As Designed

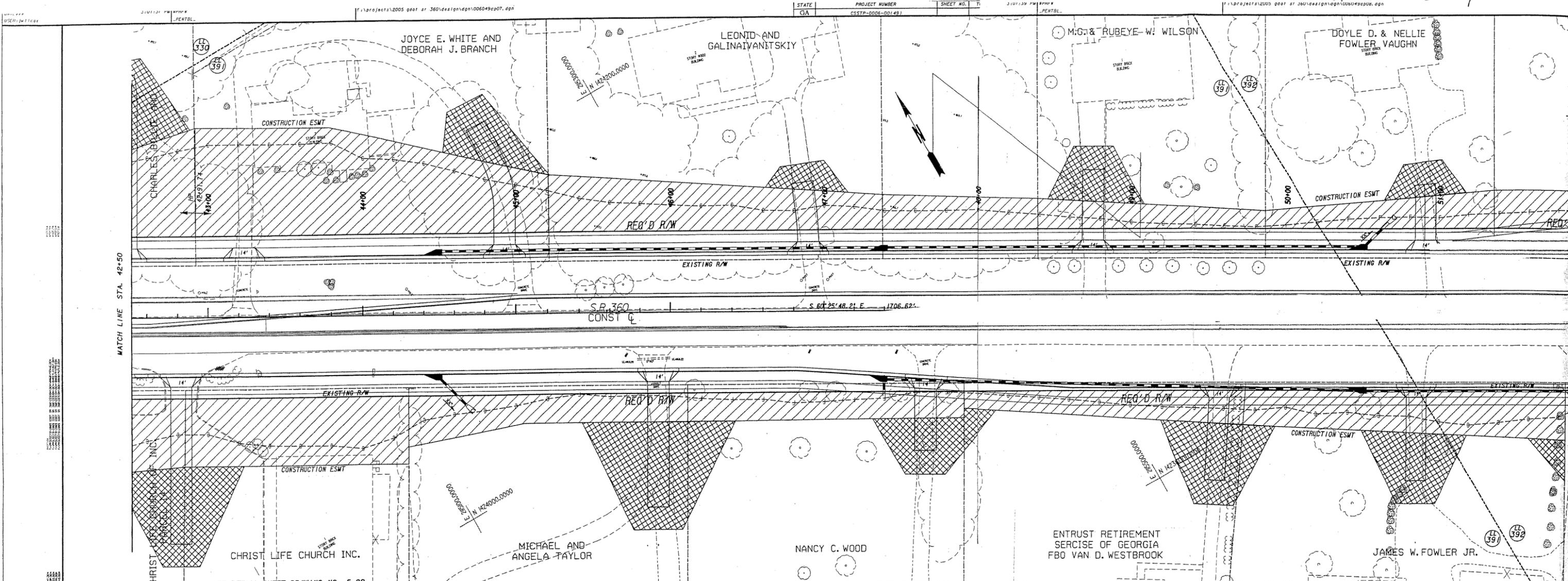
ALTERNATIVE No.
 P-8
 SHEET No. 3 OF 7



<p>REVISION DATES</p> <table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>									<p>STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE: MAINLINE PLAN</p> <p>STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE: MAINLINE PLAN</p>	<p>MULKEY ENGINEERS & CONSULTANTS 1255 CANTON STREET, SUITE G ROSWELL, GEORGIA 30075 (678) 461-3511</p> <p>MULKEY ENGINEERS & CONSULTANTS 1255 CANTON STREET, SUITE G ROSWELL, GEORGIA 30075 (678) 461-3511</p>	<p>REVISION DATES</p> <table border="1"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>								

As DESIGNED

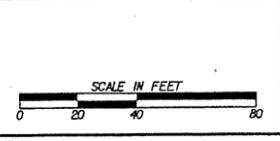
ALTERNATIVE No.
P-8
SHEET 5 OF 7



FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

PROPERTY AND EXISTING R/W LINE	---
REQUIRED R/W LINE	---
CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	▨
EASEMENT FOR CONSTR OF SLOPES	▧
EASEMENT FOR CONSTR OF DRIVES	▩

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511

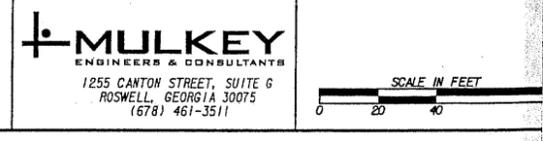


REVISION	DATE	DESCRIPTION

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLAN**

EXISTING R/W LINE	---
CONSTR LIMITS	---
OR CONSTR OF SLOPES	▨
OR CONSTR OF SLOPES	▧
OR CONSTR OF DRIVES	▩

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511



ALTERNATIVE DESIGN



SUBJECT: ALTERNATIVE No. P-8
JOB NO:

BY: DATE:
CHKD: DATE:
SHEET 6 OF 7

PAGE
SHEET /

AS DESIGNED

$$\begin{aligned} \text{PAVEMENT} &= [5(12)(170) + 370(12) + 70(24) + 330(12) \\ &+ 15(12)(240) + \left(\frac{50+170}{2}\right)(12)] / 9 \\ &= 1540 \text{ SYV} \end{aligned}$$

ALTERNATIVE DESIGN

- CURB & GUTTER $2(70) = 140 \text{ LF}$
- GRASSING $9(1540) / 43560 = 0.32 \text{ AC}$
- A.G. LIME $400(0.32/65) = 1.97 \text{ TN}$
- LIQ. LIME $270(0.32/65) = 1.33 \text{ GL}$
- MIXED GORFERT. $60(0.32/65) = 0.30 \text{ TN}$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **P-9**

DESCRIPTION: **REMOVE U-TURN AT STATION 307+50**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (Sketch attached)

A U-turn is provided at Station 307+50.

ALTERNATIVE: (Sketch attached)

Delete the U-turn at Station 307+50.

ADVANTAGES:

- Reduces costs
- Reduces construction schedule

DISADVANTAGES:

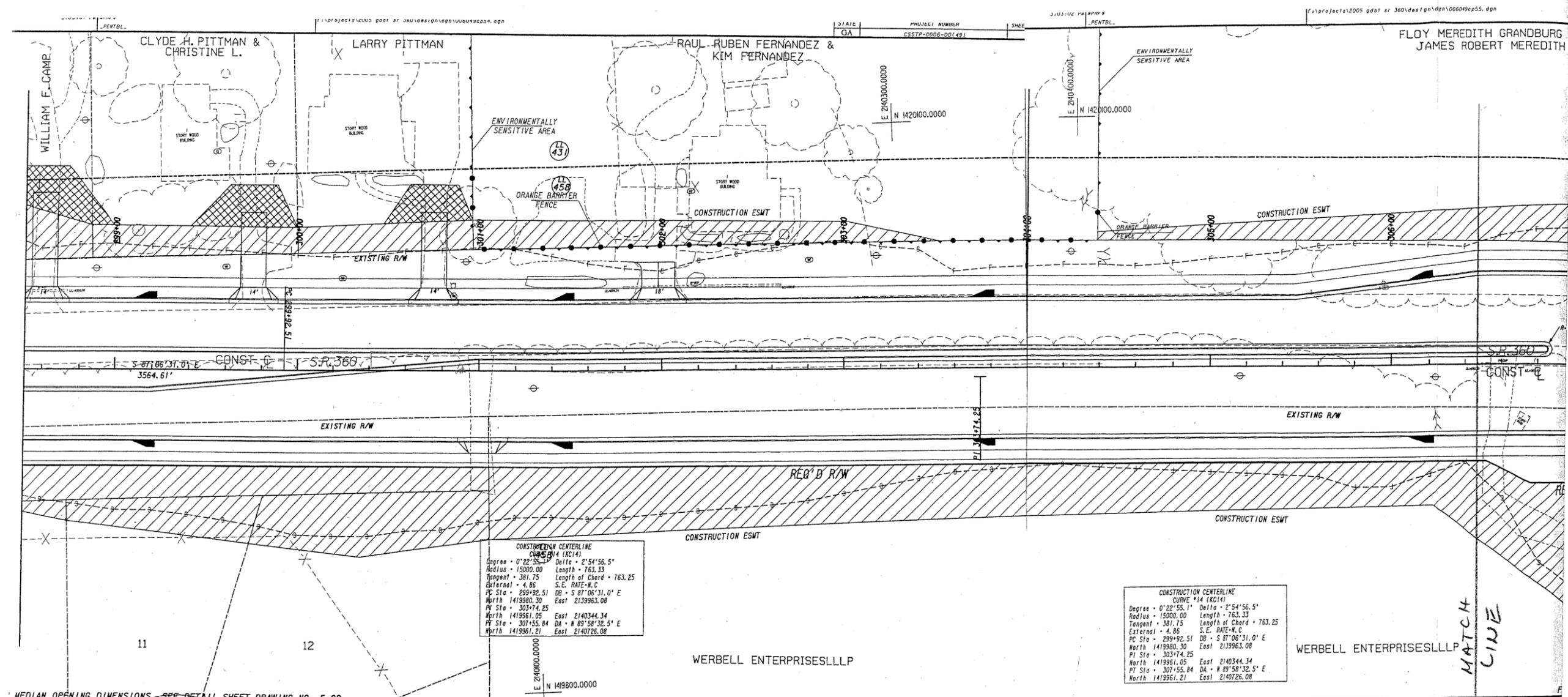
- Less convenient for seven residential properties on the westbound side and one residential property and one commercial property on the eastbound side

DISCUSSION:

Removing this U-turn will increase the distance between median openings to 3,302 ft. People desiring to access eight residences and the Werbell Enterprises LLP will have to drive further to reach a median opening in order to make a U-turn to access the properties from the opposite direction. However, costs are saved and more of the median will be green space.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 432,884	—	\$ 432,884
ALTERNATIVE	\$ 10,324	—	\$ 10,324
SAVINGS	\$ 422,560	—	\$ 422,560

ALTERNATIVE No.
P-9
SHEET 2 OF 7



CONSTRUCTION CENTERLINE
CURVE *14 (KCI4)
Degree = 0°22'55.1" Delta = 2°54'56.5"
Radius = 15000.00 Length = 763.33
Tangent = 381.75 Length of Chord = 763.25
External = 4.86 S.E. RATE = K.C
PC Sta = 299+92.51 DB = S 87°06'31.0" E
North 1419980.30 East 2139963.08
PI Sta = 303+74.25
North 1419961.05 East 2140344.34
PT Sta = 307+55.84 DA = N 89°58'32.5" E
North 1419961.21 East 2140726.08

CONSTRUCTION CENTERLINE
CURVE *14 (KCI4)
Degree = 0°22'55.1" Delta = 2°54'56.5"
Radius = 15000.00 Length = 763.33
Tangent = 381.75 Length of Chord = 763.25
External = 4.86 S.E. RATE = K.C
PC Sta = 299+92.51 DB = S 87°06'31.0" E
North 1419980.30 East 2139963.08
PI Sta = 303+74.25
North 1419961.05 East 2140344.34
PT Sta = 307+55.84 DA = N 89°58'32.5" E
North 1419961.21 East 2140726.08

MEDIAN OPENING DIMENSIONS - SEE DETAIL SHEET DRAWING NO. 5-09

EXISTING R/W LINE	---
CONSTR R/W LINE	---
CONSTRUCTION LIMITS	---
FOR CONSTR	---
ENHANCE OF SLOPES	---
FOR CONSTR OF SLOPES	---
FOR CONSTR OF DRIVES	---

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511



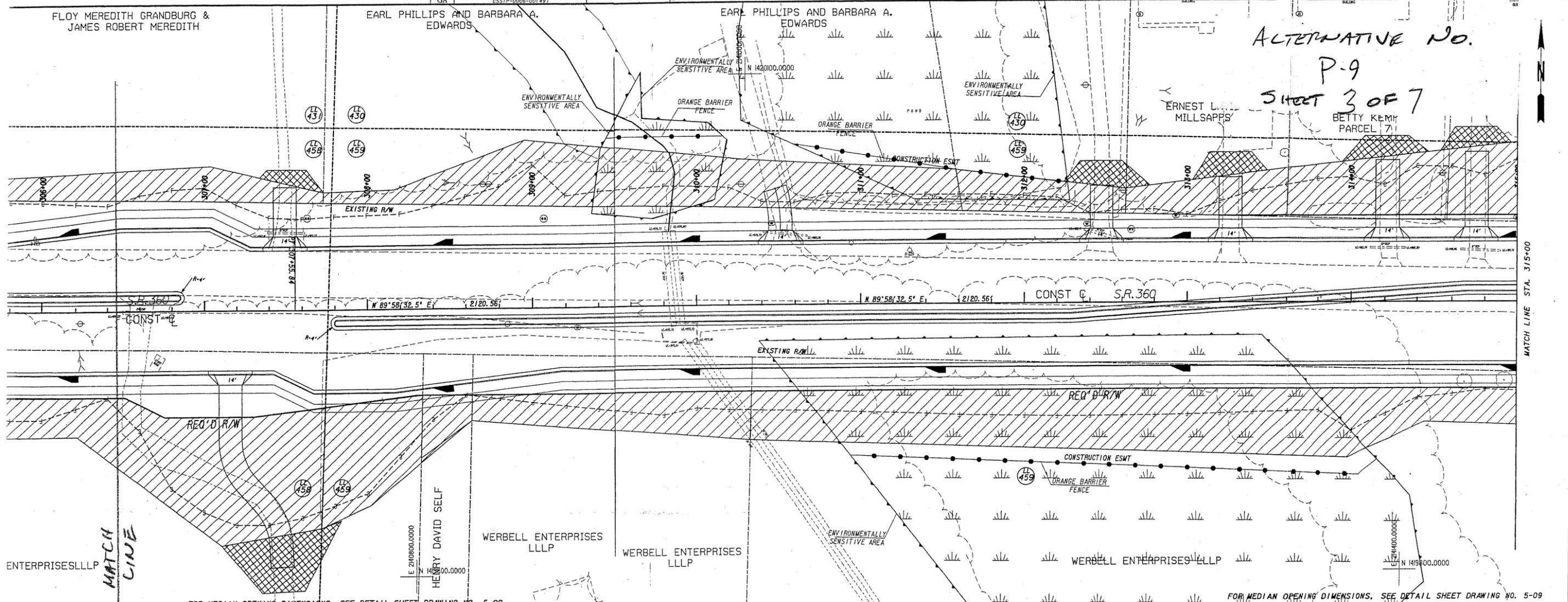
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
MAINLINE PLAN

EXISTING R/W LINE	---
CONSTR R/W LINE	---
CONSTRUCTION LIMITS	---
FOR CONSTR	---
ENHANCE OF SLOPES	---
FOR CONSTR OF SLOPES	---
FOR CONSTR OF DRIVES	---

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As DESIGNED

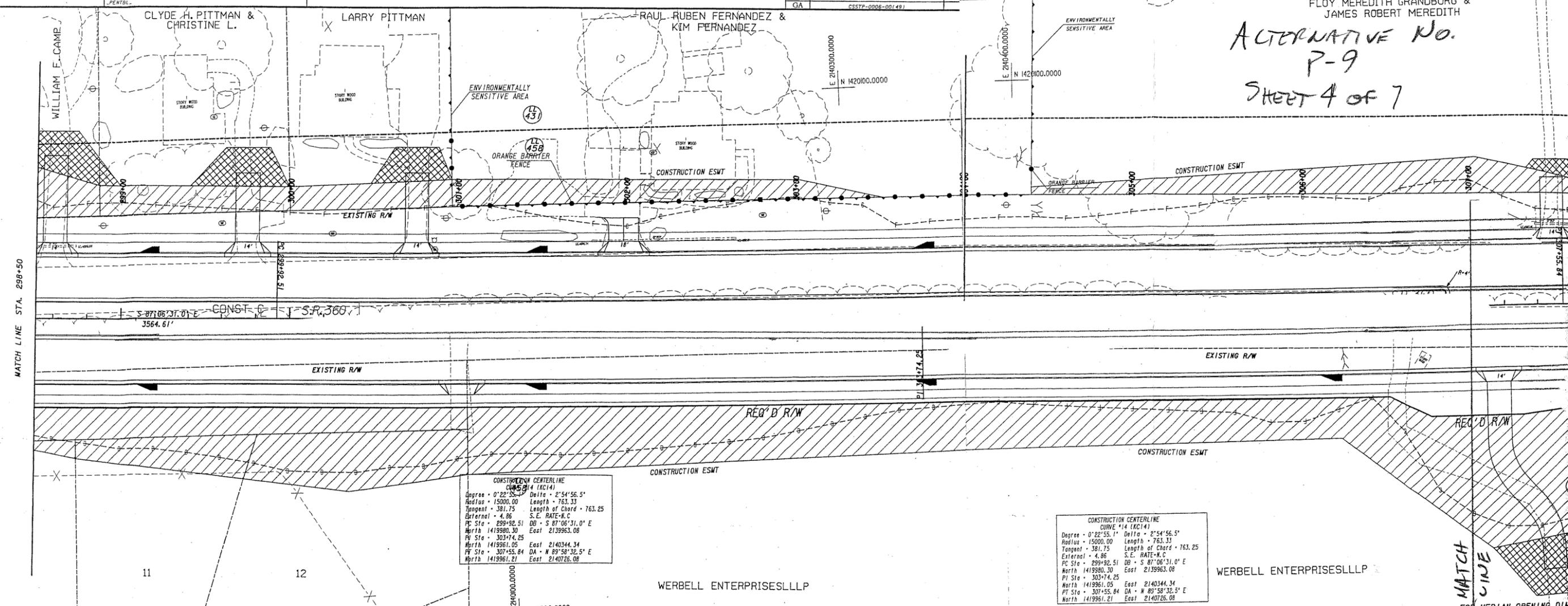


 1255 CANTON STREET, SUITE G ROSWELL, GEORGIA 30075 (678) 461-3511	REVISION DATES _____ _____ _____	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE:	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE:	 1255 CANTON STREET, SUITE G ROSWELL, GEORGIA 30075 (678) 461-3511	REVISION DATES _____ _____ _____	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE:
	SCALE IN FEET 0 20 40 80	MAINLINE PLAN OR CONSTR ANCE OF SLOPES OR CONSTR OF SLOPES OR CONSTR OF DRIVES	MAINLINE PLAN		MAINLINE PLAN	SCALE IN FEET 0 20 40 80

AS DESIGNED

FLOY MEREDITH GRANDBURG & JAMES ROBERT MEREDITH

ALTERNATIVE NO. P-9
SHEET 4 OF 7



CONSTRUCTION CENTERLINE CURVE #14 (KCI4)
 Degree - 0°22'55.1" Delta - 2°54'56.5"
 Radius - 15000.00 Length - 763.33
 Tangent - 381.75 Length of Chord - 763.25
 External - 4.86 S.E. RATE = M.C.
 PC Sta - 299+92.51 DB - S 87°06'31.0" E
 North 1419960.30 East 2139963.08
 PI Sta - 303+74.25
 North 1419961.05 East 2140344.34
 PT Sta - 307+55.84 DA - N 89°58'32.5" E
 North 1419961.21 East 2140726.08

CONSTRUCTION CENTERLINE CURVE #14 (KCI4)
 Degree - 0°22'55.1" Delta - 2°54'56.5"
 Radius - 15000.00 Length - 763.33
 Tangent - 381.75 Length of Chord - 763.25
 External - 4.86 S.E. RATE = M.C.
 PC Sta - 299+92.51 DB - S 87°06'31.0" E
 North 1419960.30 East 2139963.08
 PI Sta - 303+74.25
 North 1419961.05 East 2140344.34
 PT Sta - 307+55.84 DA - N 89°58'32.5" E
 North 1419961.21 East 2140726.08

FOR MEDIAN OPENING DIMENSIONS, -SEE DETAIL SHEET DRAWING NO. 5-09

PROPERTY AND EXISTING R/W LINE	---
REQUIRED R/W LINE	---
CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	---
EASEMENT FOR CONSTR OF SLOPES	---
EASEMENT FOR CONSTR OF DRIVES	---

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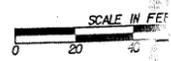


REVISION DATES

STATE OF GEORGIA
 DEPARTMENT OF TRANSPORTATION
 OFFICE: **MAINLINE PLAN**

EXISTING R/W LINE	---
CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	---
EASEMENT FOR CONSTR OF SLOPES	---
EASEMENT FOR CONSTR OF DRIVES	---

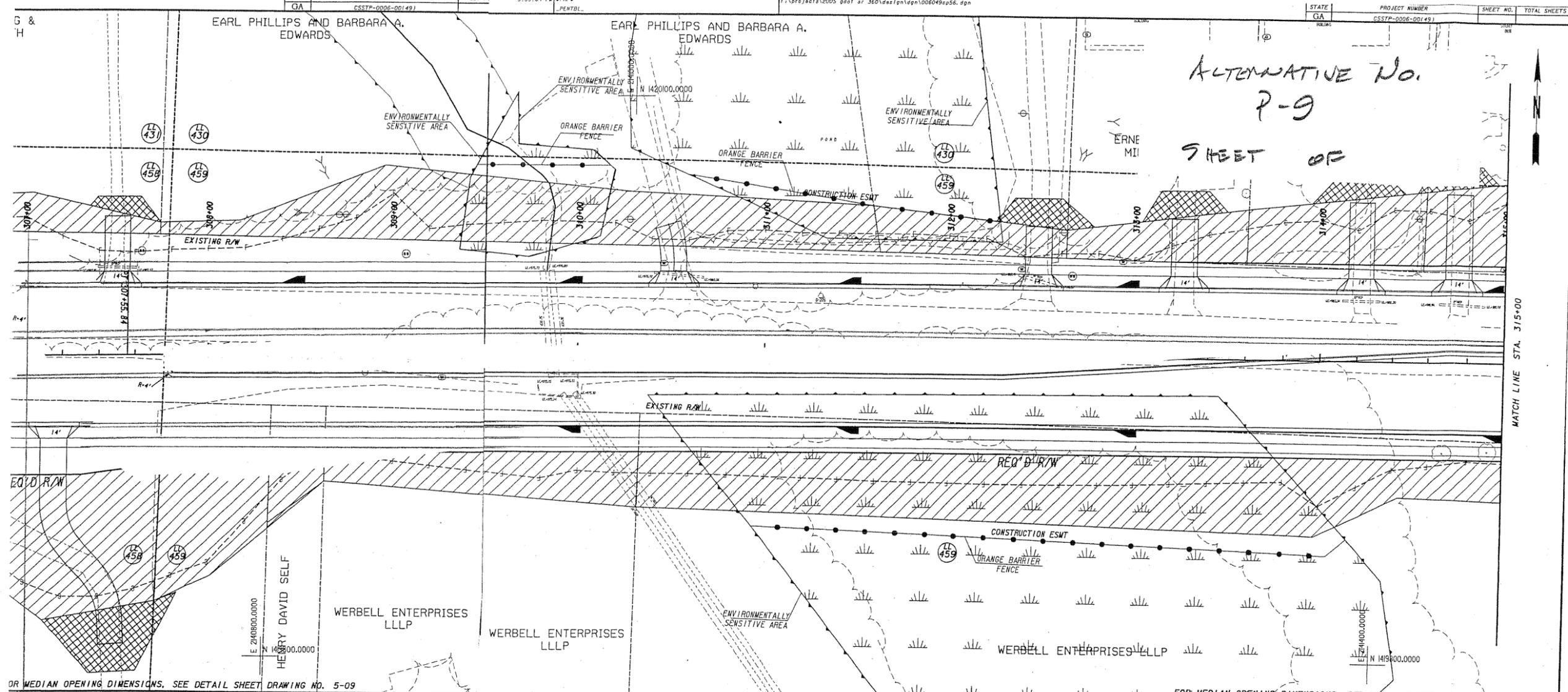
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ALTERNATIVE DESIGN

ALT. NO.
P-9
Sht. 5 of 7

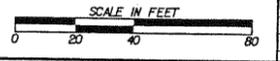
ALTERNATIVE No.
P-9
SHEET OF



MATCH LINE STA. 315+00

OR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09



REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE:
	MAINLINE PLAN

REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE:
	MAINLINE PLAN

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REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE:
	MAINLINE PLAN

DRAWING NO.
13-56

ALTERNATIVE DESIGN

MATCH LINE



SUBJECT: ALTERNATIVE P-9

JOB NO:

BY: DATE:

CHKD: DATE:

SHEET 6 OF 7

PAGE

SHEET

AS DESIGNED

$$\begin{aligned} \text{PAVEMENT} & [1.5(170)(12) + 12(570) + 90(24) \\ & + 12(440) + 1.5(12)(230) + 2\left(\frac{50 \times 170}{2}\right)(12)] / 9 \\ & = 2147.54 \checkmark \end{aligned}$$

ALTERNATIVE DESIGN

CURB & GUTTER	$2(90)$	$= 180$	LF
GRASSING	$9(2147)$	$/ 43560 = 0.44$	AC
AG. LIME	$400(0.44/65)$	$= 2.71$	TN
LIQ. LIME	$270(0.44/65)$	$= 1.83$	GL
MIXED GR. FEET	$60(0.44/65)$	$= 0.41$	TN

VALUE ENGINEERING ALTERNATIVE



PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **ROW-1**

DESCRIPTION: USE 18-IN.-WIDE CURB AND GUTTERS IN LIEU OF 30-IN.-WIDE CURB AND GUTTERS

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The curb and gutter section is 30 in. wide with a 6-in.-wide curb and 24-in.-wide gutter pan.

ALTERNATIVE: (Sketch attached)

Use an 18-in.-wide curb and gutter section with a 6-in.-wide curb and 12-in.-wide gutter pan and reduce the width of the right-of-way.

ADVANTAGES:

- Reduces right-of-way cost
- Reduces concrete costs

DISADVANTAGES:

- Requires a change in GDOT policy

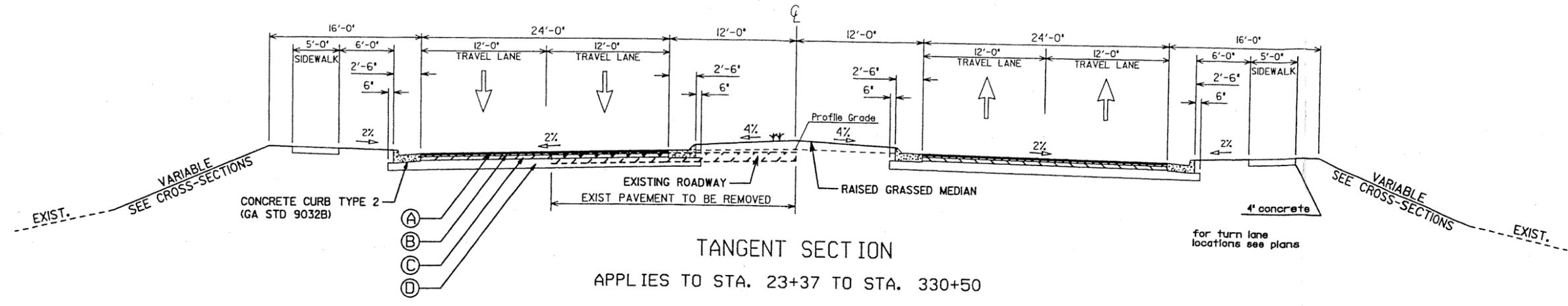
DISCUSSION:

Curbs and gutters primarily mark the edge of the roadway and direct storm water to catch basins or outlets. A smaller gutter pan will accomplish the same functions and allow the right-of-way of this road to be reduced by 4 ft. (1 ft. for each outside edge and 1 ft. for each median edge) per linear foot of roadway construction. There still remains a 12-in. shy distance from the asphalt pavement to the face of the gutter, and given the fact that truck traffic will be low on this roadway, there will be no reduction in safety. Because the right-of-way is a main cost driver of the project, this saves significant costs. Other states such as Maryland use the narrow gutter on its state roads for this reason.

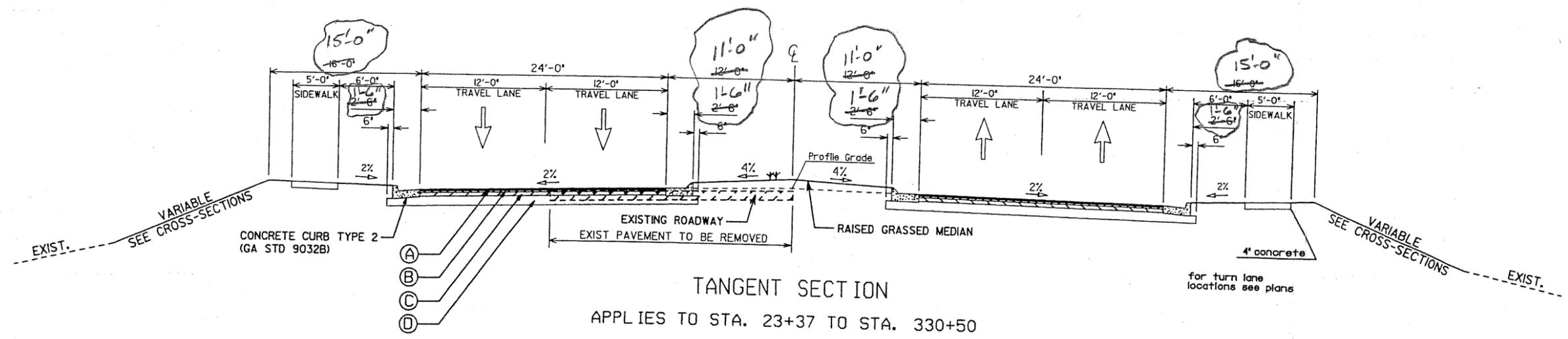
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,798,813	—	\$ 2,798,813
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 2,798,813	—	\$ 2,798,813

ALT. NO. ROW-1 Sht. 2 of 4

TS-01



AS DESIGNED



ALTERNATIVE

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(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN

TYPICAL SECTIONS

SR 360

DRAWING No. 5-01

CALCULATIONS



PROJECT: **WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: ROW-1

SHEET NO.: 3 of 4

CONC. # 100/cy

$$\text{CONC./FT. } .67' \times 1.0' \times 1.0' = .67 \text{ cf/ft} = .0248 \text{ cy/ft}$$

$$\times 141,800$$

$$\hline 3517 \text{ cy}$$

START AT STA. 10+50

END AT STA. 334+00

$$\hline 32350 \text{ FT.}$$

TYP. 2 C&G 78,600

TYP. 7 C&G 63,200

$$\hline 141,800 \text{ LF}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **ROW-2**

DESCRIPTION: **USE 24-IN.-WIDE CURB AND GUTTERS IN LIEU OF
30-IN.-WIDE CURB AND GUTTERS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The curb and gutter section is 30 in. wide with a 6-in.-wide curb and 24-in.-wide gutter pan.

ALTERNATIVE: (Sketch attached)

Use a 24-in.-wide curb and gutter section with a 6-in.-wide curb and an 18-in.-wide gutter pan and reduce the width of the right-of-way.

ADVANTAGES:

- Reduces concrete cost
- Reduces right-of-way cost

DISADVANTAGES:

- Requires a change in GDOT policy

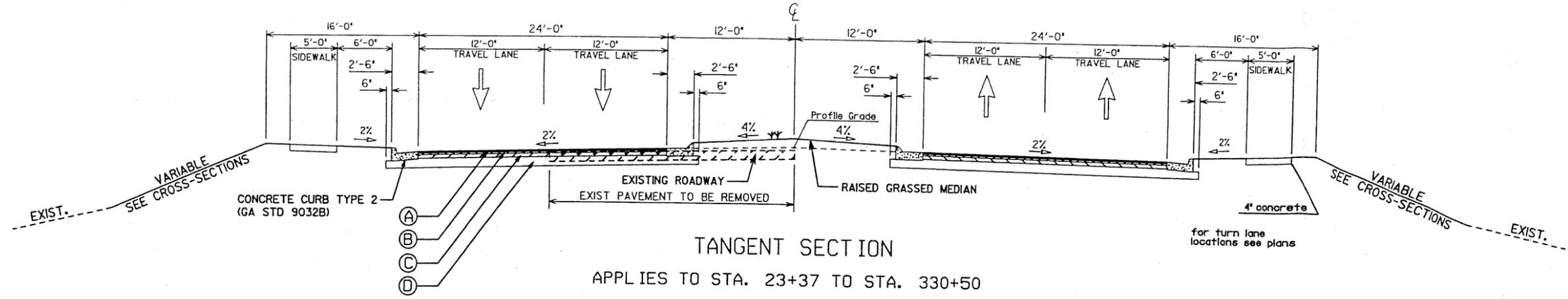
DISCUSSION:

Curbs and gutters primarily mark the edge of the roadway and direct storm water to catch basins or outlets. A smaller gutter pan will accomplish the same functions and allow the right-of-way of this road to be reduced by 2 ft. (6 in. for each outside edge and 6 in. for each median edge) per linear foot of roadway construction. There still remains an 18-in. shy distance from the asphalt pavement to the face of the gutter, and given the fact that truck traffic will be low on this roadway, there will be no reduction in safety. Because the right-of-way is a main cost driver of the project, this saves significant costs. Other states such as Florida use the narrow gutter on its state roads for this reason.

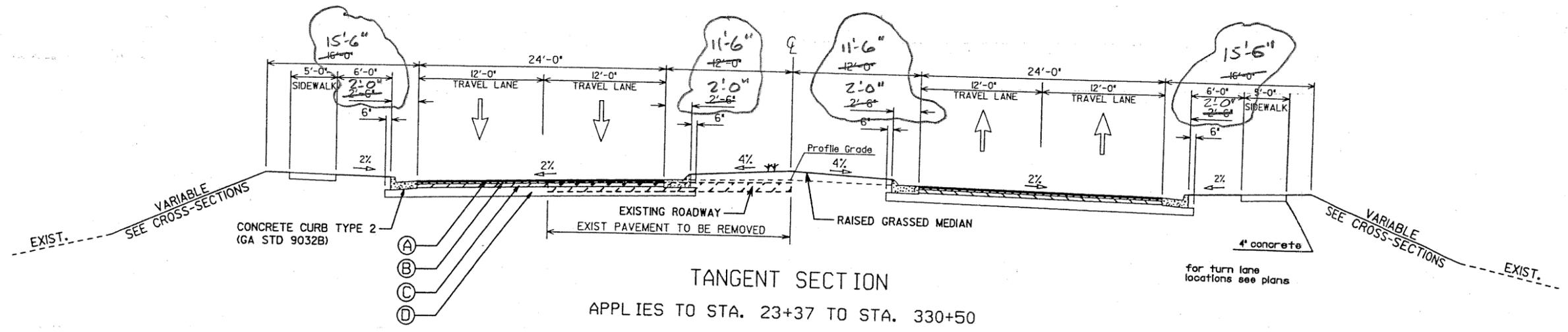
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,399,574	—	\$ 1,399,574
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 1,399,574	—	\$ 1,399,574

ALT. NO.
ROW-2
Sht. 2 of 4

TS-01



AS DESIGNED



ALTERNATIVE

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DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
SR 360

DRAWING No.
5-01

CALCULATIONS



PROJECT:

WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD
Georgia Department of Transportation

ALTERNATIVE NO.: Row-2

SHEET NO.: 3 of 4

CONC. #100/cy

$$\begin{aligned} \text{CONC./FT} &= .67 \times .50 \times 1.0 = .335 \text{ cf/ft} = .0124 \text{ cy/ft} \\ &\times 141,800 \text{ ft} \\ &\hline &1759 \text{ cy} \end{aligned}$$

START AT STA. 10+50

END AT STA. 334+00

32,320 ft

TYP. 2 C&G = 78,600 ft

TYP. 7 C&G = 63,200

141,800 ft

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **ROW-3**

DESCRIPTION: **USE RETAINING WALLS TO ELIMINATE DISPLACEMENTS AT SELECTED LOCATIONS**

SHEET NO.: **1 of 32**

ORIGINAL DESIGN: (Sketch attached)

The construction easement at Station 21+00 takes away multiple parking spaces from the automobile dealership at this location. At Stations 31+00 and 60+00, the cut or fill slopes result in residences being displaced.

ALTERNATIVE: (Sketch attached)

Use retaining walls at these locations to reduce the impact to adjacent lands and eliminate right-of-way or easement purchases.

ADVANTAGES:

- Reduces displacements
- Reduces commercial impact
- Reduces costs at the residences
- Reduces earthwork

DISADVANTAGES:

- Requires retaining walls
- Adds cost at the commercial location

DISCUSSION:

Reducing displacements will greatly simplify the right-of-way acquisition process. At the automobile dealership, it is unlikely that the easement can be obtained for the estimated cost because parking spaces are crucial to the automobile sales business. Building retaining walls will save right-of-way acquisitions.

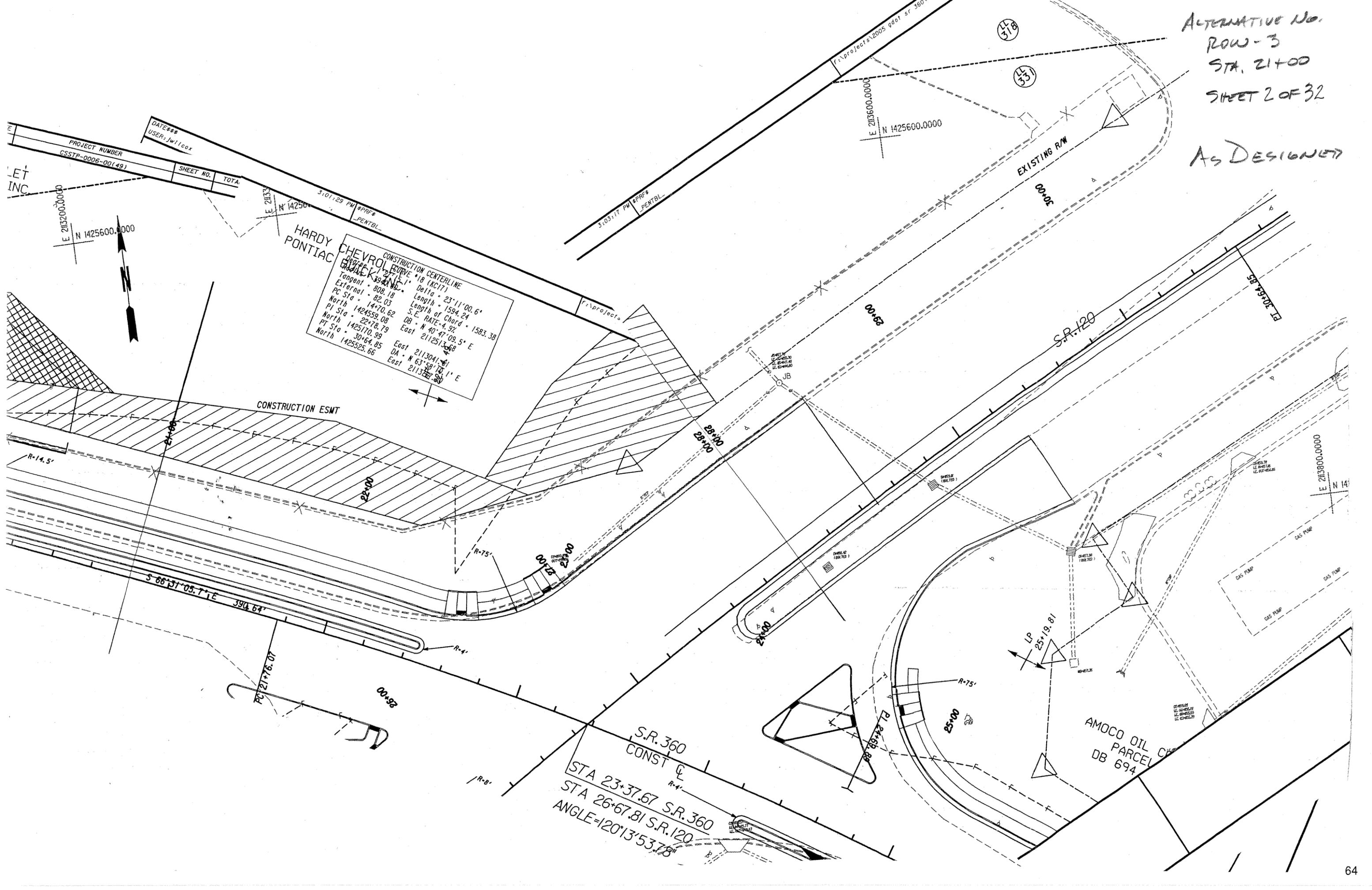
Cost Summary at Each Location

<u>Station</u>	<u>As Designed Cost</u>	<u>Alternate Design Cost</u>	<u>Cost Savings</u>
21+00 Lt.	\$214,168	\$264,263	(\$50,045)
31+00 Lt.	\$300,381	\$217,688	\$82,693
60+00 Lt.	\$277,600	\$220,019	\$57,581
Totals	\$792,149	\$701,970	\$90,179

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 792,149	—	\$ 792,149
ALTERNATIVE	\$ 701,970	—	\$ 701,970
SAVINGS	\$ 90,179	—	\$ 90,179

ALTERNATIVE No.
ROW-3
STA. 21+00
SHEET 2 OF 32

AS DESIGNED



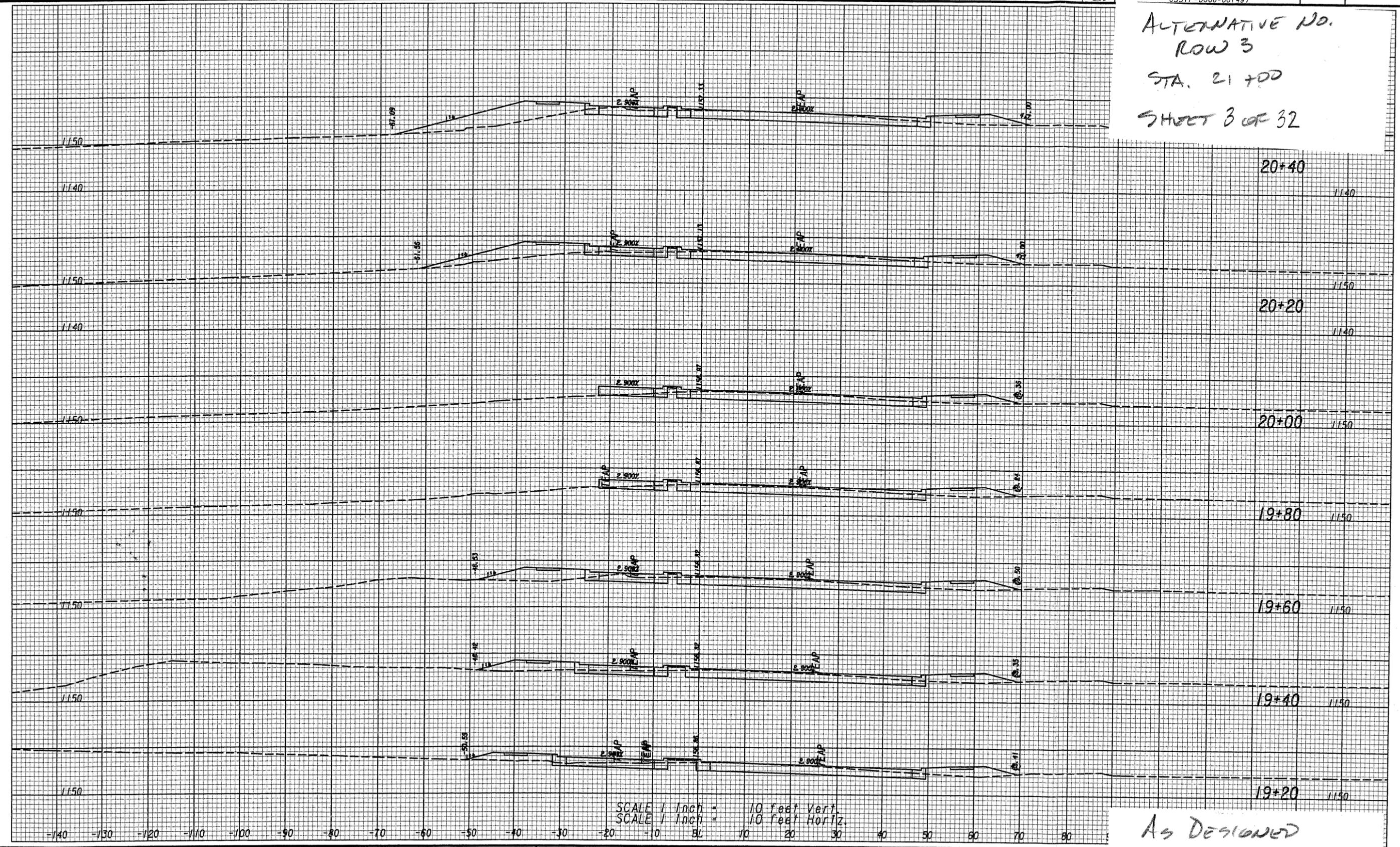
PROJECT NUMBER	SHEET NO.	TOTAL
CSSTP-0006-00(49)		

CONSTRUCTION CENTERLINE	
Curve	18 (AC17)
Tangent	808.18
External	82.03
PC Sta	14+70.62
North	142459.08
PI Sta	22+78.79
North	1425170.99
PT Sta	30+64.85
North	1425525.66
Delta	23°11'00.6"
Length of Chord	1583.38
S.E. RATE	4.9%
DB	N 40°47'09.5" E
East	2112513.58
East	2113041.51
DA	N 63°58'10.1" E
East	2113271.80

S.R. 360
CONST CL
STA 23+37.67 S.R. 360
STA 26+67.81 S.R. 120
ANGLE=120°13'53.78"

AMOCO OIL
PARCEL CH
DB 694

ALTERNATIVE NO.
ROW 3
STA. 21+00
SHEET 3 OF 32



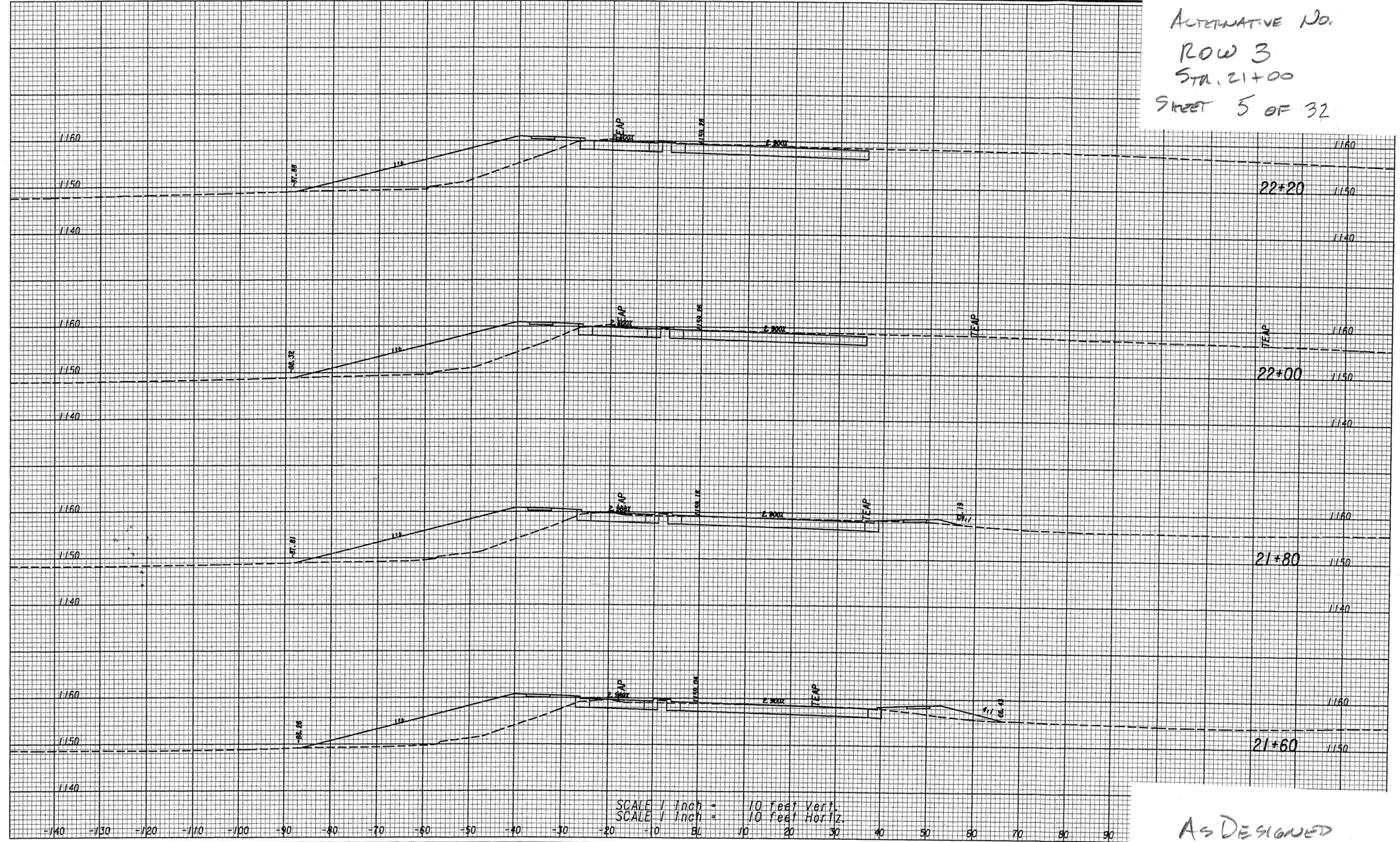
SCALE 1/4 inch = 10 feet Vert.
SCALE 1/4 inch = 10 feet Horiz.

As Designed

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511

REVISION DATES	

ALTERNATIVE No.
 ROW 3
 STA. 21+00
 SHEET 5 OF 32



SCALE 1 inch = 10 feet Vert.
 SCALE 1 inch = 10 feet Horiz.

AS DESIGNED

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REVISION DATES	

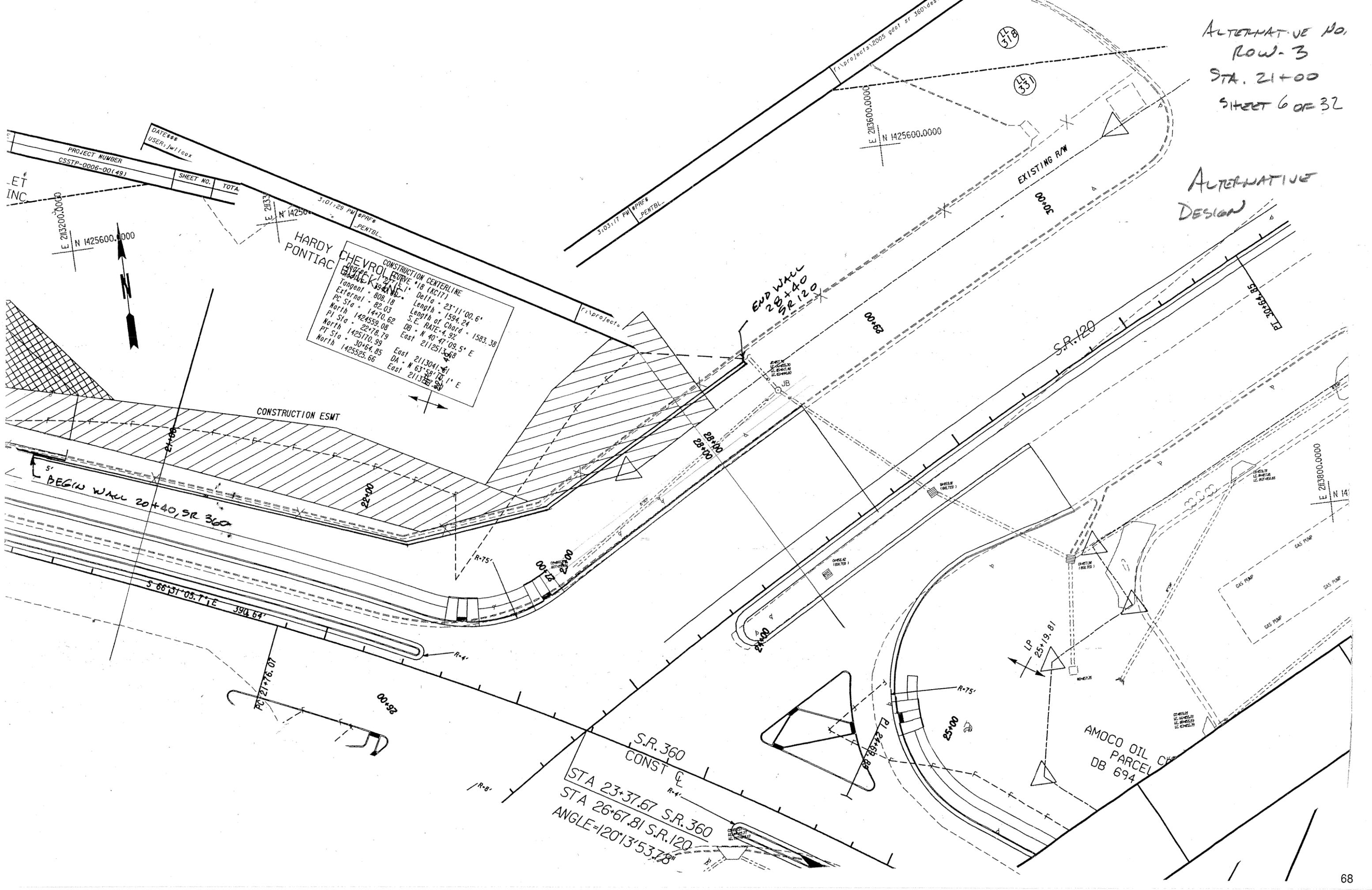
OF

SR 360

DRAWING No.
 23-10

ALTERNATIVE NO.
ROW-3
STA. 21+00
SHEET 6 OF 32

ALTERNATIVE
DESIGN

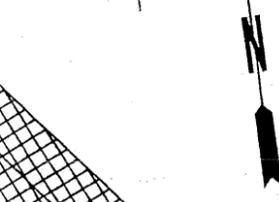


DATE: 03/17/05	SHEET NO.	TOTAL
USER: jwl/loax		

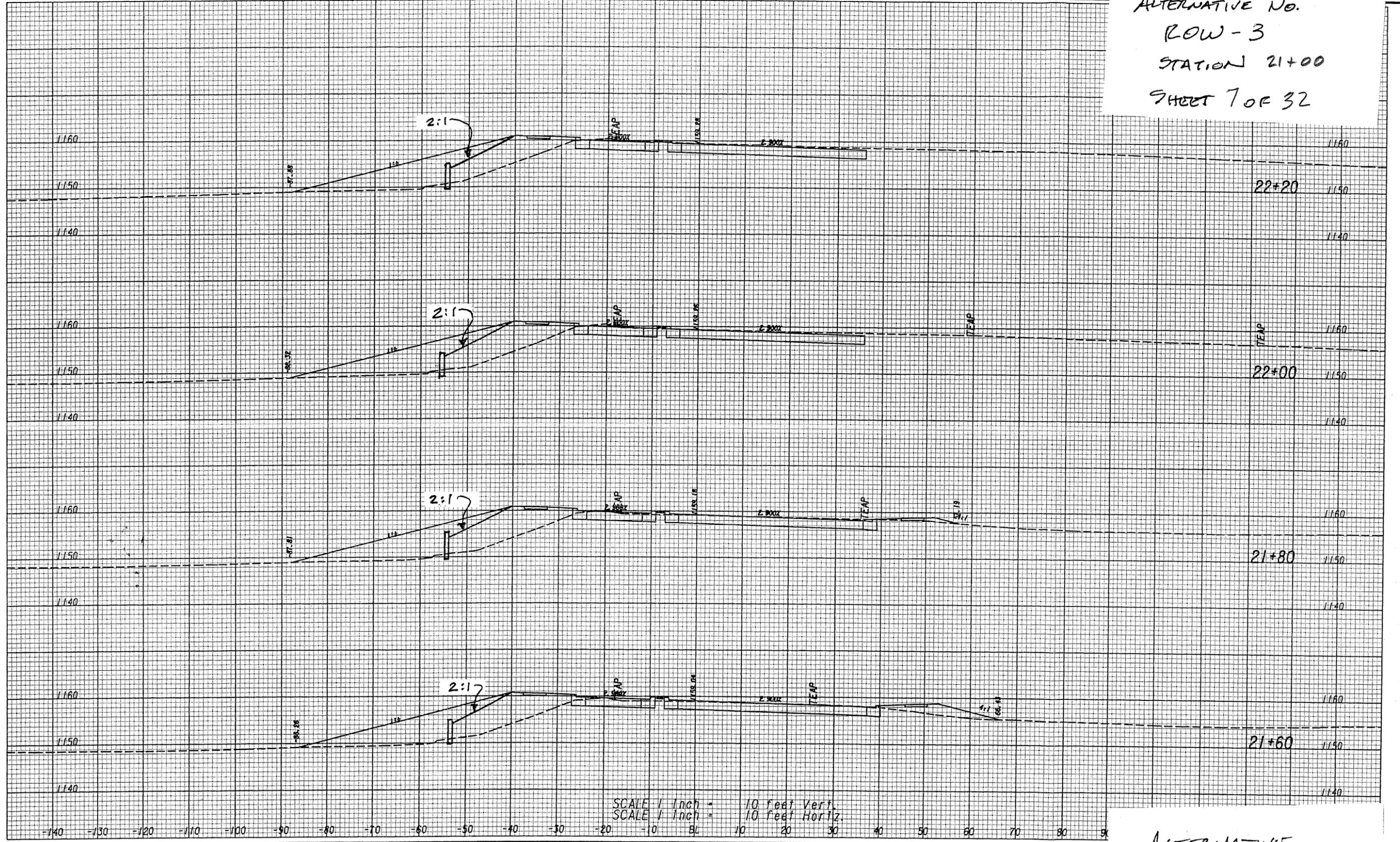
PROJECT NUMBER
CSSTP-0006-00(49)

ET INC

E 213200.0000
N 1425600.0000



ALTERNATIVE No.
ROW-3
STATION 21+00
SHEET 7 OF 32



SCALE 1/4 Inch = 10 feet Vert.
SCALE 1/4 Inch = 10 feet Horiz.

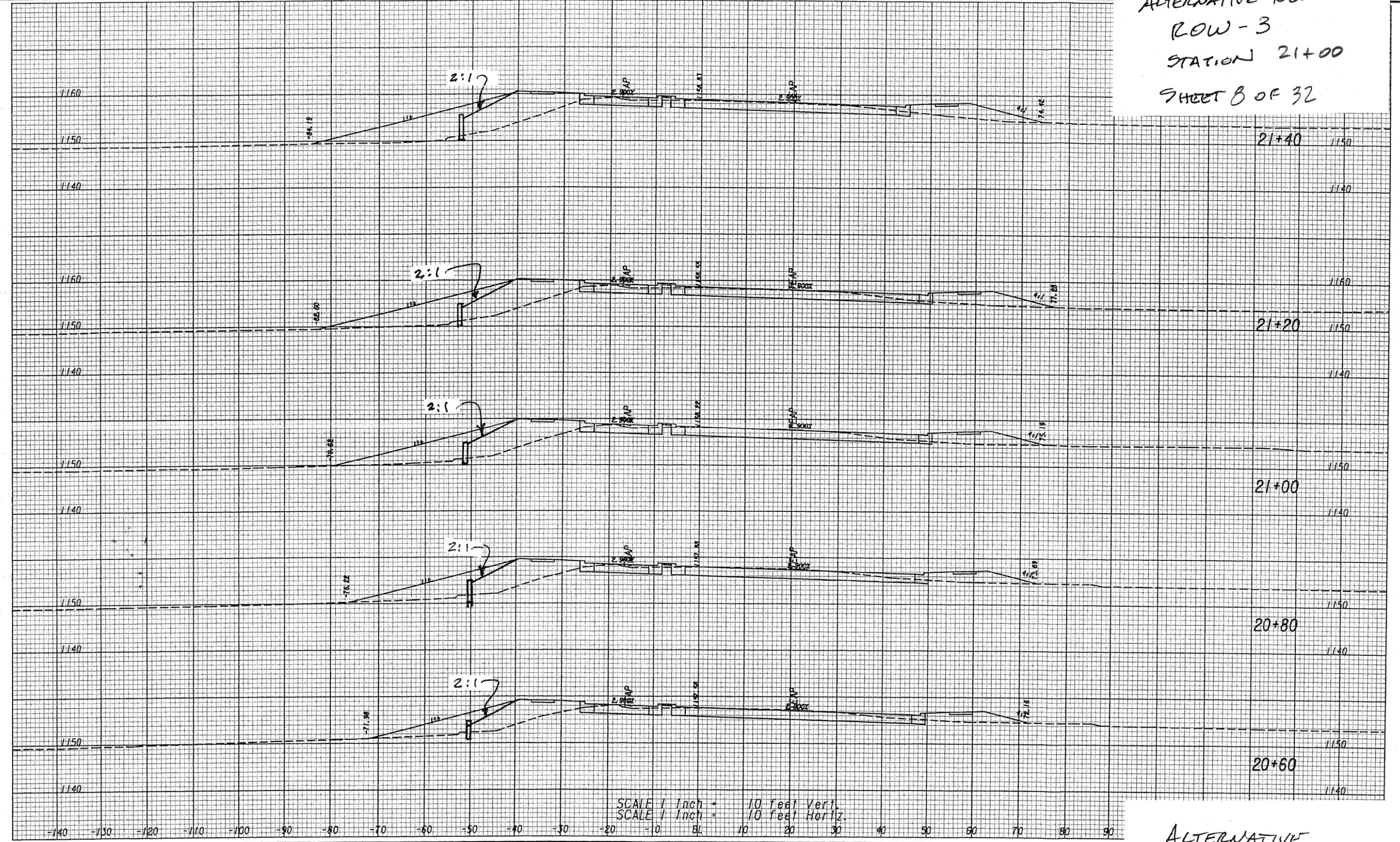
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REVISION DATES

NO.	DATE	DESCRIPTION

ALTERNATIVE DESIGN

ALTERNATIVE No.
ROW-3
STATION 21+00
SHEET 8 OF 32



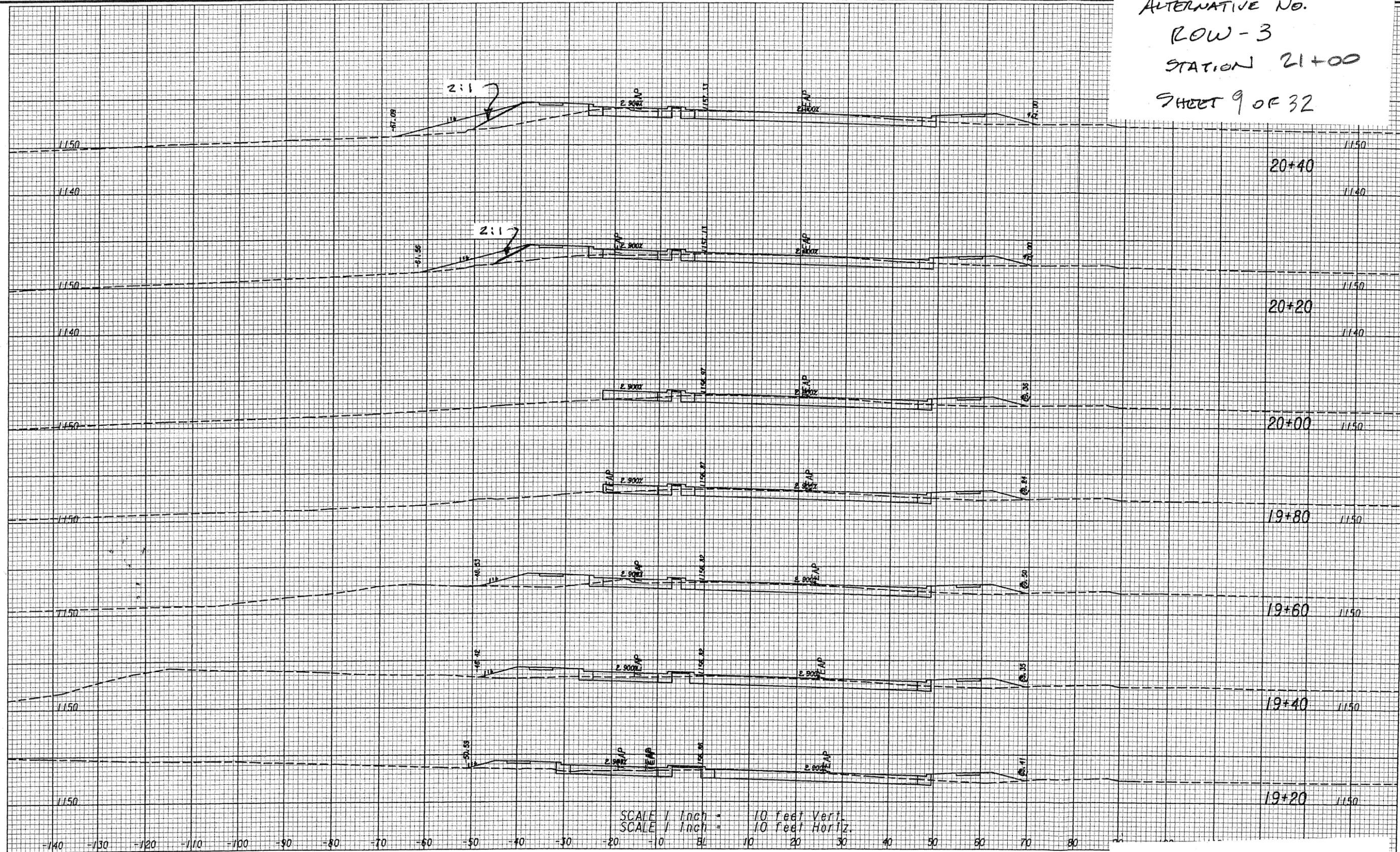
SCALE 1 Inch = 10 feet Vert.
SCALE 1 Inch = 10 feet Horiz.

ALTERNATIVE
DESIGN

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REVISION DATES	

ALTERNATIVE No.
ROW-3
STATION 21+00
SHEET 9 OF 32



SCALE 1/4 Inch = 10 feet Vert.
SCALE 1/4 Inch = 10 feet Horiz.

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REVISION DATES	

ALTERNATIVE
DESIGN



SUBJECT: ALTERNATIVE No.
ROW - 3
JOB NO: 21+00 LT

BY: DATE:
CHKD: DATE:
SHEET 10 OF 32

PAGE
SHEET /

ADD WALL FROM STA 20+30, SR 360 TO STA 28+40, SR 120 AND ELIMINATE SLOPE EASEMENT IN COMMERCIAL PARKING LOT

STATION	WALL HT	WALL AREA
+40	2	60
+60	4	40
+80	5	100
21+00	5	100
+20	5	105
+40	5.5	105
+60	5	110
+80	6	110
22+00	5	110
+20	6	50
CORNER +30 L = 70'	4	280
CORNER 27+20	4	80
+40	4	80
+60	4	



SUBJECT: ALTERNATIVE NO.
ROW 3
JOB NO: 21+00 LT

BY: DATE:
CHKD: DATE:
Sheet 11 of 32

PAGE
SHEET
/

STATION	WALL HT	WALL AREA
27+00	4	90
+80	5	110
28+00	6	100
+20	4	60
+40	2	

TOTAL WALL AREA = 1740 SF

SLOPE EASEMENT SAVED,

STATION	WIDTH	AREA
20+30	18	4350
21+80	40	3650
CORNER 22+30 L=70'	33	2030
CORNER 27+20	25	2600
+60	40	2125
28+10	45	675
+40	0	

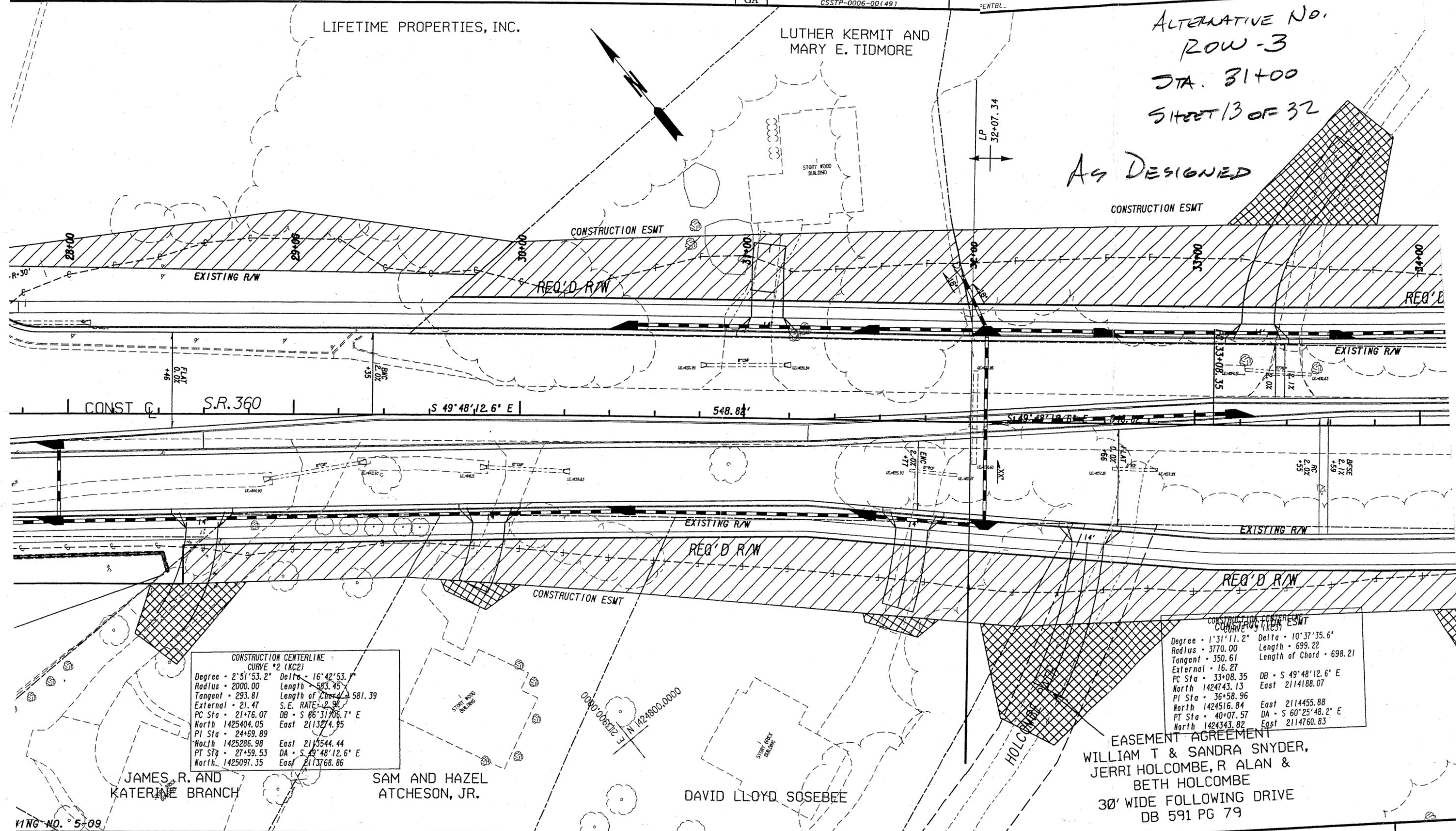
TOTAL EASEMENT SAVED = 15430 SF

LIFETIME PROPERTIES, INC.

LUTHER KERMIT AND MARY E. TIDMORE

ALTERNATIVE No. ROW-3 STA. 31+00 SHEET 13 OF 32

As DESIGNED



CONSTRUCTION CENTERLINE CURVE #2 (KC2)

Degree	2° 51' 53.2"	Delta	16° 42' 53.1"
Radius	2000.00	Length of Chord	583.45
Tangent	293.81	Length of Chord	581.39
External	21.47	S.E. RATE	2.9%
PC Sta	21+76.07	DB	S 86° 31' 06.7" E
North	1425404.05	East	2113274.95
PI Sta	24+69.89		
North	1425286.98	East	2113544.44
PT Sta	27+59.53	DA	S 49° 48' 12.6" E
North	1425097.35	East	2113768.86

CONSTRUCTION CENTERLINE CURVE #3 (KC3)

Degree	1° 31' 11.2"	Delta	10° 37' 35.6"
Radius	3770.00	Length	699.22
Tangent	350.61	Length of Chord	698.21
External	16.27		
PC Sta	33+08.35	DB	S 49° 48' 12.6" E
North	1424743.13	East	2114188.07
PI Sta	36+58.96		
North	1424516.84	East	2114455.88
PT Sta	40+07.57	DA	S 60° 25' 48.2" E
North	1424343.82	East	2114760.83

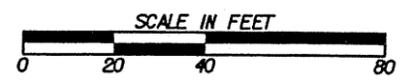
EASEMENT AGREEMENT WILLIAM T & SANDRA SNYDER, JERRI HOLCOMBE, R ALAN & BETH HOLCOMBE 30' WIDE FOLLOWING DRIVE DB 591 PG 79

JAMES R. AND KATHERINE BRANCH

SAM AND HAZEL ATCHESON, JR.

DAVID LLOYD SOSEBEE

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ROSWELL, GEORGIA 30075
(678) 461-3511



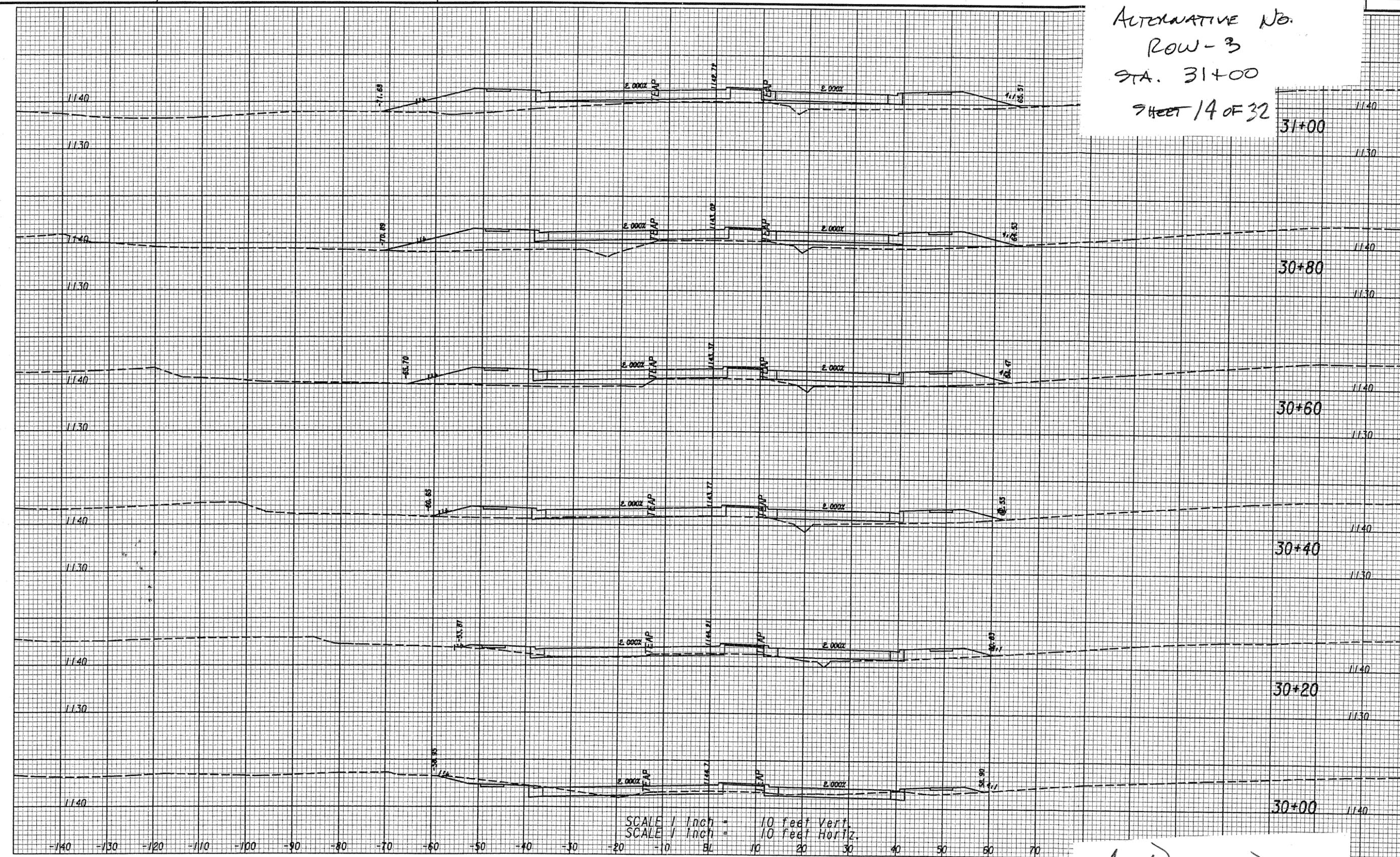
REVISION DATES

STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLAN**

EXISTING R/W LINE ---R---
LINE ---C---
LIMITS ---E---
CONSTR ---X---
OF SLOPES
INSTR OF SLOPES
INSTR OF DRIVES



ALTERNATIVE No.
ROW-3
STA. 31+00
SHEET 14 OF 32



SCALE 1/4" = 10 feet Vert.
SCALE 1/4" = 10 feet Horiz.

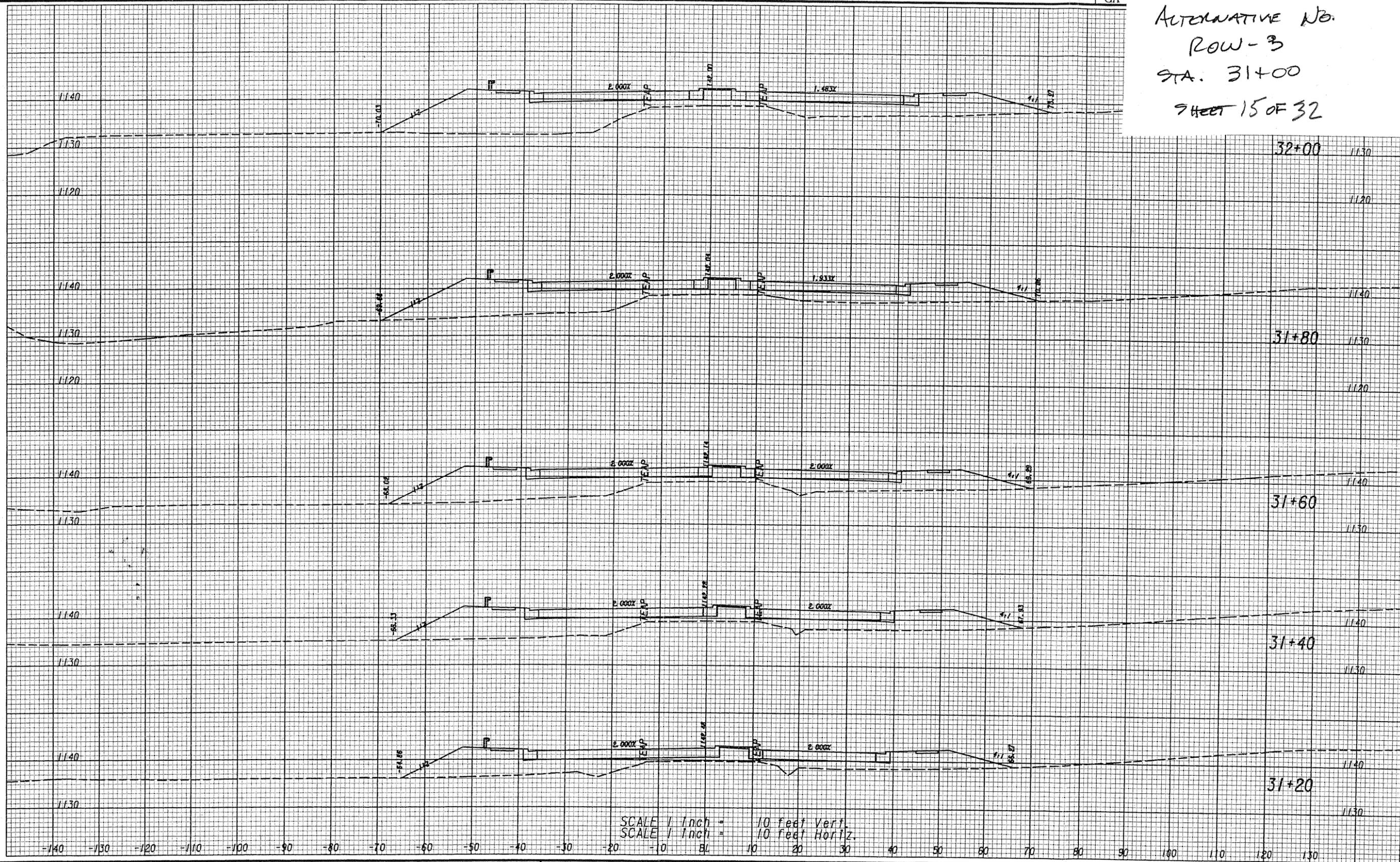
As Designed

REVISION

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TATION
TIONS
DRAWING No.
23-18

ALTERNATIVE No.
ROW-3
STA. 31+00
SHEET 15 OF 32



SCALE 1 Inch = 10 feet Vert.
SCALE 1 Inch = 10 feet Horiz.

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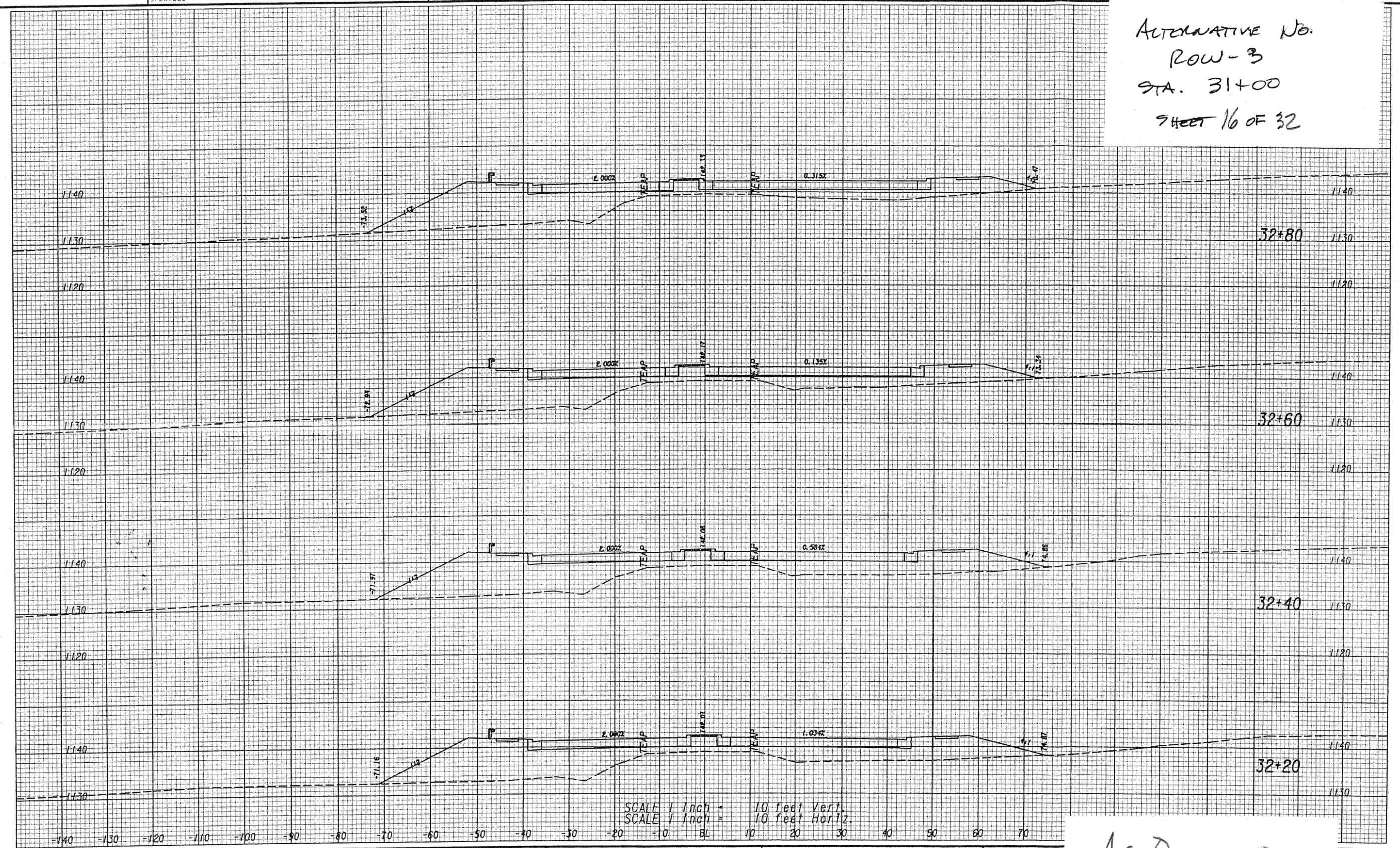
REVISION	DATE	BY

As DESIGNED

TION
IONS

DRAWING No.
23-19

ALTERNATIVE No.
 ROW-3
 STA. 31+00
 SHEET 16 OF 32



As Designed

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REVISION

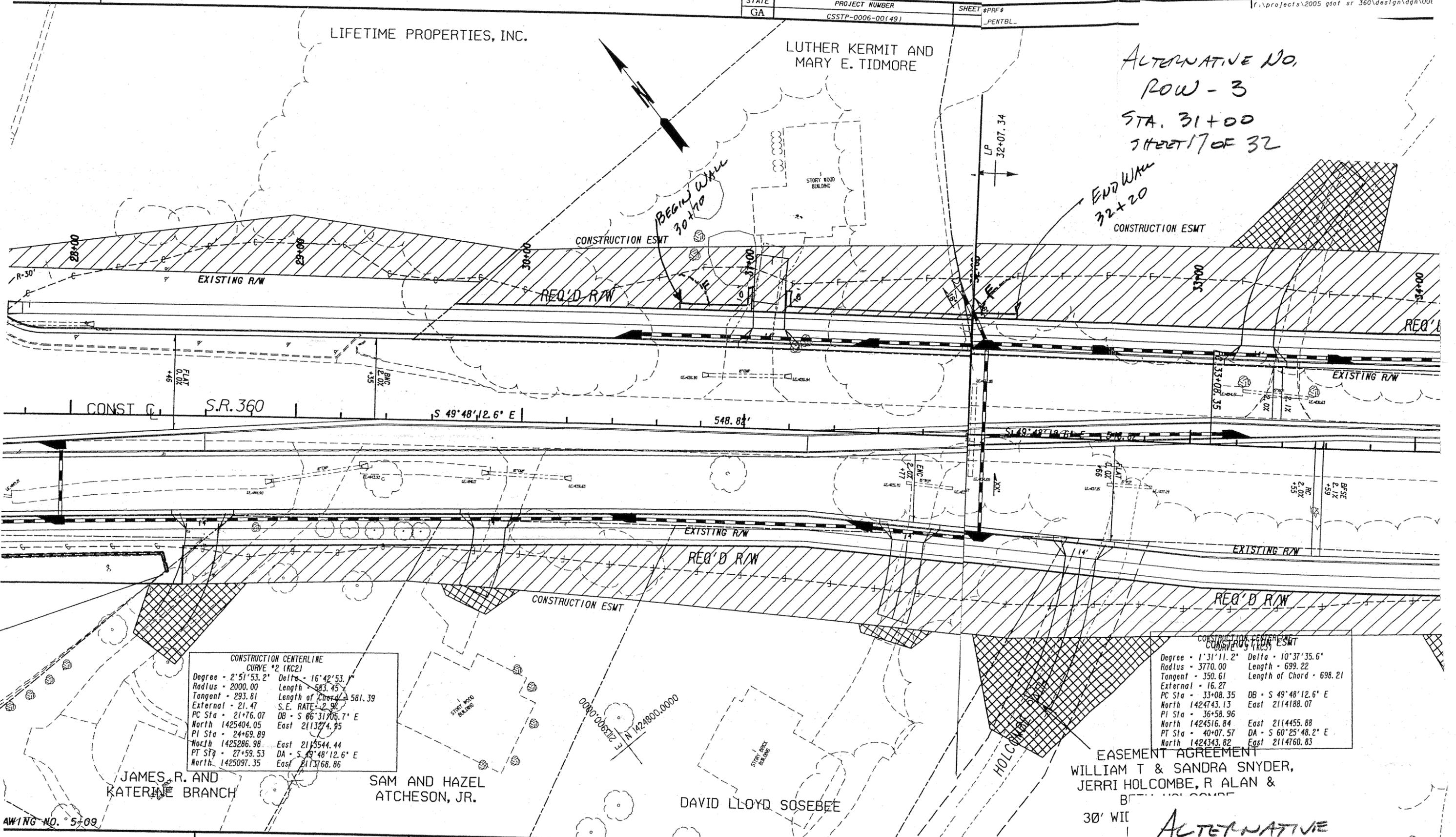
ATION
 TIONS

DRAWING No.
 23-20

LIFETIME PROPERTIES, INC.

LUTHER KERMIT AND MARY E. TIDMORE

ALTERNATIVE NO. 3
ROW - 3
STA. 31+00
SHEET 17 OF 32



CONSTRUCTION CENTERLINE CURVE #2 (KC2)

Degree - 2°51'53.2"	Delta - 16°42'53.7"
Radius - 2000.00	Length - 583.45
Tangent - 293.81	Length of Chord - 581.39
External - 21.47	S.E. RATE - 2.9%
PC Sta - 21+76.07	DB - S 86°31'06.7" E
North 1425404.05	East 2113274.95
PI Sta - 24+69.89	
North 1425286.98	East 2113544.44
PT Sta - 27+59.53	DA - S 49°48'12.6" E
North 1425097.35	East 2113768.86

CONSTRUCTION CENTERLINE CURVE #1 (KC1)

Degree - 1°31'11.2"	Delta - 10°37'35.6"
Radius - 3770.00	Length - 699.22
Tangent - 350.61	Length of Chord - 698.21
External - 16.27	
PC Sta - 33+08.35	DB - S 49°48'12.6" E
North 1424743.13	East 2114188.07
PI Sta - 36+58.96	
North 1424516.84	East 2114455.88
PT Sta - 40+07.57	DA - S 60°25'48.2" E
North 1424343.82	East 2114760.83

EASEMENT AGREEMENT
WILLIAM T & SANDRA SNYDER,
JERRI HOLCOMBE, R ALAN & B...

30' WIL

ALTERNATIVE DESIGN

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(678) 461-3511



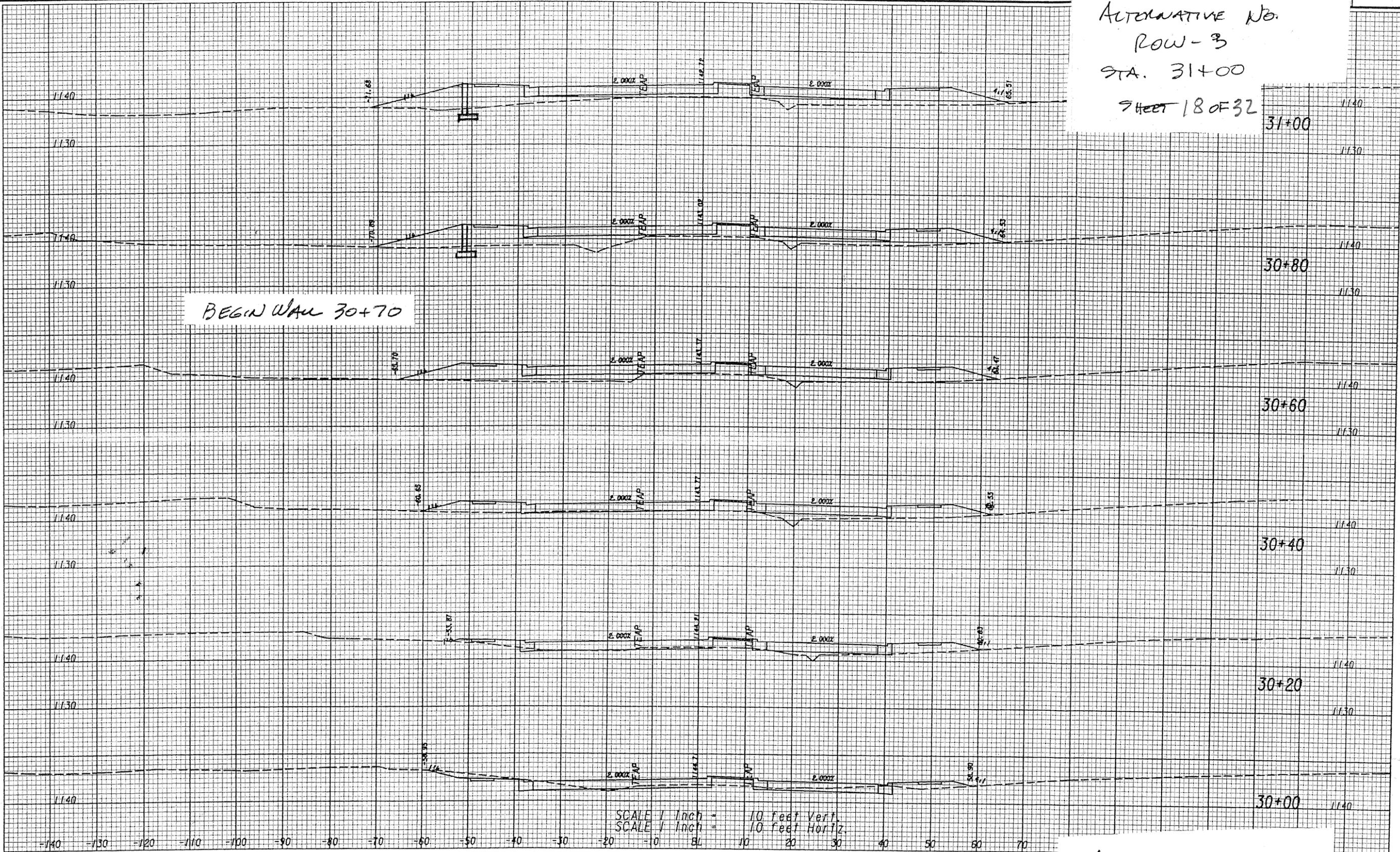
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLANNING**

LEGEND:
 --- R --- RIGHT OF SLOPES
 --- C --- CENTERLINE
 --- F --- FOOTING R/W LINE
 [Hatched Box] MSTR OF SLOPES
 [Cross-hatched Box] MSTR OF SLOPES
 [Cross-hatched Box] MSTR OF DRIVES

M
ENR
1255
RO

ALTERNATIVE No.
ROW-3
STA. 31+00
SHEET 18 OF 32



SCALE 1/4 inch = 10 feet Vert.
SCALE 1/4 inch = 10 feet Horiz.

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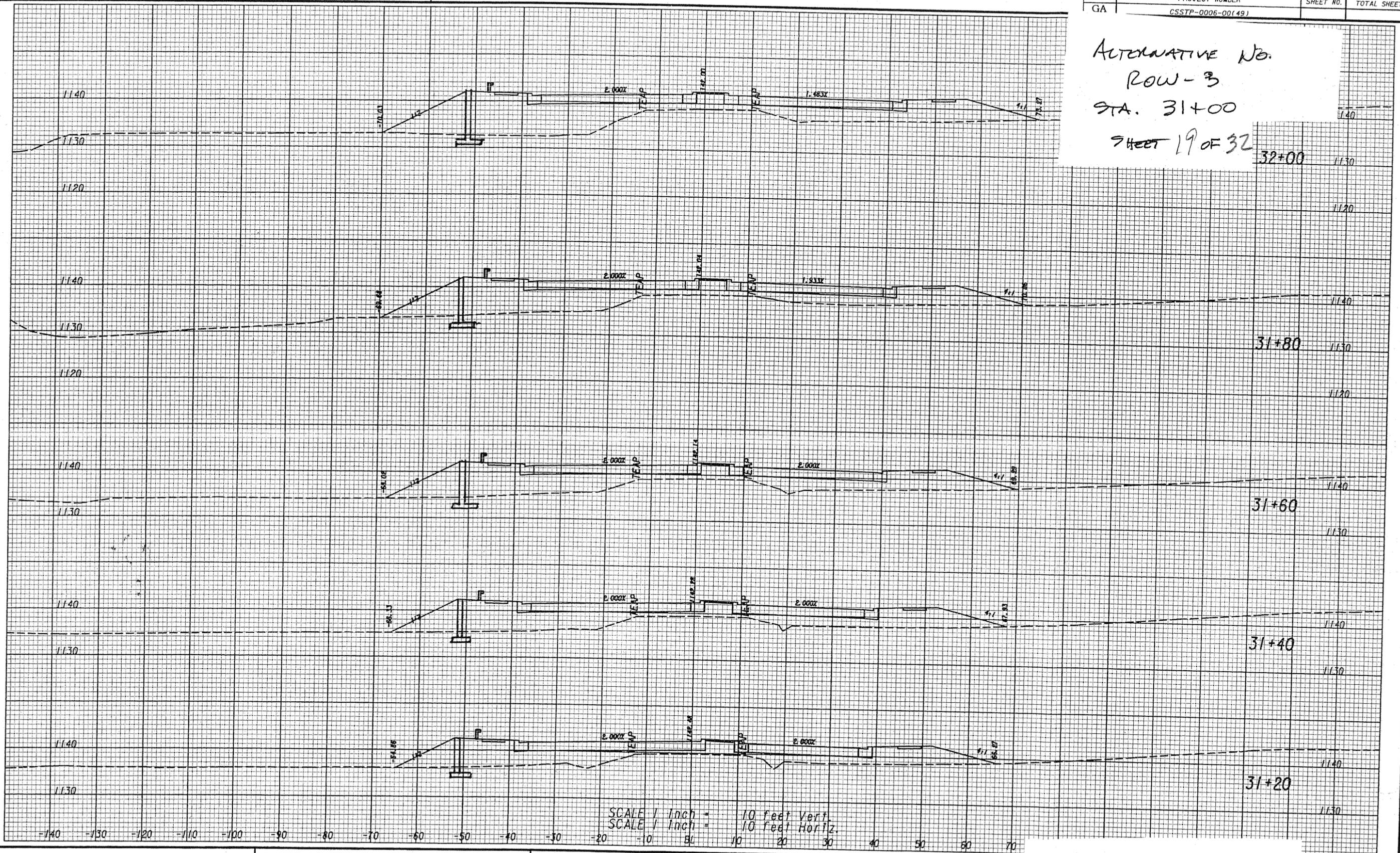
REVISION

ALTERNATIVE
DESIGN

TATION
TIONS

DRAWING No.
23-18

ALTERNATIVE No.
ROW-3
STA. 31+00
SHEET 19 OF 32



SCALE 1/4" = 10 feet Vert.
SCALE 1/4" = 10 feet Horiz.

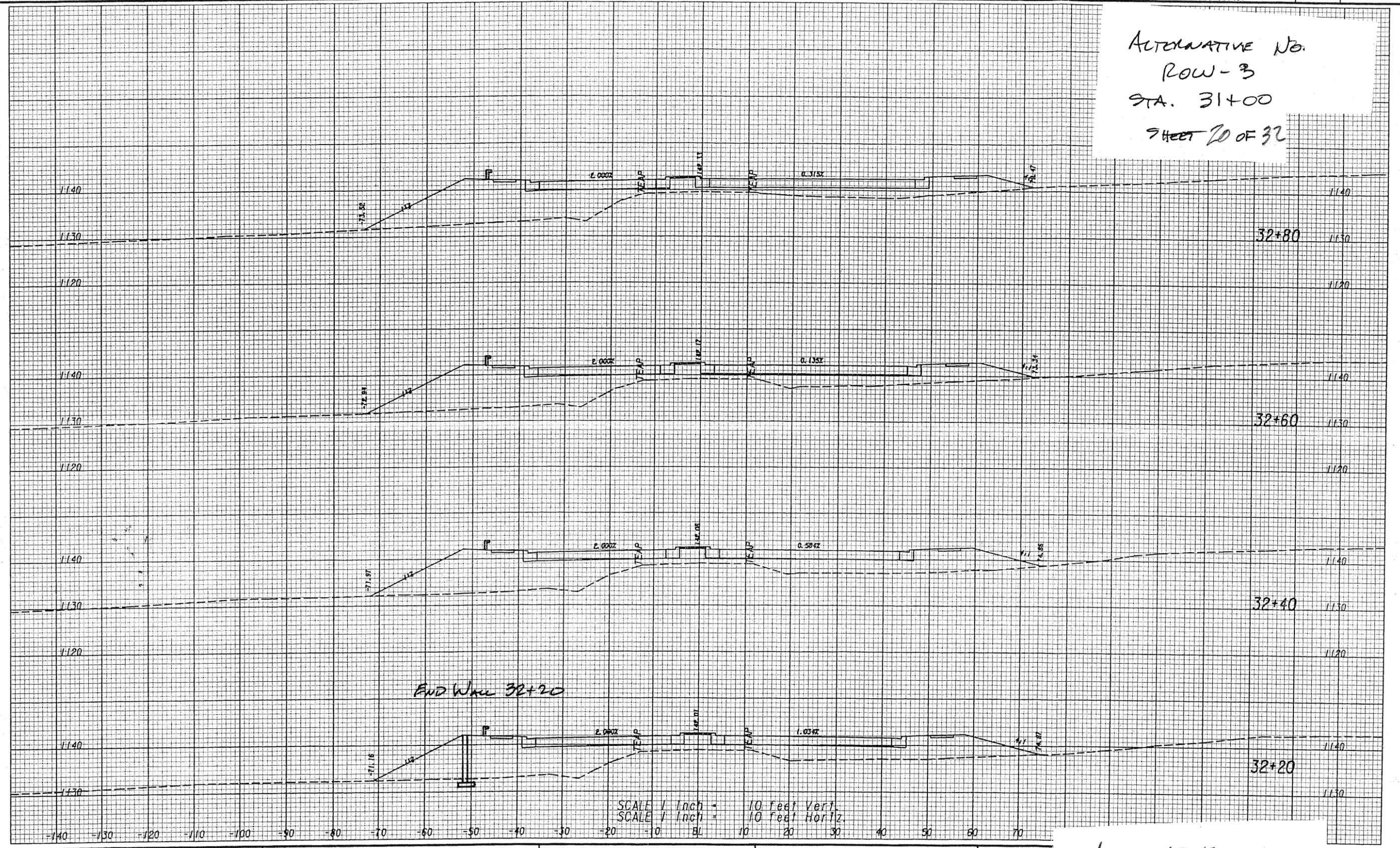
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ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

REVIS

ALTERNATIVE
DESIGN

TRANSPORTATION
SECTIONS

ALTERNATIVE No.
 ROW-3
 STA. 31+00
 SHEET 20 OF 32



SCALE 1/4" = 10 feet Vert.
 SCALE 1/4" = 10 feet Horiz.

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REVISION

ALTERNATIVE
 DESIGN

TATION
 TIONS

DRAWING No.
 23-20



SUBJECT: ALTERNATIVE No.
ROW-3
JOB NO: STA. 31+00 LT

BY: DATE:
CHKD: DATE:
SHEET 21 OF 32

PAGE

SHEET
/

RETAINING WALL AREA

STATION	WALL HEIGHT	WALL AREA
30+70	5	60
+80	7	150
31+00	8	160
+20	8	160
+40	8	170
+60	9	190
+80	10	200
32+00	10	200
+20	10	

TOTAL WALL AREA = 1290 SF

EMBANKMENT REDUCTION - Avg H = 9' Avg W = 18'

$$VOLUME = .5(9)(18)(190)/27 = 450 CY$$

COST WORKSHEET



PROJECT: **WIDENING OF SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**

ALTERNATIVE NO.

*ROW - 3
STA. 31+00 LT*

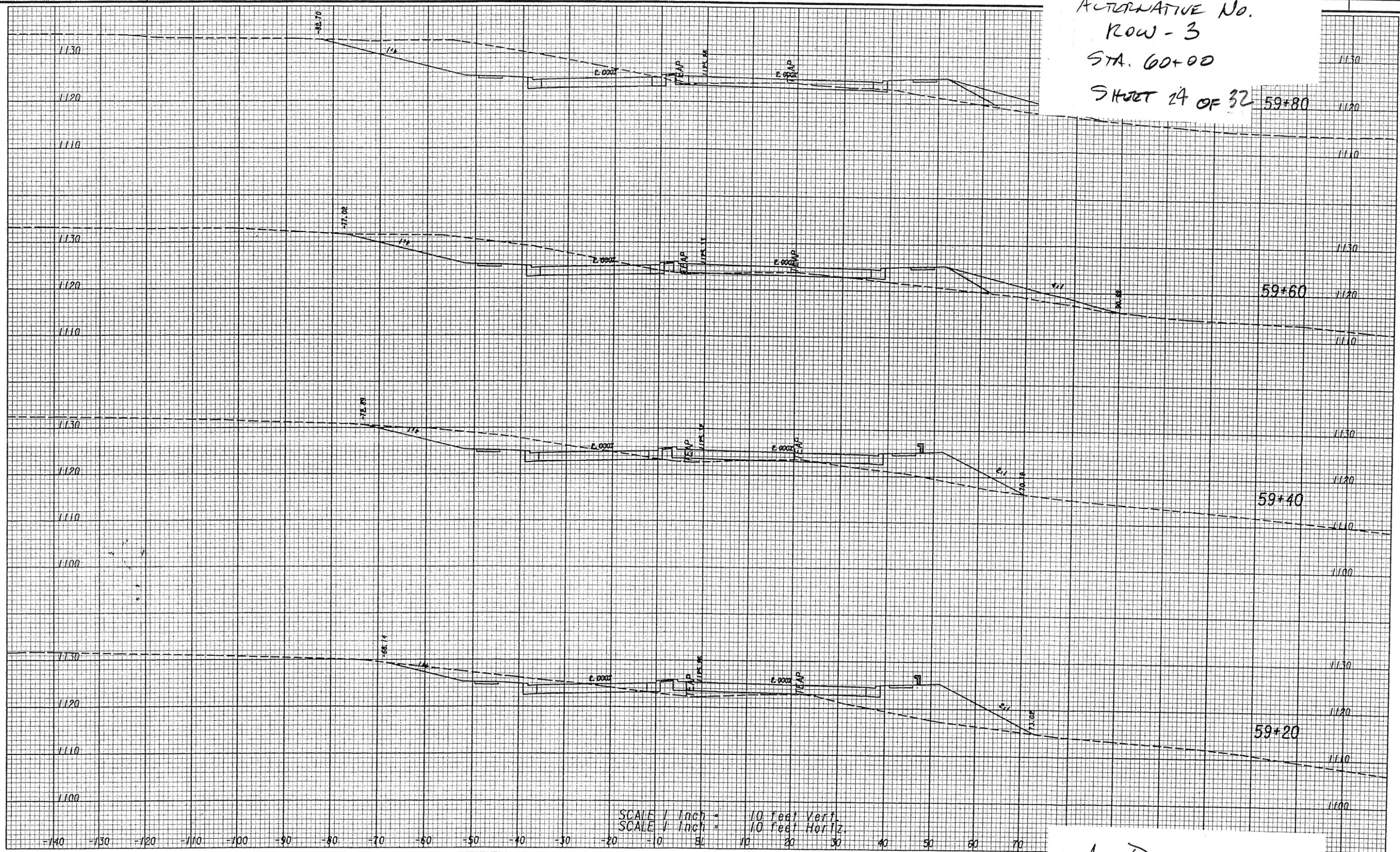
Georgia Department of Transportation

SHEET NO.

22 of 32

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
EMBANKMENT	CY	450	15	6,750	0	-	-
RET. WALL	SF	0	-	-	1290	50.00	64,500
CONST SUBTOTAL				6,750			64,500
CONST. MARKUP 237.5%				16,031			153,188
CONST TOTAL				22,781			217,688
R/W COST	LS	1	60,000	60,000			
RELOCATION COST	LS	1	20,000	20,000			
R/W SUBTOTAL				80,000			
R/W MARKUP 247%				197,600			
R/W TOTAL				277,600			0
Sub-total				300,381			217,688
Mark-up at <i>INCLUDED ABOVE</i> %				-			-
TOTAL				300,381			217,688

ALTERNATIVE No.
ROW - 3
STA. 60+00
SHEET 24 OF 32



SCALE 1/4 inch = 10 feet Vert.
SCALE 1/4 inch = 10 feet Horiz.

As DESIGNED

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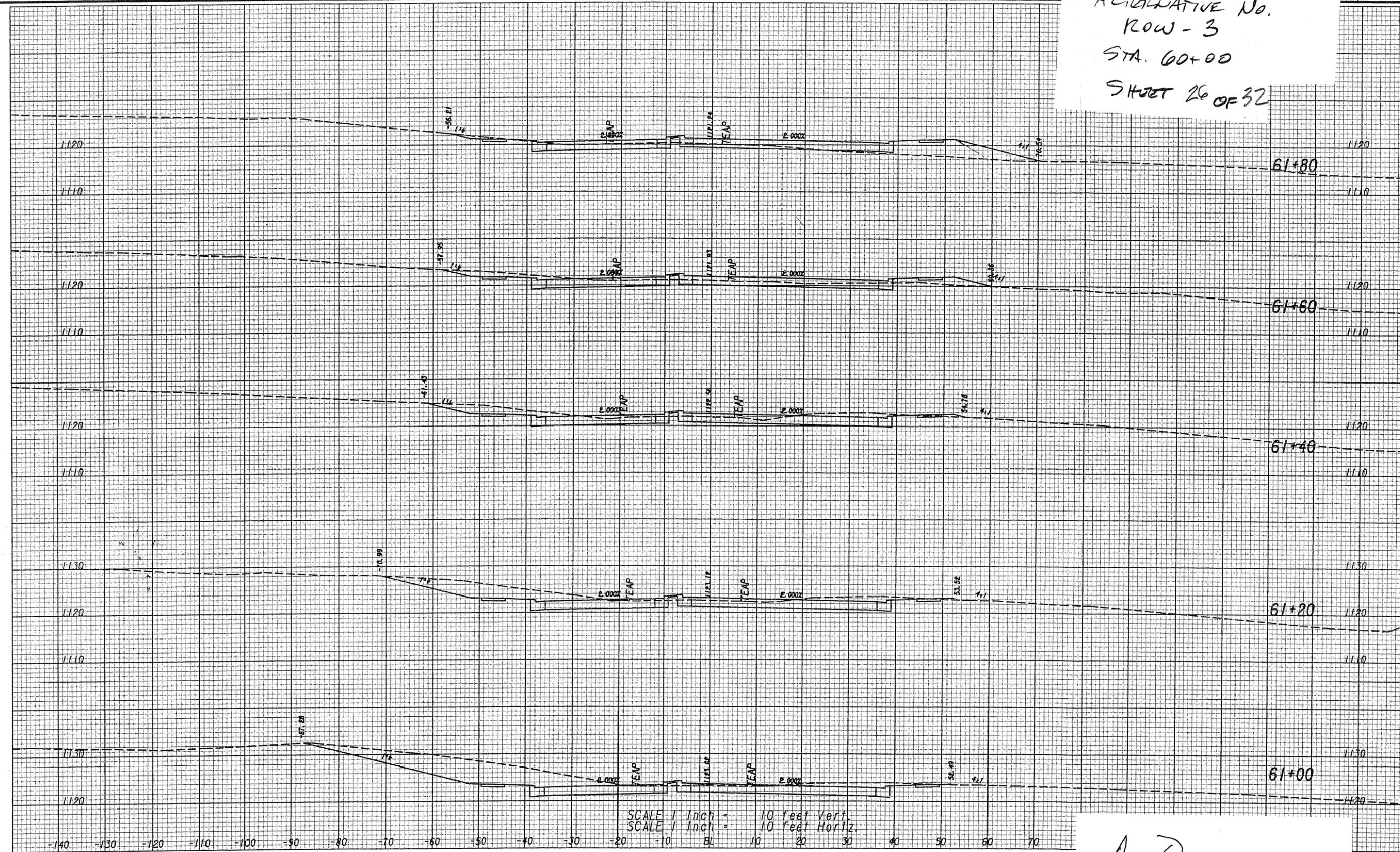
REVISION

STATION

CTIONS

DRAWING No.
23-48

ALTERNATIVE No.
ROW - 3
STA. 60+00
SHEET 26 OF 32



SCALE 1 Inch = 10 feet Vert.
SCALE 1 Inch = 10 feet Horiz.

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REVISION

ATION
TIONS

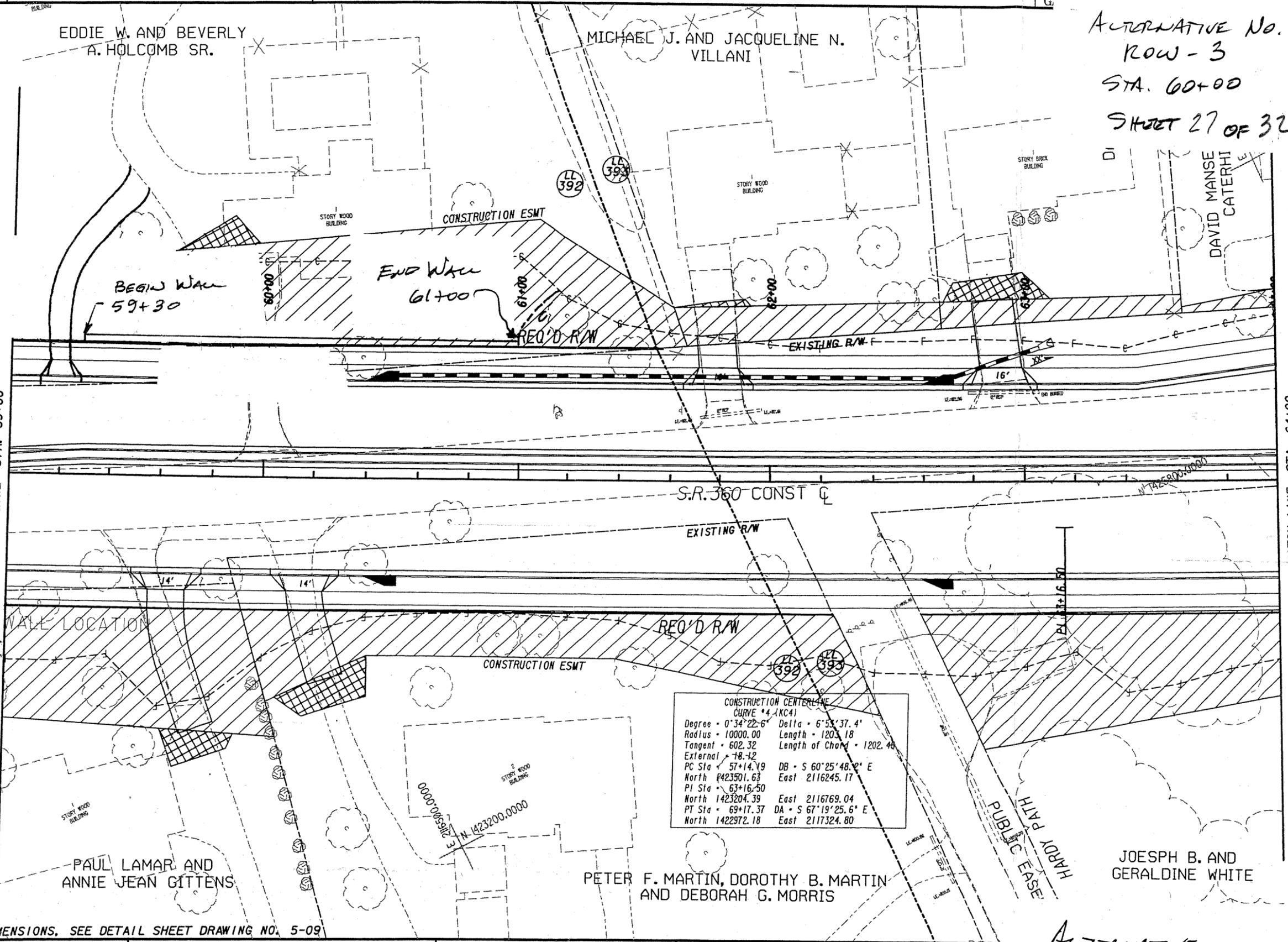
DRAWING No.
23-50

ALTERNATIVE No.
ROW - 3
STA. 60+00
SHEET 27 OF 32



MATCH LINE STA. 59+00

MATCH LINE STA. 64+00



FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

PROPERTY AND EXISTING R/W LINE	---
REQUIRED R/W LINE	---
CONSTRUCTION LIMITS	---C---F---
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	[Hatched Box]
EASEMENT FOR CONSTR OF SLOPES	[Cross-hatched Box]
EASEMENT FOR CONSTR OF DRIVES	[X-hatched Box]

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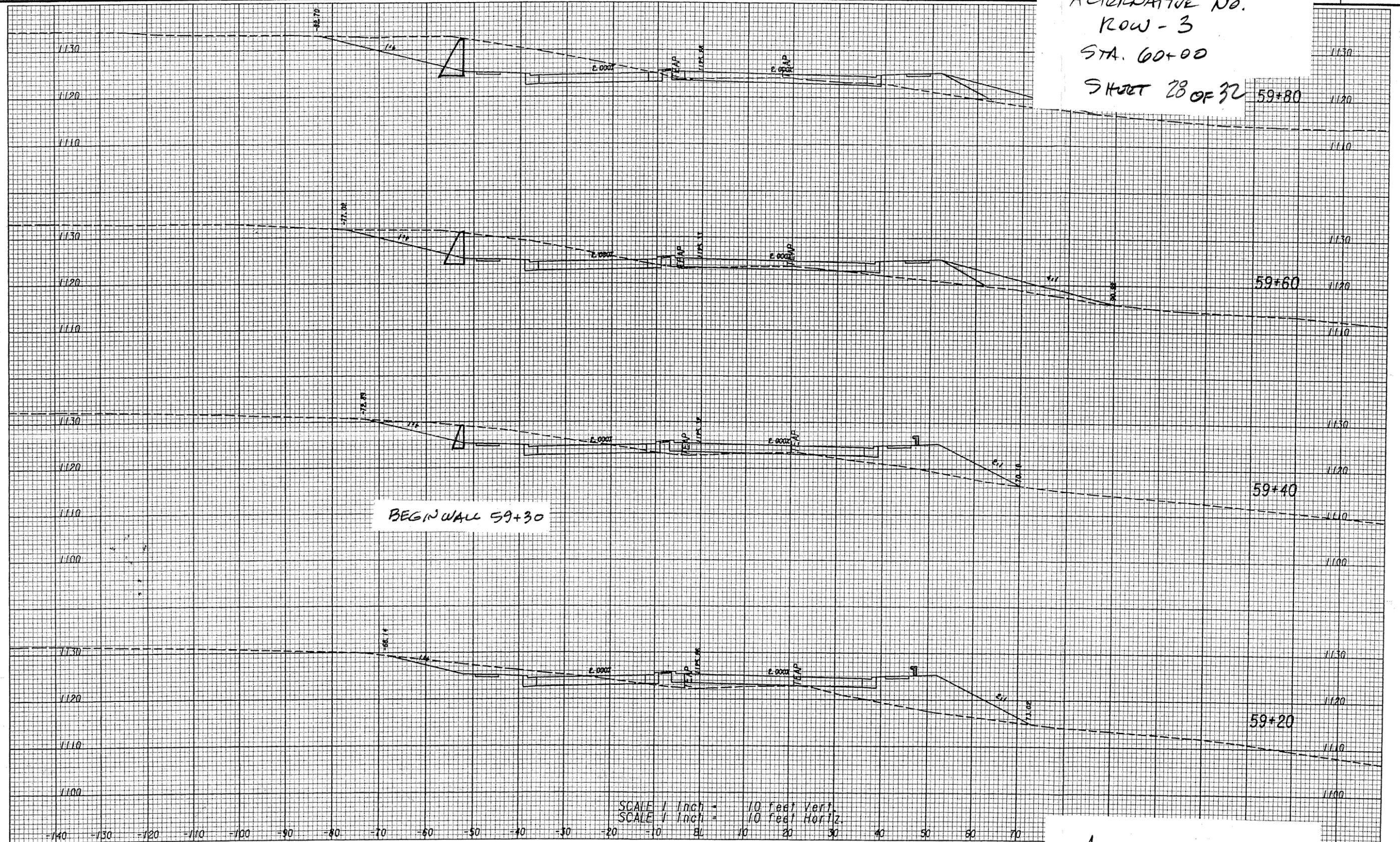
REVISION

ALTERNATIVE DESIGN

TATION

DRAWING No.
13-10

ALTERNATIVE No.
ROW - 3
STA. 60+00
SHEET 28 OF 32



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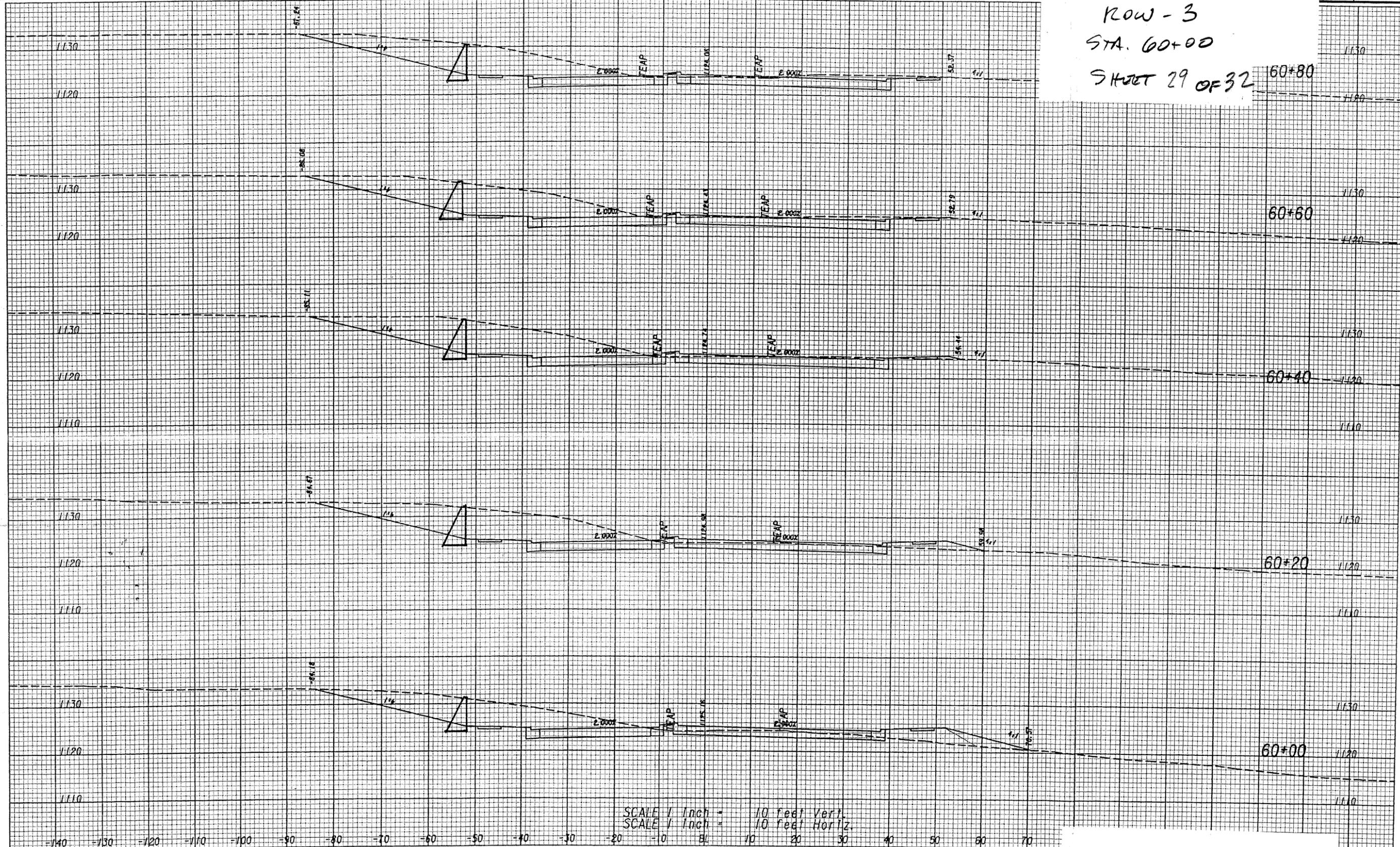
REVISION

ALTERNATIVE
DESIGN

STATION
CTIONS

DRAWING No.
23-48

ALTERNATIVE No.
ROW - 3
STA. 60+00
SHEET 29 OF 32 60+80



SCALE 1/4 inch = 10 feet Vert.
SCALE 1/4 inch = 10 feet Horiz.

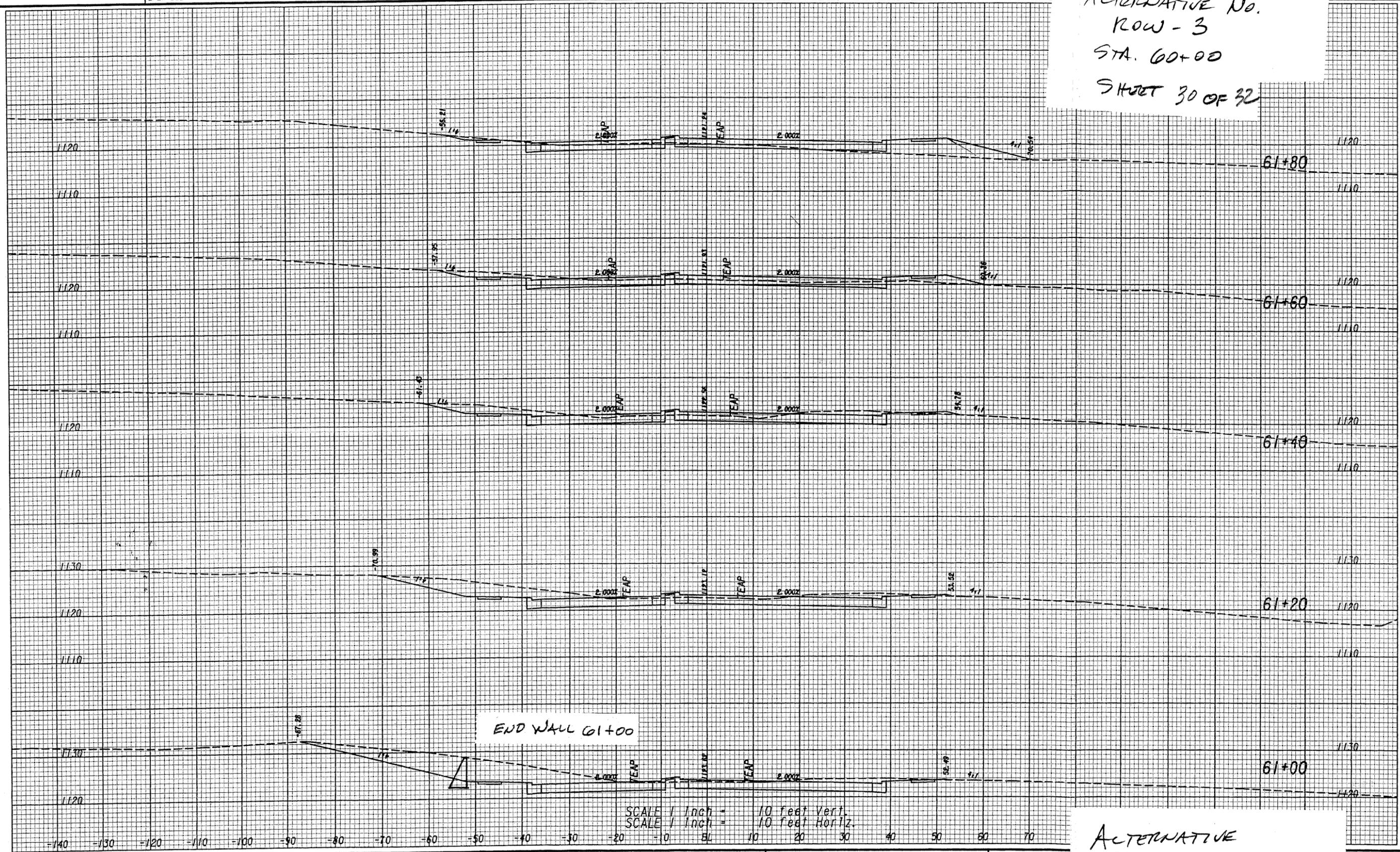
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REVISION

ALTERNATIVE
DESIGN

TATION
CTIONS
DRAWING No.
23-49

ALTERNATIVE No.
ROW - 3
STA. 60+00
SHEET 30 OF 32



SCALE 1 Inch = 10 feet Vert.
SCALE 1 Inch = 10 feet Horiz.

ALTERNATIVE
DESIGN

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REVISION

ATION
TIONS

DRAWING No.
23-50



SUBJECT:

ALTERNATIVE NO.

ROW-3

JOB NO:

STA. 60+00 LT

BY:

DATE:

CHKD:

DATE:

SHEET 31 OF 32

PAGE

SHEET

/

RETAINING WALL

STATION	WALL HT	WALL AREA
59+30	2	35
+40	5	120
+60	7	150
+80	8	150
60+00	7	150
+20	8	170
+40	9	180
+60	9	170
+80	8	140
62+00	6	

$$\text{WALL AREA TOTAL} = 1265$$

$$\text{AVG. HT} = 1265 / 170 = 7.44$$

$$\text{END AREA} = \frac{.67 + 4.39}{2} (7.44) = 18.82$$

$$\text{WALL VOLUME} = 170 (18.82) / 27 = 119 \text{ CY}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia ALTERNATIVE NO.: **ROW-4**

DESCRIPTION: **REDUCE THE WIDTH OF THE MEDIAN FROM 24 FT. TO 22 FT.** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The typical median section is 24 ft. wide with a 30-in.-wide curb and gutter section on each side and a 19-ft.-wide landscaped area in the middle. When a left-turn lane pocket is formed in the median, there is a 4-ft.-wide buffer zone between the through travel lane and the left-turn lane.

ALTERNATIVE: (Sketch attached)

Reduce the median width to 22 ft. by decreasing the width of the buffer zone between the left-turn lane and the through travel lane by 2 ft.

ADVANTAGES:

- Reduces right-of-way costs

DISADVANTAGES:

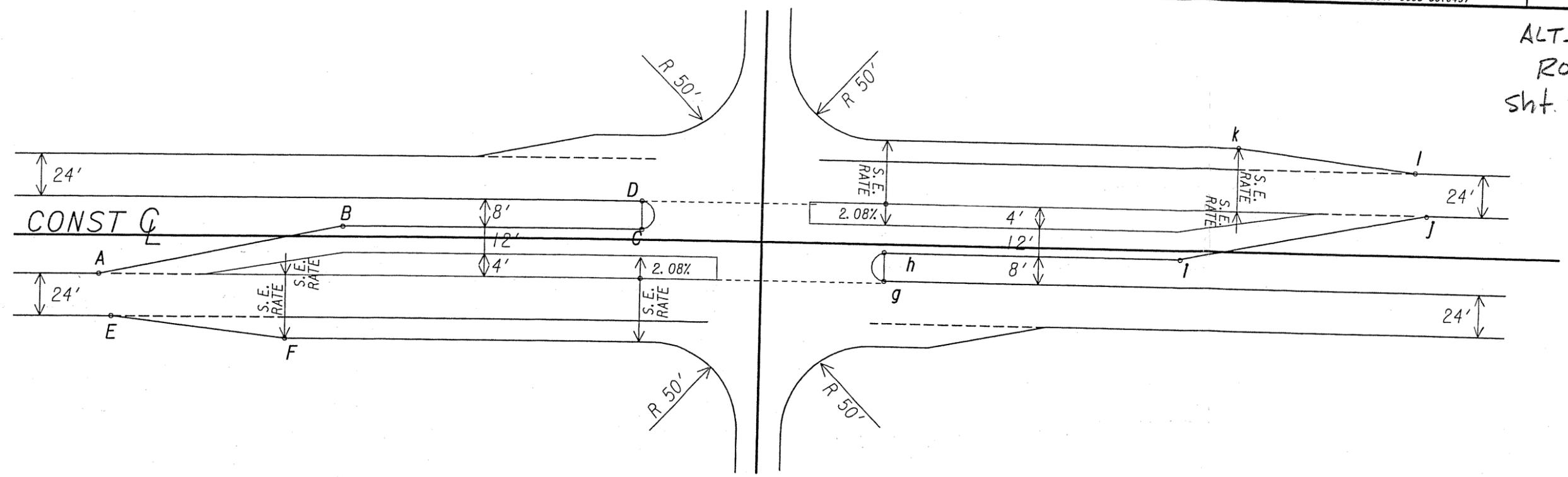
- Requires a change in GDOT policy

DISCUSSION:

The median width is dependent upon the room available for the left-turn lanes. Using a 4-ft.-wide buffer zone between the left-turn lane and the through lane adds pavement and right-of-way costs to the project. In many instances, there is little or no buffer zone between these two lanes. If the proposed approach is taken on this project, significant costs can be saved.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,655,346	—	\$ 1,655,346
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 1,655,346	—	\$ 1,655,346

ALT. NO.
ROW-4
Sht. 2 of 4



MEDI AN OPENING NO.	MEDI AN OPENING LOCATION	A	B	C	D	E	F	G	H	I	J	K	L
	MEDI AN TYPE C	STATION											
1	37+41.70	31+28.36	33+68.19	36+89.49	36+89.49	31+28.64	33+08.36	37+94.17	37+94.17	42+62.62	45+02.60	-----	-----
2	65+33.59	56+90.31	59+29.71	64+79.54	64+79.54	-----	-----	65+88.71	65+88.71	71+38.61	73+78.61	69+17.35	70+17.35
3	81+71.78	73+20.41	75+61.08	81+11.15	81+11.15	74+06.68	75+86.28	82+22.94	82+22.94	86+97.43	89+39.08	86+78.74	88+61.07
4	98+88.74	86+97.43	89+39.41	98+19.28	98+19.28	90+68.15	92+47.39	99+56.44	99+56.44	104+37.62	107+47.69	109+46.69	111+25.17
5	120+06.72	111+90.63	114+30.46	119+45.93	119+45.93	-----	-----	120+59.46	120+59.46	126+09.46	128+49.46	-----	-----
6	135+43.99	127+23.80	129+63.80	134+92.80	134+92.80	127+83.80	129+63.80	135+92.80	135+92.80	141+21.80	143+61.80	141+21.80	143+01.80
7	168+87.30	160+39.48	162+80.18	168+23.25	168+23.25	160+98.49	162+79.04	169+40.43	169+40.43	174+70.99	177+10.64	174+18.20	175+98.20
8	178+00.00	-----	-----	177+02.02	177+01.99	171+20.00	173+00.00	178+53.99	178+53.99	182+34.88	184+73.35	-----	-----
9	190+94.89	182+35.16	184+74.44	190+45.89	190+45.89	-----	-----	191+43.89	191+43.89	196+38.24	198+77.62	-----	-----
10	210+74.90	203+44.90	205+24.90	210+20.90	210+20.90	203+44.90	205+24.90	211+28.90	211+28.90	216+75.77	218+55.83	-----	-----
11	228+04.87	219+95.63	221+75.63	227+39.69	227+39.69	219+95.63	221+75.63	228+57.70	228+57.70	234+03.74	235+83.73	234+03.74	235+83.73
12	247+63.97	239+21.66	241+62.38	247+12.38	247+12.38	-----	-----	248+30.38	248+30.38	253+47.60	255+88.92	251+96.29	253+76.88
13	262+96.71	254+05.15	256+45.44	262+45.92	262+45.92	257+08.06	258+88.09	263+46.40	263+46.40	267+88.04	269+68.04	-----	-----
14	274+54.78	267+88.39	269+68.39	274+05.79	274+05.79	267+88.39	269+68.39	275+03.79	275+03.79	280+23.55	282+03.55	277+13.18	278+93.18
15	288+17.95	280+23.90	282+03.89	287+53.89	287+53.89	281+17.32	282+97.32	288+81.68	288+81.68	294+31.68	296+11.67	293+38.28	295+18.28
16	306+44.55	299+19.53	300+99.48	305+99.55	305+99.55	-----	-----	306+93.55	306+93.55	312+28.89	314+68.89	-----	-----
17	321+25.00	312+29.42	314+69.09	320+76.00	320+76.00	317+51.00	318+51.00	321+74.00	321+74.00	322+71.58	325+11.54	-----	-----

AS DESIGNED

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN

TYPICAL SECTIONS

MEDIAN DETAILS

DRAWING No.
5-10

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia ALTERNATIVE NO.: **ROW-5**

DESCRIPTION: **REDUCE THE WIDTH OF THE MEDIAN FROM 24 FT. TO 20 FT.** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The typical median section is 24 ft. wide with a 30-in.-wide curb and gutter section on each side and a 19-ft.-wide landscaped area in the middle. When a left-turn lane pocket is formed in the median, there is a 4-ft.-wide buffer zone between the through travel lane and the left-turn lane.

ALTERNATIVE: (Sketch attached)

Reduce the median width to 20 ft. by decreasing the width of the buffer zone between the left-turn lane and the through travel lane by 4 ft.

ADVANTAGES:

- Reduces concrete costs
- Reduces right-of-way costs

DISADVANTAGES:

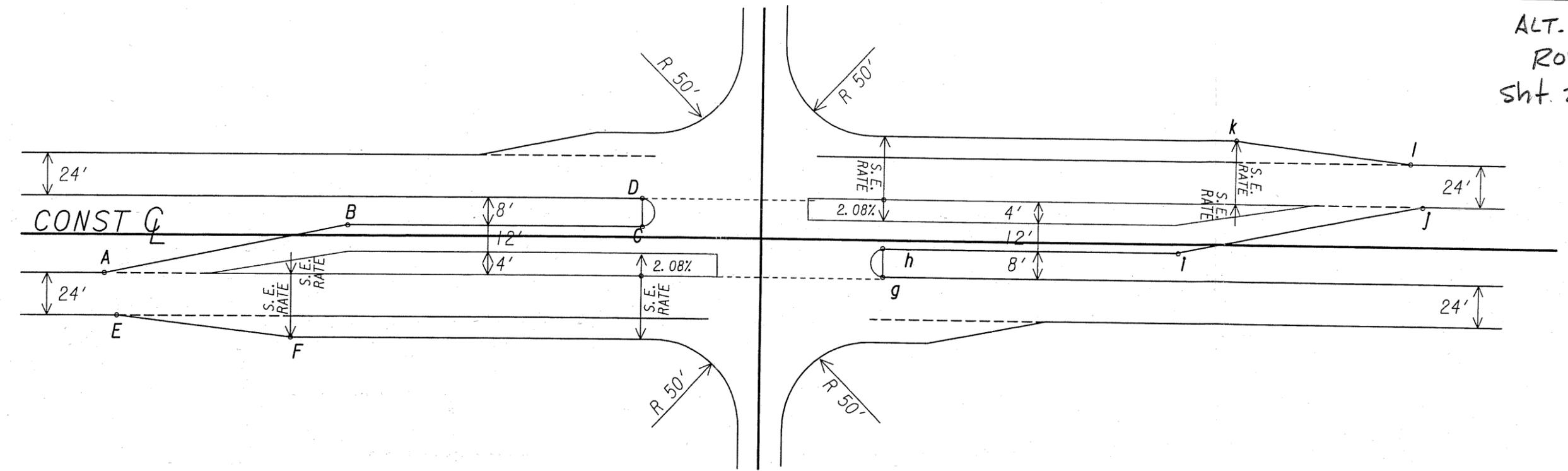
- Requires a change in GDOT policy

DISCUSSION:

The median width depends upon the room available for the left-turn lanes. Using a 4-ft.-wide buffer zone between the left-turn lane and the through lane adds pavement and right-of-way costs to the project. In many instances, there is no buffer zone between these two lanes. If the proposed approach is taken on this project, significant costs can be saved. With few trucks using this route, the need for a buffer zone is questioned.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 3,310,695	—	\$ 3,310,695
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 3,310,695	—	\$ 3,310,695

ALT. NO.
ROW-5
Sht. 2 of 4



MEDI AN OPENING NO.	MEDI AN OPENING LOCATION C	A	B	C	D	E	F	G	H	I	J	K	L
	MEDI AN TYPE C	STATION											
1		37+41.70	31+28.36	33+68.19	36+89.49	36+89.49	31+28.64	33+08.36	37+94.17	37+94.17	42+62.62	45+02.60	-----
2		65+33.59	56+90.31	59+29.71	64+79.54	64+79.54	-----	-----	65+88.71	65+88.71	71+38.61	73+78.61	69+17.35
3		81+71.78	73+20.41	75+61.08	81+11.15	81+11.15	74+06.68	75+86.28	82+22.94	82+22.94	86+97.43	89+39.08	86+78.74
4		98+88.74	86+97.43	89+39.41	98+19.28	98+19.28	90+68.15	92+47.39	99+56.44	99+56.44	104+37.62	107+47.69	88+61.07
5		120+06.72	111+90.63	114+30.46	119+45.93	119+45.93	-----	-----	120+59.46	120+59.46	126+09.46	128+49.46	109+46.69
6		135+43.99	127+23.80	129+63.80	134+92.80	134+92.80	127+83.80	129+63.80	135+92.80	135+92.80	141+21.80	143+61.80	111+25.17
7		168+87.30	160+39.48	162+80.18	168+23.25	168+23.25	160+98.49	162+79.04	169+40.43	169+40.43	174+70.99	177+10.64	141+21.80
8		178+00.00	-----	-----	177+02.02	177+01.99	171+20.00	173+00.00	178+53.99	178+53.99	182+34.88	184+73.35	143+01.80
9		190+94.89	182+35.16	184+74.44	190+45.89	190+45.89	-----	-----	191+43.89	191+43.89	196+38.24	198+77.62	174+18.20
10		210+74.90	203+44.90	205+24.90	210+20.90	210+20.90	203+44.90	205+24.90	211+28.90	211+28.90	216+75.77	218+55.83	175+98.20
11		228+04.87	219+95.63	221+75.63	227+39.69	227+39.69	219+95.63	221+75.63	228+57.70	228+57.70	234+03.74	235+83.73	-----
12		247+63.97	239+21.66	241+62.38	247+12.38	247+12.38	-----	-----	248+30.38	248+30.38	253+47.60	255+88.92	234+03.74
13		262+96.71	254+05.15	256+45.44	262+45.92	262+45.92	257+08.06	258+88.09	263+46.40	263+46.40	267+88.04	269+68.04	235+83.73
14		274+54.78	267+88.39	269+68.39	274+05.79	274+05.79	267+88.39	269+68.39	275+03.79	275+03.79	280+23.55	282+03.55	251+96.29
15		288+17.95	280+23.90	282+03.89	287+53.89	287+53.89	281+17.32	282+97.32	288+81.68	288+81.68	294+31.68	296+11.67	253+76.88
16		306+44.55	299+19.53	300+99.48	305+99.55	305+99.55	-----	-----	306+93.55	306+93.55	312+28.89	314+68.89	277+13.18
17		321+25.00	312+29.42	314+69.09	320+76.00	320+76.00	317+51.00	318+51.00	321+74.00	321+74.00	322+71.58	325+11.54	278+93.18

AS DESIGNED

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1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511

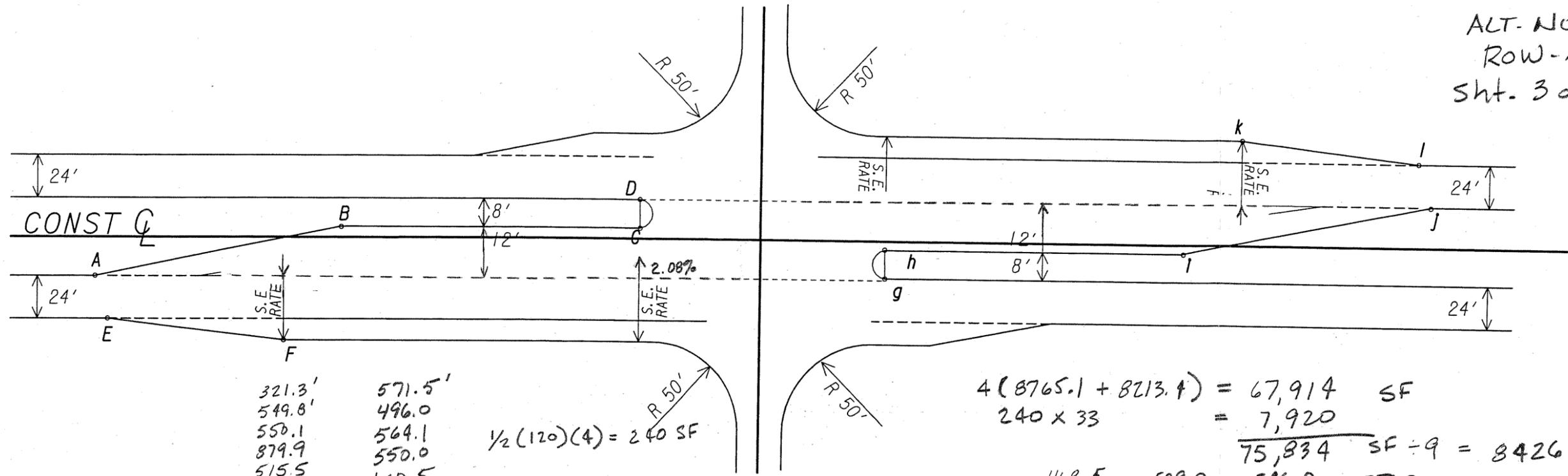
DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
MEDIAN DETAILS

DRAWING No.
5-10

ALT. NO.
Row-5
Sht. 3 of 4



321.3'
 549.8'
 550.1
 879.9
 515.5
 529.0
 543.1
 606.9
 4495.6 + 4269.5 = 8765.1

571.5'
 496.0
 564.1
 550.0
 600.5
 437.4
 550.0
 500.0

$\frac{1}{2}(120)(4) = 240 \text{ SF}$

$4(8765.1 + 8213.4) = 67,914 \text{ SF}$
 $240 \times 33 = 7,920$
 $75,834 \text{ SF} - 9 = 842634$

468.5 529.0 546.0 550.0
 549.9 530.6 517.2 535.3
 474.5 380.9 441.6 97.6
 481.2 494.4 519.8
 550.0 546.9
 $2524.1 + 2481.8 + 2024.6 + 1182.9 = 8213.4 \text{ LF}$

MEDI AN OPENING NO.	MEDI AN OPENING LOCATION	A	B	C	D	E	F	G	H	I	J	K	L
	MEDI AN TYPE C	STATION											
1	37+41.70	31+28.36	33+68.19	36+89.49	36+89.49	31+28.64	33+08.36	37+94.17	37+94.17	42+62.62	45+02.60	-----	STATION
2	65+33.59	56+90.31	59+29.71	64+79.54	64+79.54	-----	-----	65+88.71	65+88.71	71+38.61	73+78.61	69+17.35	70+17.35
3	81+71.78	73+20.41	75+61.08	81+11.15	81+11.15	74+06.68	75+86.28	82+22.94	82+22.94	86+97.43	89+39.08	86+78.74	88+61.07
4	98+88.74	86+97.43	89+39.41	98+19.28	98+19.28	90+68.15	92+47.39	99+56.44	99+56.44	104+37.62	107+47.69	109+46.69	111+25.17
5	120+06.72	111+90.63	114+30.46	119+45.93	119+45.93	-----	-----	120+59.46	120+59.46	126+09.46	128+49.46	-----	-----
6	135+43.99	127+23.80	129+63.80	134+92.80	134+92.80	127+83.80	129+63.80	135+92.80	135+92.80	141+21.80	143+61.80	141+21.80	143+01.80
7	168+87.30	160+39.48	162+80.18	168+23.25	168+23.25	160+98.49	162+79.04	169+40.43	169+40.43	174+70.99	177+10.64	174+18.20	175+98.20
8	178+00.00	-----	-----	177+02.02	177+01.99	171+20.00	173+00.00	178+53.99	178+53.99	182+34.88	184+73.35	-----	-----
9	190+94.89	182+35.16	184+74.44	190+45.89	190+45.89	-----	-----	191+43.89	191+43.89	196+38.24	198+77.62	-----	-----
10	210+74.90	203+44.90	205+24.90	210+20.90	210+20.90	203+44.90	205+24.90	211+28.90	211+28.90	216+75.77	218+55.83	-----	-----
11	228+04.87	219+95.63	221+75.63	227+39.69	227+39.69	219+95.63	221+75.63	228+57.70	228+57.70	234+03.74	235+83.73	234+03.74	235+83.73
12	247+63.97	239+21.66	241+62.38	247+12.38	247+12.38	-----	-----	248+30.38	248+30.38	253+47.60	255+88.92	251+96.29	253+76.88
13	262+96.71	254+05.15	256+45.44	262+45.92	262+45.92	257+08.06	258+88.09	263+46.40	263+46.40	267+88.04	269+68.04	-----	-----
14	274+54.78	267+88.39	269+68.39	274+05.79	274+05.79	267+88.39	269+68.39	275+03.79	275+03.79	280+23.55	282+03.55	277+13.18	278+93.18
15	288+17.95	280+23.90	282+03.89	287+53.89	287+53.89	281+17.32	282+97.32	288+81.68	288+81.68	294+31.68	296+11.67	293+38.28	295+18.28
16	306+44.55	299+19.53	300+99.48	305+99.55	305+99.55	-----	-----	306+93.55	306+93.55	312+28.89	314+68.89	-----	-----
17	321+25.00	312+29.42	314+69.09	320+76.00	320+76.00	317+51.00	318+51.00	321+74.00	321+74.00	322+71.58	325+11.54	-----	-----

ALTERNATIVE

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ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION	DATE	DESCRIPTION

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
MEDIAN DETAILS

DRAWING NO.
5-10

COST WORKSHEET



PROJECT: **WIDENING OF SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**

ALTERNATIVE NO. **ROW-5**

Georgia Department of Transportation

SHEET NO. **4 of 4**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
PAVEMENT	SY	8426	59.74	503,369			
MARK-UP	237.5%			<u>1,195,501</u>			
SUBTOTAL CONST.				1,698,870			
RIGHT-OF-WAY							
PAULDING CITY							
4 x 32,790 x .5	SF	65,580	3.436	225,333			
COPB COUNTY							
4 x 32,790 x .5	SF	65,580	3.647	239,170			
SUBTOTAL				<u>464,503</u>			
MARK-UP	247%			1,147,322			
SUBTOTAL ROW				<u>1,611,825</u>			
Sub-total				3,310,695			
Mark-up at %				INCL.			
TOTAL				3,310,695			

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia ALTERNATIVE NO.: **ROW-7**

DESCRIPTION: **ELIMINATE THE 4-FT.-WIDE BUFFER STRIPS AT THE LEFT-TURN LANE POCKETS IN THE MEDIAN** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

A 4-ft.-wide painted pavement area separates the through traffic lanes from the dedicated left-turn lanes cut into the median.

ALTERNATIVE: (Sketch attached)

Delete the 4-ft.-wide painted pavement area.

ADVANTAGES:

- Reduces the amount of pavement area and its associated cost

DISADVANTAGES:

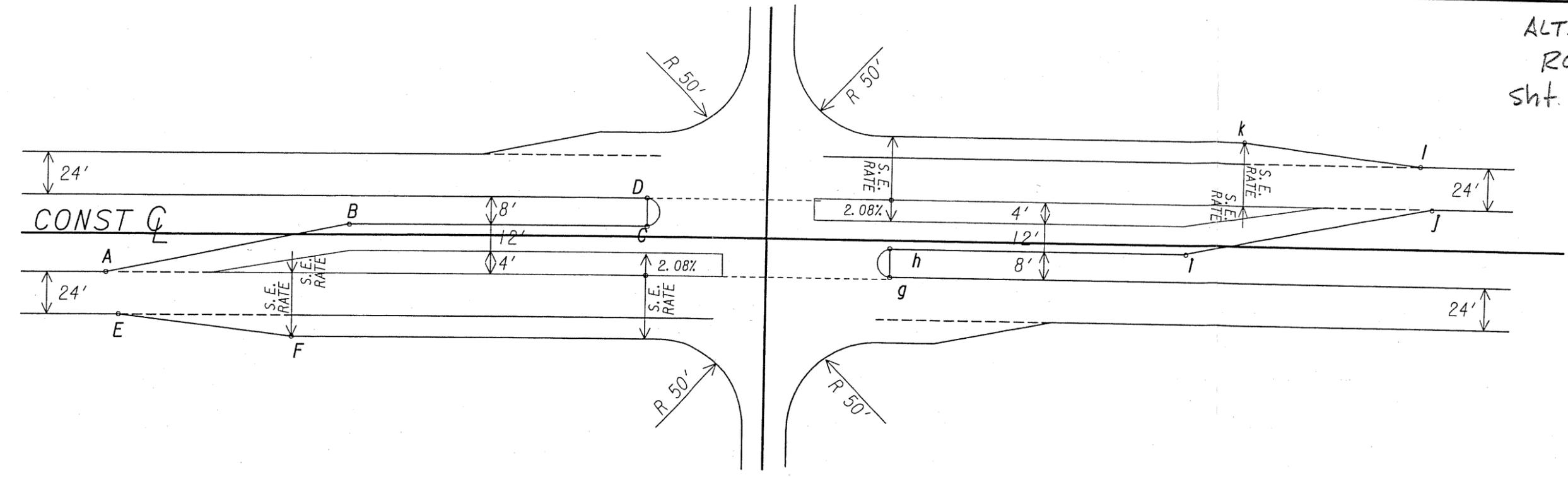
- Could be perceived as being less safe

DISCUSSION:

There are many instances where this painted pavement strip has not been installed without any negative consequences. The cost savings on this project are significant since there is a left-turn pocket over about 70% of the project's length.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,698,871	—	\$ 1,698,871
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 1,698,871	—	\$ 1,698,871

ALT. NO.
ROW-7
Sht 2 of 4



MUTUAL

MUTUAL

MUTUAL

Design/dan/006049/10.dwg 2/6/2008 12:54:24 PM

MEDI AN OPENING NO.	MEDI AN OPENING LOCATION	A	B	C	D	E	F	G	H	I	J	K	L
	MEDI AN TYPE C	STATION											
1	37+41.70	31+28.36	33+68.19	36+89.49	36+89.49	31+28.64	33+08.36	37+94.17	37+94.17	42+62.62	45+02.60	-----	-----
2	65+33.59	56+90.31	59+29.71	64+79.54	64+79.54	-----	-----	65+88.71	65+88.71	71+38.61	73+78.61	69+17.35	70+17.35
3	81+71.78	73+20.41	75+61.08	81+11.15	81+11.15	74+06.68	75+86.28	82+22.94	82+22.94	86+97.43	89+39.08	86+78.74	88+61.07
4	98+88.74	86+97.43	89+39.41	98+19.28	98+19.28	90+68.15	92+47.39	99+56.44	99+56.44	104+37.62	107+47.69	109+46.69	111+25.17
5	120+06.72	111+90.63	114+30.46	119+45.93	119+45.93	-----	-----	120+59.46	120+59.46	126+09.46	128+49.46	-----	-----
6	135+43.99	127+23.80	129+63.80	134+92.80	134+92.80	127+83.80	129+63.80	135+92.80	135+92.80	141+21.80	143+61.80	141+21.80	143+01.80
7	168+87.30	160+39.48	162+80.18	168+23.25	168+23.25	160+98.49	162+79.04	169+40.43	169+40.43	174+70.99	177+10.64	174+18.20	175+98.20
8	178+00.00	-----	-----	177+02.02	177+01.99	171+20.00	173+00.00	178+53.99	178+53.99	182+34.88	184+73.35	-----	-----
9	190+94.89	182+35.16	184+74.44	190+45.89	190+45.89	-----	-----	191+43.89	191+43.89	196+38.24	198+77.62	-----	-----
10	210+74.90	203+44.90	205+24.90	210+20.90	210+20.90	203+44.90	205+24.90	211+28.90	211+28.90	216+75.77	218+55.83	-----	-----
11	228+04.87	219+95.63	221+75.63	227+39.69	227+39.69	219+95.63	221+75.63	228+57.70	228+57.70	234+03.74	235+83.73	234+03.74	235+83.73
12	247+63.97	239+21.66	241+62.38	247+12.38	247+12.38	-----	-----	248+30.38	248+30.38	253+47.60	255+88.92	251+96.29	253+76.88
13	262+96.71	254+05.15	256+45.44	262+45.92	262+45.92	257+08.06	258+88.09	263+46.40	263+46.40	267+88.04	269+68.04	-----	-----
14	274+54.78	267+88.39	269+68.39	274+05.79	274+05.79	267+88.39	269+68.39	275+03.79	275+03.79	280+23.55	282+03.55	277+13.18	278+93.18
15	288+17.95	280+23.90	282+03.89	287+53.89	287+53.89	281+17.32	282+97.32	288+81.68	288+81.68	294+31.68	296+11.67	293+38.28	295+18.28
16	306+44.55	299+19.53	300+99.48	305+99.55	305+99.55	-----	-----	306+93.55	306+93.55	312+28.89	314+68.89	-----	-----
17	321+25.00	312+29.42	314+69.09	320+76.00	320+76.00	317+51.00	318+51.00	321+74.00	321+74.00	322+71.58	325+11.54	-----	-----

AS DESIGNED

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
MEDI AN DETAILS

DRAWING NO.
5-10

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **ROW-8**

DESCRIPTION: **REDUCE WIDTH OF THE URBAN SHOULDER FROM 16 FT. TO 12 FT.**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

The urban shoulder is currently shown at 16 ft. wide, including 2.5 ft. of curb and gutter, 6 ft. of inside grass strip, 5 ft. of concrete sidewalk, and 2.5 ft. of outside grass strip before the break in the embankment or cut section.

ALTERNATIVE: (Sketch attached)

Reduce the shoulder width to 12 ft. The new shoulder will include 2.5 ft. of curb and gutter, 2 ft. of inside grass strip, 5 ft. of concrete sidewalk and 2.5 ft. of outside grass strip. On the attached cross-sections, the savings in earthwork is drawn as an example.

ADVANTAGES:

- Reduces right-of-way costs
- Reduces earthwork (cut and fill) costs

DISADVANTAGES:

- Utilities would have to be placed under the sidewalk, making maintenance more difficult

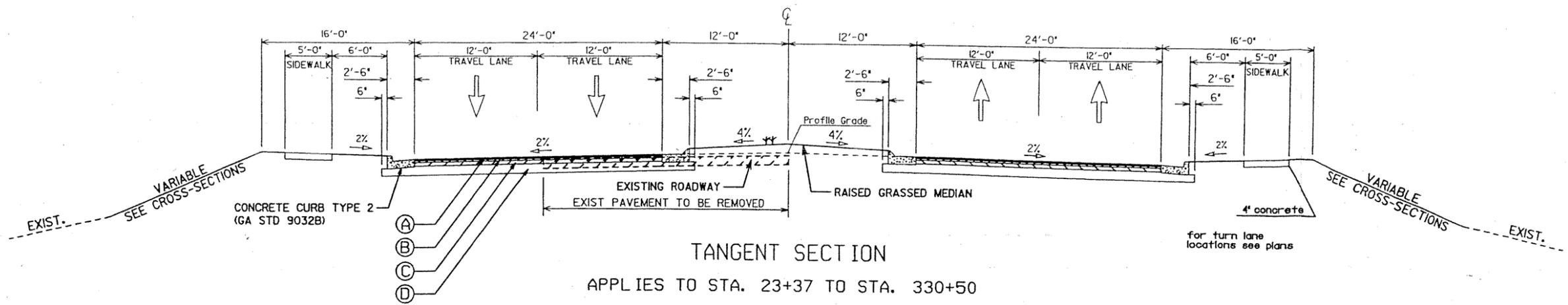
DISCUSSION:

If the shoulder width can be reduced to minimum allowable, there will be noticeable cost savings in right-of-way purchases and less grass to maintain. Cut and fill earthwork can also be reduced to reduce costs as well.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 5,157,262	—	\$ 5,157,262
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 5,157,262	—	\$ 5,157,262

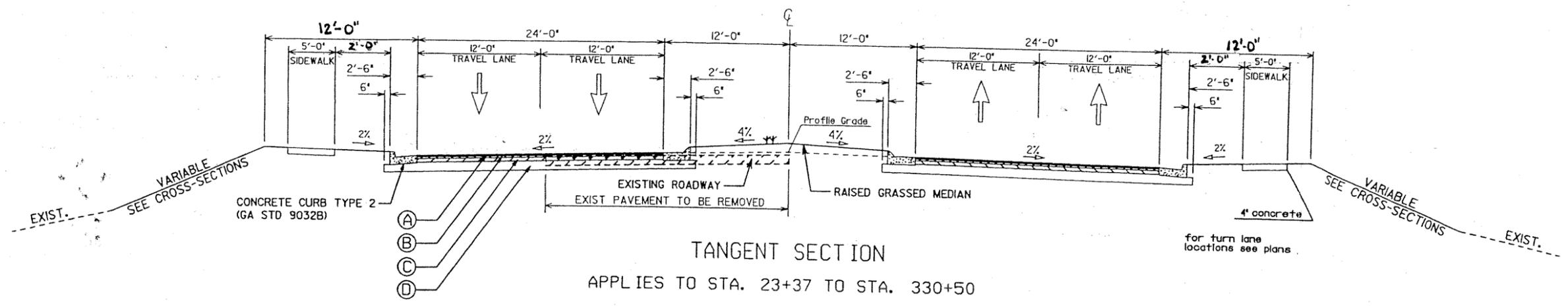
ALT. NO.
ROW-08
Sht. 2 of 6

TS-01



TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50

AS DESIGNED



TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50

ALTERNATIVE

MULKEY
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ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

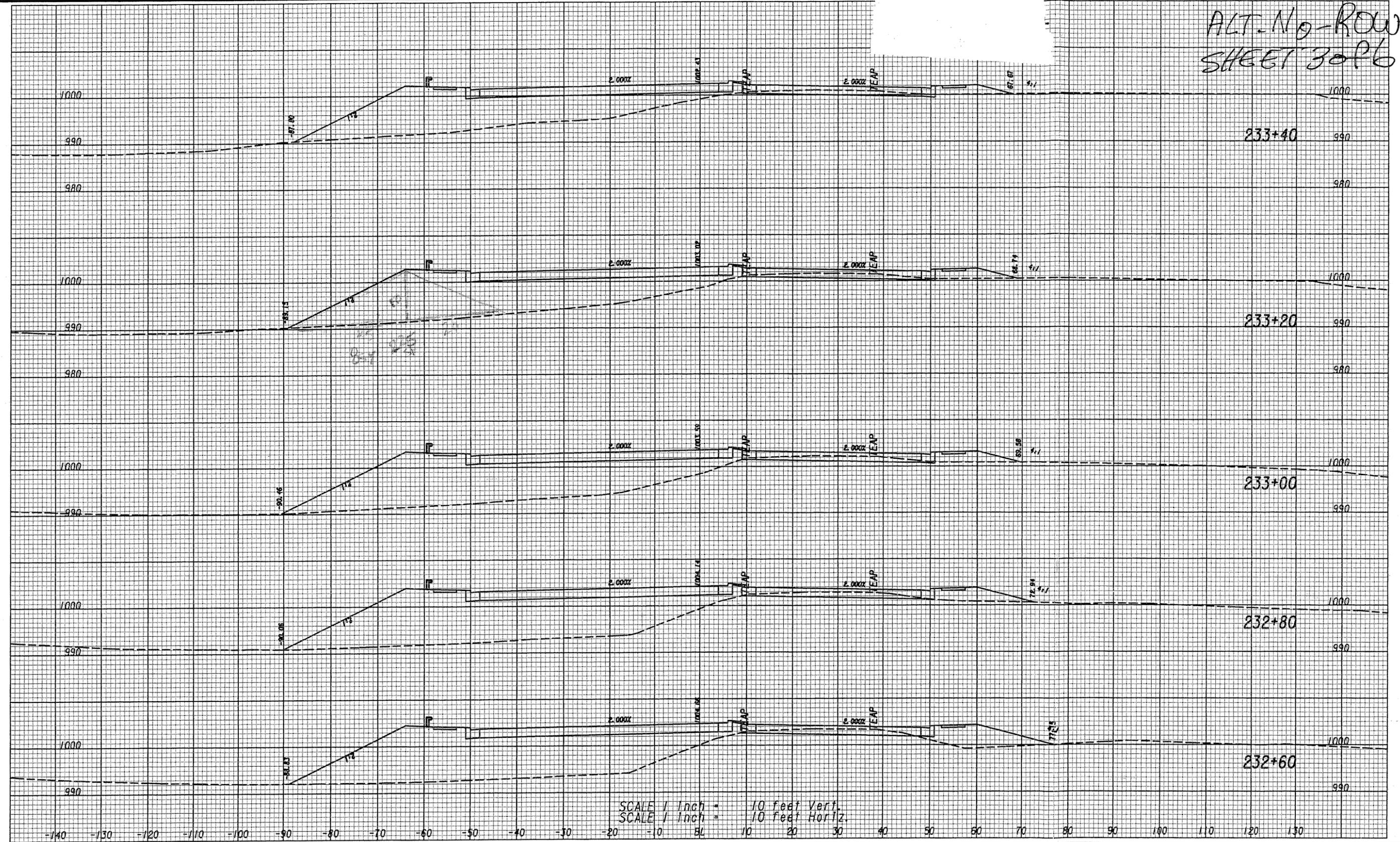
REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS

SR 360

DRAWING No.
5-01

ALT. No - ROWS
SHEET 3 of 6



SCALE 1 Inch = 10 feet Vert.
SCALE 1 Inch = 10 feet Horiz.

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(678) 461-3511

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
EARTHWORK CROSS SECTIONS
SR 360

DRAWING No.
23-221

CALCULATIONS



PROJECT: **WIDENING of SR 360 FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: ROW-08

SHEET NO.: 5 of 6

16 ft shoulder (existing)

-4 ft from grassed strip

12 ft of suggested shoulder

project length \rightarrow 32,790'

$$(12' \times 32790) \rightarrow 393,480 \text{ ft}^2$$

$$(16' \times 32790) \rightarrow 524,640 \text{ ft}^2$$

$$\textcircled{131,160 \text{ ft}^2} \text{ save}$$

$$\text{Cobb County} \rightarrow 16385 \times 2 \Rightarrow 32770' (5') = 163850 \text{ SF}$$

$$\text{Paulding County} \rightarrow 16405 \times 2 \Rightarrow 32810' (5') = 164050 \text{ SF}$$

30 SF of fill
Fill

$$8192 \times 120 \rightarrow 983,040$$

$$8192 \times 30 \rightarrow 245,760 \uparrow$$

$$1,228,800$$

$$8202 \times 120 \rightarrow 984,240$$

$$8202 \times 30 \rightarrow 246,060 \uparrow$$

$$1,230,300$$

60 SF of cut
Cut

$$8192 \times 60 \rightarrow 491,520$$

$$8192 \times 120$$

$$(2703360 \text{ SF}) \div 9 = 300373 \text{ CF}$$

$$\textcircled{111380 \text{ CY}}$$

$$8202 \times 60 \rightarrow 492,120$$

$$8202 \times 120 \rightarrow$$

$$(2706660 \text{ SF}) \div 9 = 300740 \text{ CF}$$

$$\textcircled{11139 \text{ CY}}$$

COST WORKSHEET



PROJECT: **WIDENING OF SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**

ALTERNATIVE NO. **ROW-08**

Georgia Department of Transportation

SHEET NO. **6 of 6**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
RIGHT-OF-WAY (Cobb Cty)	SF	163850	3.647	\$597561			
(Paulding Cty)	SF	164050	3.436	\$563675			
subtotal				\$1161236			
mark-up	2.47			\$2868253			
total →				<u>\$4029489</u>			
Earthwork (Cobb Cty)							
in place embankmt	CY	11138	15 ⁰⁰	\$167,070			
(Paulding Cty)							
in place embankmt	CY	11139	15 ⁰⁰	\$167,085			
subtotal				\$334,155			
mark-up	2.375			\$793,618			
total →				<u>\$1,127,773</u>			
Sub-total				\$5,157,262			0
Mark-up at	%			shown above			
TOTAL				\$5,157,262			0

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia ALTERNATIVE NO.: **ROW-10**

DESCRIPTION: **REDUCE THE BACK OF OUTSIDE CURB TO BACK OF OUTSIDE CURB DISTANCE TO THE MINIMUM (COMBINE ALT. NOS. P-1, ROW-1 AND ROW-7)** SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (Sketch attached)

In the typical section, the face of outside curb to face of outside curb dimension is 76 ft., which includes four 30-in.-wide curbs, four 12-ft.-wide paved travel lanes, two 6-in.-wide curbs at the median, and a 19-ft.-wide landscaped median. Where a left-turn lane is placed in the median, a 4-ft.-wide buffer zone is between the through lane and the turn lane is also added resulting in an 8-ft.-wide nose piece consisting of two 30-in.-wide curb and gutter sections and 3-ft.-wide concrete infill piece. Where right-turn lanes are needed, add a 12-ft.-wide lane to the outside of the through lanes.

ALTERNATIVE: (Sketch attached)

Reduce the back of outside curb to back of outside curb dimension to the minimum by using 18-in.-wide curb and gutter sections at the outside edge of the roadway and at the median, 11-ft.-wide paved travel lanes, and 16-ft.-wide landscaped median for a total width of 66 ft. At the nose sections where left-turn lanes are added to the median, use an 11-ft.-wide lane, delete the 4-ft.-wide buffer zone, leaving an 8-ft.-wide median consisting of two 18-in.-wide curb and gutter sections and a 5-ft.-wide concrete infill piece. Use an 11-ft.-wide lane for the four dedicated right-turn lanes. Move centerline alignment so the total savings in right-of-way occurs on one side of the road in order to avoid taking some residential and commercial properties.

ADVANTAGES:

- Reduces right-of-way costs
- Avoids having to take some properties
- Reduces pavement costs
- Reduces concrete costs

DISADVANTAGES:

- Requires a change in GDOT policy

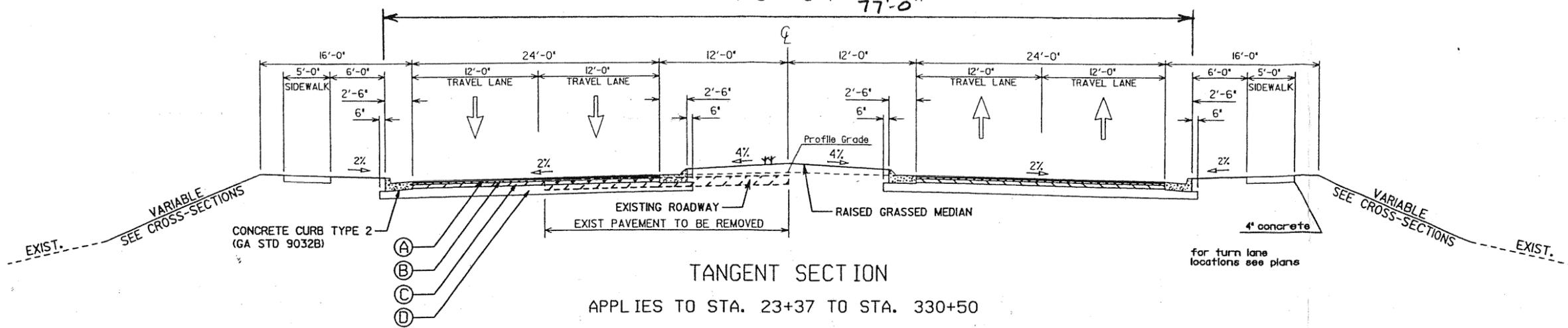
DISCUSSION:

This project’s cost is driven by right-of-way and pavement. This alternative reduces the width of the typical section from 77 ft. to 66 ft., back of outside curb to back of outside curb by combining Alt. Nos. P-1, ROW-1 and ROW-7. An additional 1 ft. is saved where there is a right-turn lane. Reducing these to the minimum will allow the greatest reduction in cost while providing a four-lane divided arterial.

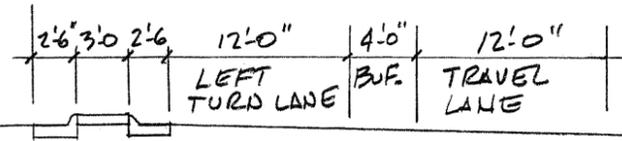
Truck traffic is projected to be very low, and the proposed lane widths and curb and gutter sections are typically used by other DOTs and are acceptable to FHWA. Thus, safety will not be compromised.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 15,836,265	—	\$ 15,836,265
ALTERNATIVE	\$ 401,153	—	\$ 401,153
SAVINGS	\$ 15,435,112	—	\$ 15,435,112

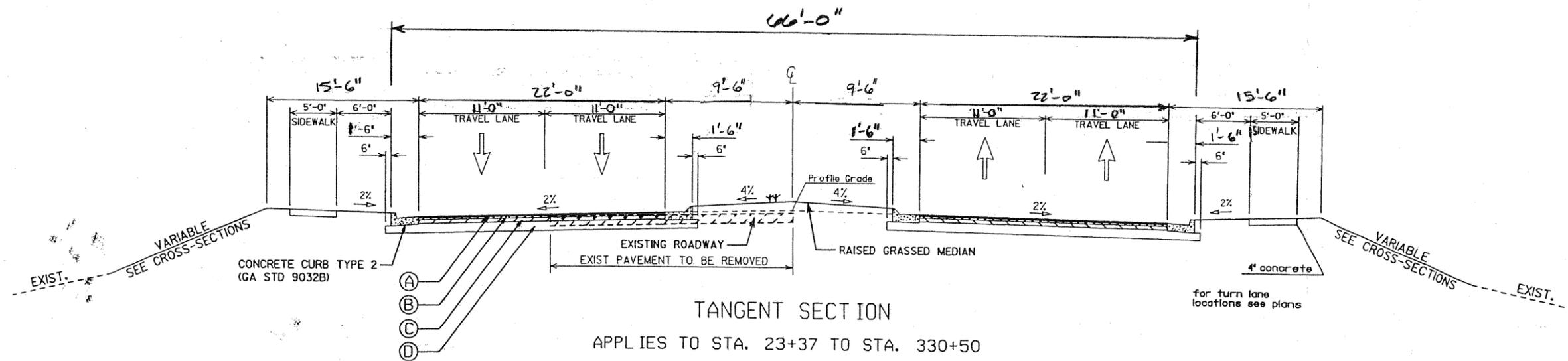
TS-01 77'-0"



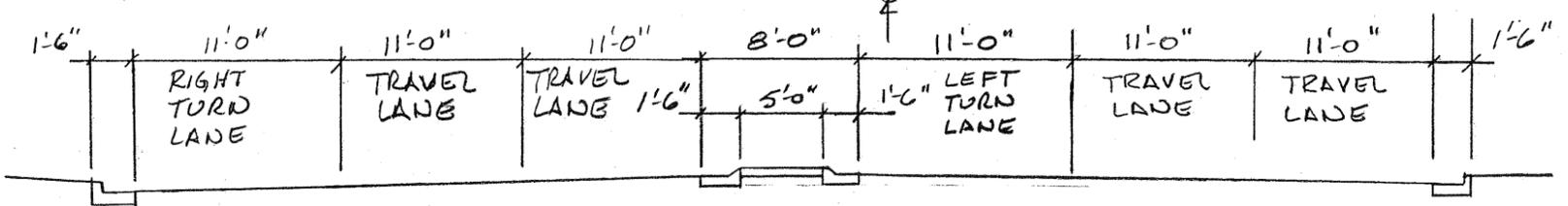
TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50



AS DESIGNED



TANGENT SECTION
APPLIES TO STA. 23+37 TO STA. 330+50



ALTERNATIVE

RIGHT / LEFT TURN LANES

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS

SR 360

DRAWING No.
5-01

CALCULATIONS



PROJECT: **WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: ROW-10

SHEET NO.: 3 of 5

RIGHT-OF-WAY SAVINGS

STA

SEE OTHERS.

$$\frac{30,750 \text{ LF} \times 11'}{1} = 338,250 \text{ SF}$$

$$\text{RIGHT LANES} - 40\% \text{ of } 30,750 \times 1' \times 2 = 24,600$$
$$\underline{362,850 \text{ SF}} \checkmark$$

MEDIAN CONCRETE

$$16978' \times 1.05 \times \frac{2'}{9} = 3962 \text{ sy} \checkmark$$



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: **SR 360 WIDENING - Project No.: CSSTP-0006-00(049), P.I. No.: 0006049**
Cobb and Paulding Counties, Georgia

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
GENERAL (G)						
G-1	Improve intersections at Poplar Spring Road with Old Atlanta Road and Macland Circle and remove intersections of Old Atlanta Road and Macland Circle with SR 360	\$ 1,061,791	\$ 687,001	\$ 374,790		\$ 374,790
G-2	Cul-de-sac Bullard Road on south side of SR 360 and delete tee intersection	\$ 611,942	\$ 86,900	\$ 525,042		\$ 525,042
BRIDGES (B)						
B-1	Use a precast concrete arch culvert in lieu of a bridge at Powder Springs Creek	\$ 5,035,048	\$ 3,406,877	\$ 1,628,171		\$ 1,628,171
B-2	Use a single-span bridge in lieu of a three-span bridge at each bridge location	\$ 2,840,852	\$ 2,655,511	\$ 185,341		\$ 185,341
SIDEWALKS (S)						
S-1	Place sidewalks on one side of road only	\$ 2,148,695	\$ -	\$ 2,148,695		\$ 2,148,695
S-2	Use asphalt in lieu of concrete for sidewalks	\$ 4,303,884	\$ 2,173,078	\$ 2,130,806		\$ 2,130,806
S-3	Install a sidewalk on the north side of SR 360 from Bullard Road to SR 176 and along the east side of Bullard Road in lieu of throughout the project	\$ 4,394,250	\$ 538,059	\$ 3,856,191		\$ 3,856,191
EMBANKMENT (E)						
E-1	Use 2:1 cut slopes in lieu of 4:1 cut slopes in selected locations	\$ 4,319,746	\$ 2,630,576	\$ 1,689,170		\$ 1,689,170
E-3	Use 2:1 fill slopes in lieu of 4:1 fill slopes in selected locations, move the sidewalk closer to the edge of road, and add W-beam guard rail along the edge of the embankment	\$ 3,151,189	\$ 581,850	\$ 2,569,339		\$ 2,569,339

VALUE ENGINEERING ALTERNATIVE



PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **G-1**

DESCRIPTION: IMPROVE INTERSECTION AT POPLAR SPRING ROAD WITH OLD ATLANTA ROAD/MACLAND CIRCLE AND REMOVE INTERSECTIONS OF ATLANTA ROAD AND MACLAND CIRCLE WITH SR 360

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

Add and improve two intersections at Macland Circle and Old Atlanta Road with SR 360.

ALTERNATIVE: (Sketch attached)

Remove proposed intersections and cul-de-sac Macland Circle and Old Atlanta Road. Improve the intersection of Poplar Spring Road with Macland Circle/Old Atlanta Road by relocating it south if needed to miss left-turn pockets from proposed Poplar Spring Road/SR 360 intersection improvements.

ADVANTAGES:

- Reduces costs
- Reduces access to SR 360, thus enhancing safety
- Reduces right-of-way
- Reduces turn lanes
- Reduces materials

DISADVANTAGES:

- Improvements may conflict with new left-turn pockets proposed along Poplar Spring Road
- Limits access for property owners

DISCUSSION:

There are too many intersections too close together along SR 360. This alternative eliminates two of them and channelizes the traffic to Poplar Spring Road before routing it to SR 360. Although this change saves costs, it can be justified based on safety improvements alone.

The right-of-way impacts are also reduced because the auxiliary lane from Poplar Springs Road to the Macland Circle intersection is eliminated and replaced with some right-of-way for the cul-de-sac and movement of Macland Circle and Old Atlanta Road to the south in order to intersect Poplar Springs Road south of the new left-turn lanes.

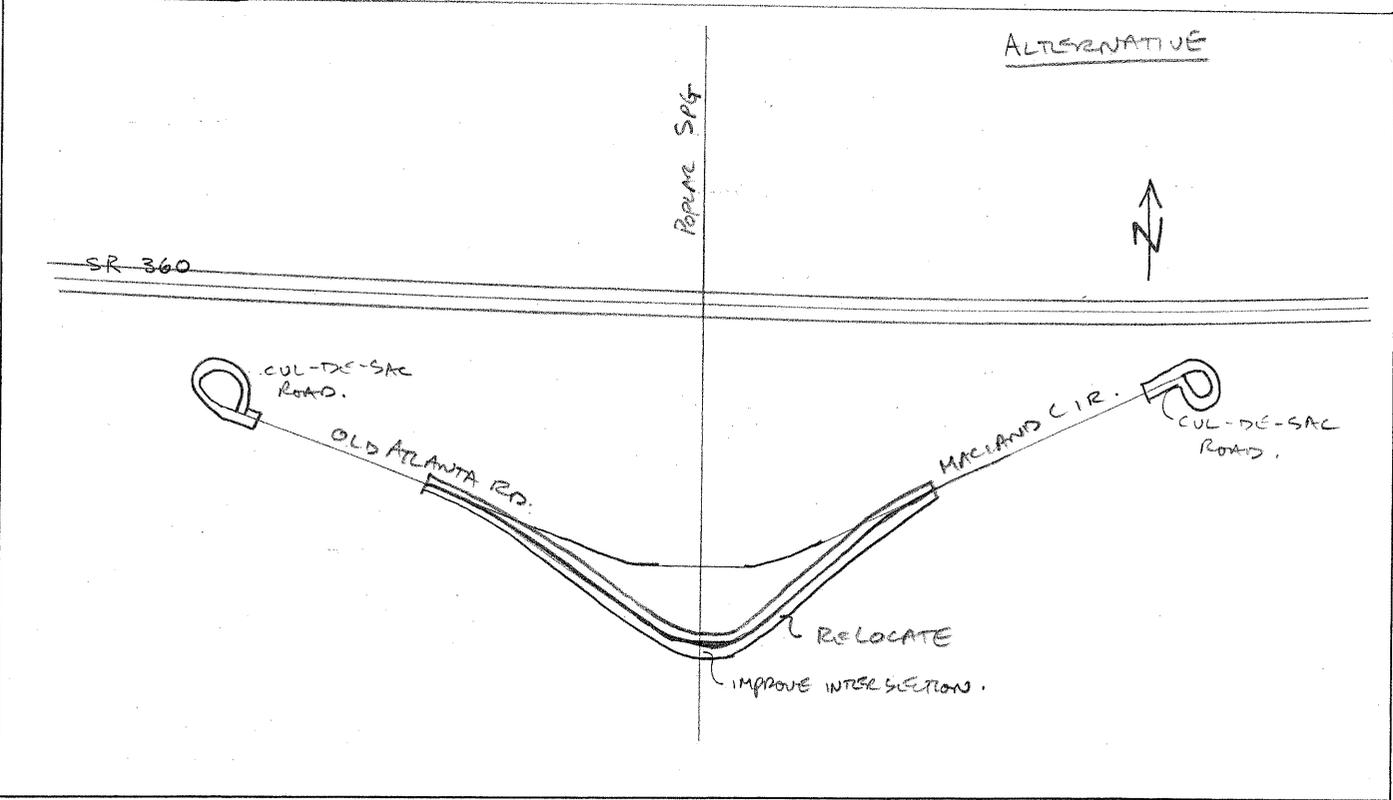
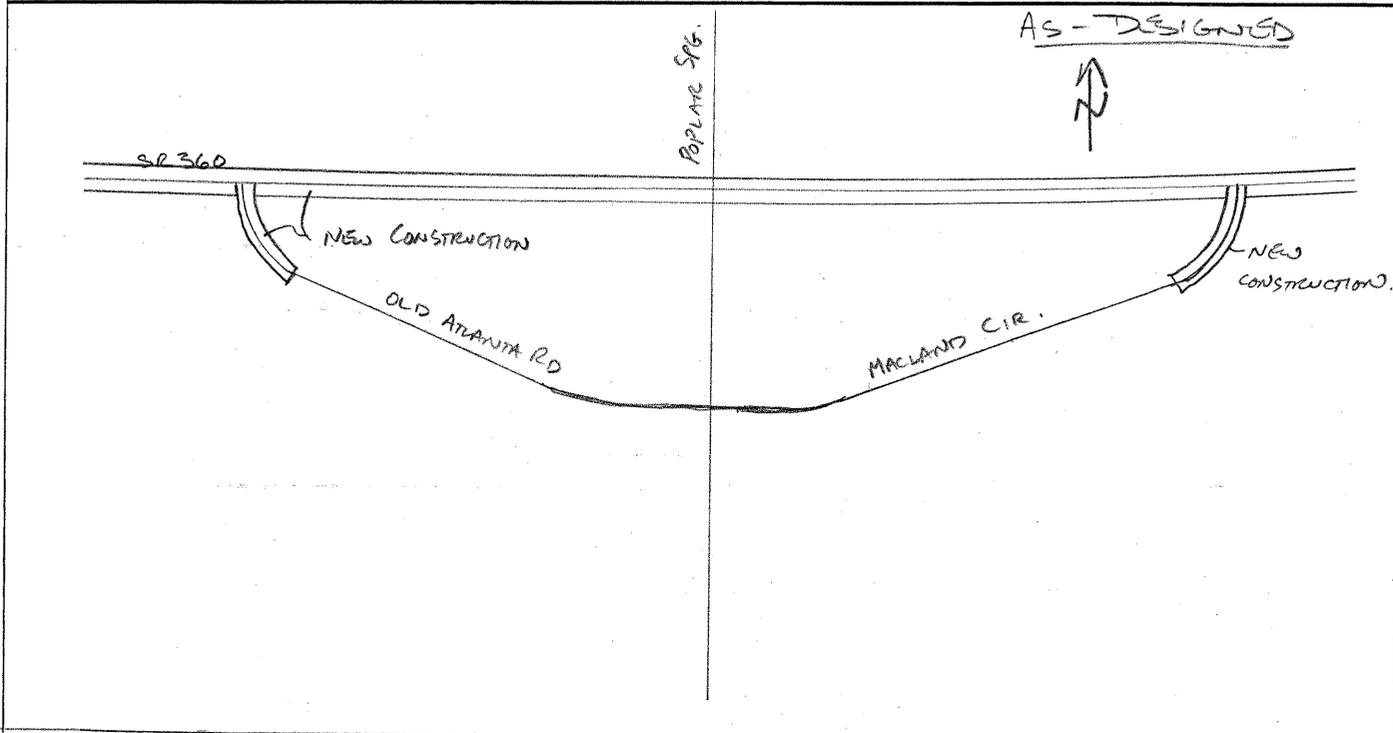
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,061,791	—	\$ 1,061,791
ALTERNATIVE	\$ 687,001	—	\$ 687,001
SAVINGS	\$ 374,790	—	\$ 374,790

PROJECT: **WIDENING of SR 360 FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: G-1

AS DESIGNED ALTERNATIVE

SHEET NO.: 2 of 4



CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: G-1

SHEET NO.: 3 of 4

TURN POCKETS: $\frac{1}{9} (12') (560' + 80' + 650') + (\frac{1}{9}) (16') (780' + 600')$
 $= \underline{4174' \text{ SY}}$

SIDE ROAD IMPROVEMENTS: ASSUME THESE EQUAL THE AMOUNT OF MATERIALS WORK FOR THE COL-DE-SACS.

MEDIAN CONCRETE: $(3') (500' + 550') (\frac{1}{9}) = \underline{350' \text{ SY}}$

R/W SAVED: $(12') (560' + 80' + 650') = \underline{15,480 \text{ SF}}$
 No RELOCATIONS AFFECTED.

REPAIR IMPROVEMENTS: $\frac{1}{9} (28') (650') = \underline{2022' \text{ SY}}$

DRIVEWAY IMPROVEMENTS: EQUAL TO DESIGNED IMPROVEMENTS.

R/W PURCHASED: $(36') (650') = \underline{23,400 \text{ SF}}$
 No RELOCATIONS.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia ALTERNATIVE NO.: **G-2**

DESCRIPTION: **CUL-DE-SAC BULLARD ROAD ON SOUTH SIDE OF SR 360 (MACLAND ROAD) AND DELETE THE TEE INTERSECTION** SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (Sketch attached)

Bullard Road intersects with SR 360 on the south side of SR 360 at an improved intersection.

ALTERNATIVE: (Sketch attached)

Provide a cul-de-sac on Bullard Road just south of SR 360 and require all traffic to use Florence Road to access SR 360.

ADVANTAGES:

- Reduces costs
- Eliminates a dangerous traffic crossing situation

DISADVANTAGES:

- Reduces access
- Lengthens drive for residents located on Bullard Road

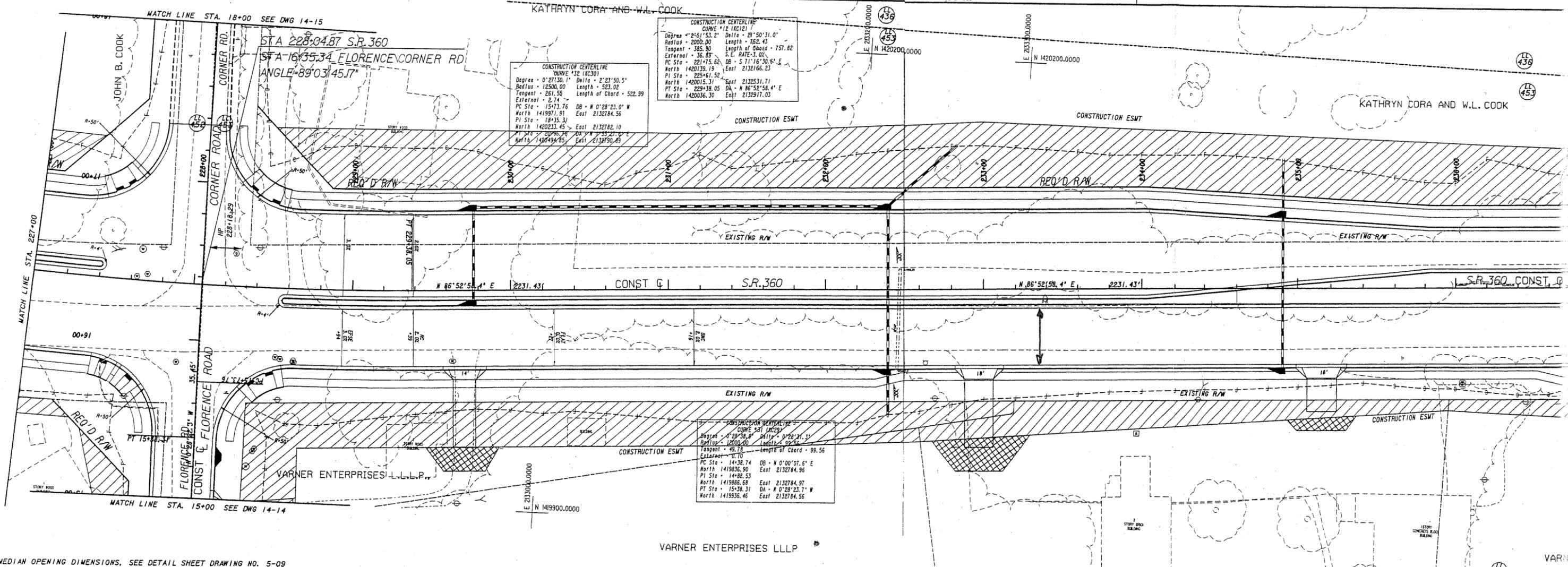
DISCUSSION:

A large proportion of the northbound traffic on Bullard Road comes from Florence Road, turns right onto SR 360, and then almost immediately turns left onto Bullard Road on the north side of SR 360. The separation of Bullard Road on the south and north of SR 360 is only approximately 650 ft. This will be a dangerous situation when the northbound Bullard Road traffic must cross the two through eastbound lanes of SR 360. This alternative proposes a cul-de-sac on Bullard Road, just south of SR 360. Northbound traffic on Florence Road would continue north on Florence Road and turn right onto SR 360 at a signalized intersection. This traffic would then have nearly 2,000 feet to get to the left-turn lane. The few residents living on Bullard Road would have to go south of Bullard and then north of Florence Road to access SR 360, a slight inconvenience.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 611,942	—	\$ 611,942
ALTERNATIVE	\$ 86,900	—	\$ 86,900
SAVINGS	\$ 525,042	—	\$ 525,042

ALTERNATIVE No.
G-2
SHEET 2 OF 7

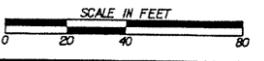
3:02:39 PM PRF... PROJECT NUMBER CSSTP-005-00142 SHEET NO 3:02:41 PM PRF... STATE GA



FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

PROPERTY AND EXISTING R/W LINE	---
REQUIRED R/W LINE	---
CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	---
EASEMENT FOR CONSTR OF SLOPES	---
EASEMENT FOR CONSTR OF DRIVES	---

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

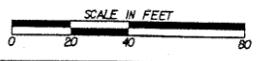


REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLAN**

CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	---
EASEMENT FOR CONSTR OF SLOPES	---
EASEMENT FOR CONSTR OF DRIVES	---

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511



REVISION DATES

As Designed

Aut. No. G-2
SHEET 3 OF 7

STA 240+99.46 S.R.360
STA 10+00.00 BULLARD RD (SOUTH)
ANGLE=83°26'04.04"

MYRTLE J GILBERT &
RENA ANNETTE
GILBERT

PAUL DAVID BANKS

KATHRYN CORA AND W.L. COOK

KATHRYN CORA AND W.L. COOK

VARNER ENTERPRISES, LLLP

VARNER ENTERPRISES, LLLP

NITEC ENTERPRISES, INC.

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511



REVISION DATES

NO.	DATE	DESCRIPTION

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE**

REVISION DATES

NO.	DATE	DESCRIPTION

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **MAINLINE PLAN**

DRAWING NO. 13-43

As DESIGNED

VARNER ENTERPRISES, LLLP

NITEC ENTERPRISES, INC.



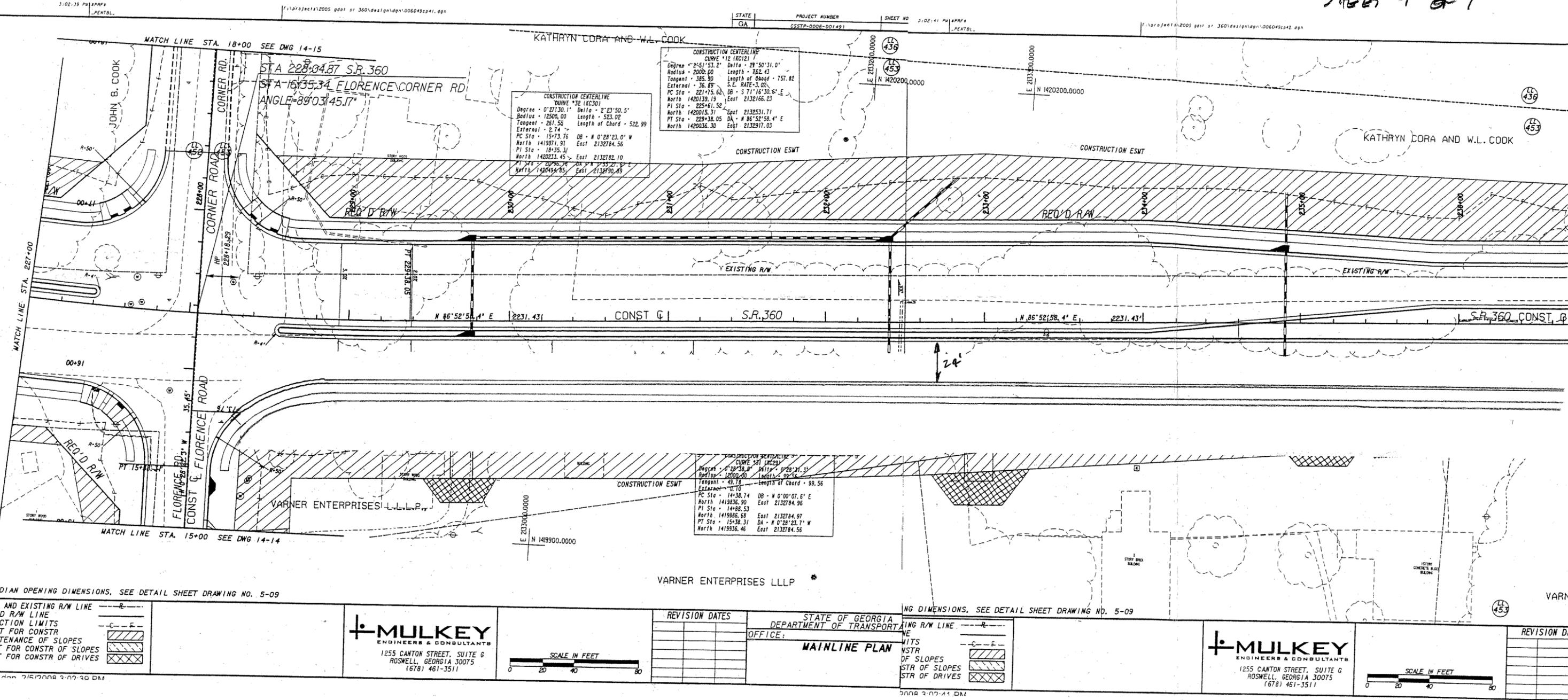
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: **CROSSROAD PLAN**
BULLARD ROAD (SOUTH)

CONSTRUCTION CENTERLINE

STATION	CHORD BEARING	CHORD DISTANCE	CHORD CURVE CENTERLINE
213+00.00	N 86°52'58.4" E	28.87	213+00.00
213+28.87	N 86°52'58.4" E	28.87	213+28.87
213+57.74	N 86°52'58.4" E	28.87	213+57.74
214+16.61	N 86°52'58.4" E	28.87	214+16.61
214+45.48	N 86°52'58.4" E	28.87	214+45.48
214+74.35	N 86°52'58.4" E	28.87	214+74.35
215+03.22	N 86°52'58.4" E	28.87	215+03.22
215+32.09	N 86°52'58.4" E	28.87	215+32.09
215+60.96	N 86°52'58.4" E	28.87	215+60.96
215+89.83	N 86°52'58.4" E	28.87	215+89.83
216+18.70	N 86°52'58.4" E	28.87	216+18.70
216+47.57	N 86°52'58.4" E	28.87	216+47.57
216+76.44	N 86°52'58.4" E	28.87	216+76.44
217+05.31	N 86°52'58.4" E	28.87	217+05.31
217+34.18	N 86°52'58.4" E	28.87	217+34.18
217+63.05	N 86°52'58.4" E	28.87	217+63.05
217+91.92	N 86°52'58.4" E	28.87	217+91.92
218+20.79	N 86°52'58.4" E	28.87	218+20.79
218+49.66	N 86°52'58.4" E	28.87	218+49.66
218+78.53	N 86°52'58.4" E	28.87	218+78.53
219+07.40	N 86°52'58.4" E	28.87	219+07.40
219+36.27	N 86°52'58.4" E	28.87	219+36.27
219+65.14	N 86°52'58.4" E	28.87	219+65.14
220+00.00	N 86°52'58.4" E	28.87	220+00.00

ALTERNATIVE No.
G-2

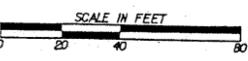
SHEET 4 OF 7



FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

PROPERTY AND EXISTING R/W LINE	---
REQUIRED R/W LINE	---
CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR	---
& MAINTENANCE OF SLOPES	---
EASEMENT FOR CONSTR OF SLOPES	---
EASEMENT FOR CONSTR OF DRIVES	---

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE G
ROSWELL, GEORGIA 30075
(678) 461-3511



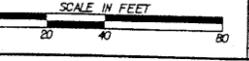
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
MAINLINE PLAN

FOR MEDIAN OPENING DIMENSIONS, SEE DETAIL SHEET DRAWING NO. 5-09

EXISTING R/W LINE	---
CONSTRUCTION LIMITS	---
EASEMENT FOR CONSTR	---
& MAINTENANCE OF SLOPES	---
EASEMENT FOR CONSTR OF SLOPES	---
EASEMENT FOR CONSTR OF DRIVES	---

MULKEY
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1255 CANTON STREET, SUITE G
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(678) 461-3511

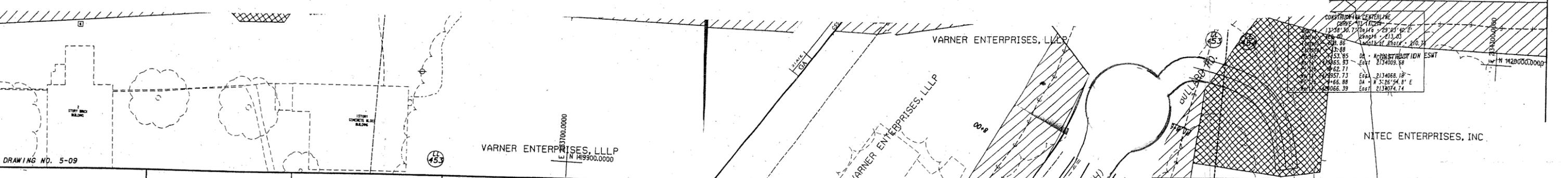
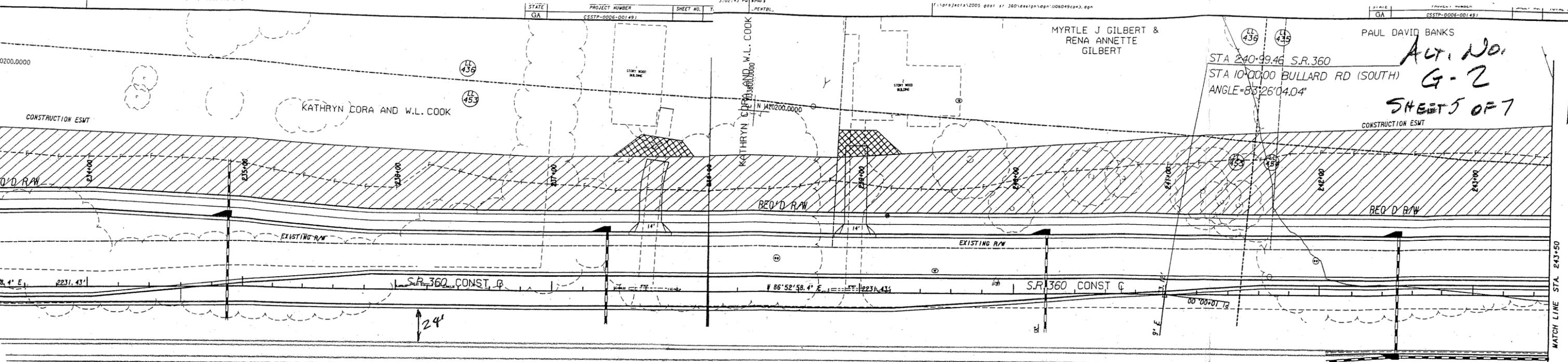


REVISION DATES

ALTERNATIVE
DESIGN

Alt. No. G-2 SHEETS OF 7

STA 240+99.46 S.R.360
 STA 10+00.00 BULLARD RD (SOUTH)
 ANGLE=83°26'04.04"



MULKEY
 ENGINEERS & CONSULTANTS
 1255 CANTON STREET, SUITE G
 ROSWELL, GEORGIA 30075
 (678) 461-3511

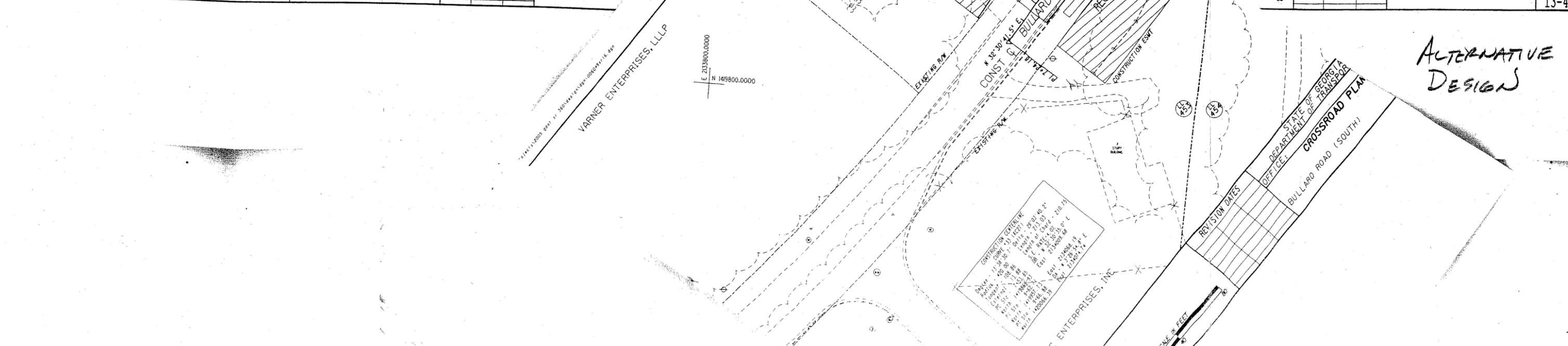


REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE: MAINLINE

REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE: MAINLINE PLAN

DRAWING NO. 13-43

ALTERNATIVE DESIGN





SUBJECT:

ALTERNATIVE G-2

JOB NO:

BY:

DATE:

CHKD:

DATE:

SHEET 6 OF 7

PAGE

SHEET

/

AS DESIGNED

RIGHT TURN LANE FROM FLORENCE ROAD

$$\begin{aligned} \text{TO BULLARD ROAD} &= 12(24060 - 22860)/9 \\ &= 1600 \text{ SY} \end{aligned}$$

$$\begin{aligned} \text{BULLARD ROAD} &= 12(2)(950 - 750)/9 \\ &= 533 \text{ SY} \end{aligned}$$

$$\Sigma = 2133$$

ALTERNATIVE DESIGN

$$\begin{aligned} \text{BULLARD ROAD} &= [80(24) + \pi(25^2)]/9 \\ &= 431 \text{ SY} \end{aligned}$$

$$\text{R/W COBS} = 1600 \text{ SY} = 14,400 \text{ SF}$$

COST WORKSHEET



PROJECT: **WIDENING OF SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**

ALTERNATIVE NO.

G-2

Georgia Department of Transportation

SHEET NO.

7 of 7

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
PAYEMENT	SY	2133	59.74	127,425	431	59.74	25,748
	2.375			302,634			61,152
R/W CORRS	SF	14,400	\$3 ⁶⁴	\$52,416	∅	\$3 ⁶⁴	∅
	2.47			\$129,467			∅
Sub-total				N/A			N/A
Mark-up at %				N/A			N/A
TOTAL				\$611,942			\$86,900

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **B-1**

DESCRIPTION: **USE A DOUBLE PRECAST CONCRETE ARCH CULVERT IN
LIEU OF BRIDGE AT POWDER SPRINGS CREEK**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

A bridge 150 ft. long x 90 ft. 5 in. wide is proposed at the Powder Springs Creek crossing.

ALTERNATIVE: (Sketch attached)

Use a double-arch, precast concrete culvert.

ADVANTAGES:

- Reduces cost
- Simplifies construction
- Reduces construction schedule
- More attractive structure

DISADVANTAGES:

- None apparent

DISCUSSION:

A precast concrete arch culvert will be easier, simpler and quicker to construct.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 5,035,048	—	\$ 5,035,048
ALTERNATIVE	\$ 3,406,877	—	\$ 3,406,877
SAVINGS	\$ 1,628,171	—	\$ 1,628,171

ALT. NO. B-2
Sht. 2 of 6

ALTERNATIVE No. B-1
SHEET OF

BRIDGE CONSISTS OF
 2 - 30'-0" TYPE I MOD PSC BEAM SPANS ----- SPECIAL DESIGN
 1 - 90'-0" BULB TEE, 54 IN. PSC BEAM SPAN ---- SPECIAL DESIGN
 2 - PILE END BENTS ----- SPECIAL DESIGN
 2 - CONCRETE INTERMEDIATE BENTS ----- SPECIAL DESIGN
 24" TYPE I RIP RAP

DESIGN DATA

SPECIFICATIONS ----- AASHTO 17TH EDITION, 2002
 (DESIGNED FOR SEISMIC PERFORMANCE CATEGORY A)
 TYPICAL HS20-44 AND/OR MILITARY LOADING ----- IMPACT ALLOWED
 FUTURE PAVING ALLOWANCE ----- 30 LBS PER SQ FT

TRAFFIC DATA

TRAFFIC ----- ADT = XXXX (2010)
 ADT = XXXXX (2030)
 DIRECTIONAL DIST ----- XXXX
 DESIGN SPEED ----- XX MPH
 TRUCKS ----- XX%
 24 HOUR TRUCKS ----- XX%

DRAINAGE DATA

DRAINAGE AREA ----- X.X SQ. MI.

FLOOD FREQUENCY	DISCHARGE THRU BRIDGE	MEAN VELOCITY	AREA OF OPENING BELOW FLOODSTAGE	BACKWATER
50 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
100 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
500 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT

PROPOSED UTILITIES
NONE

THEORETICAL SCOUR DEPTHS (FT)

LOCATION	100 YEAR STORM			500 YEAR STORM		
	GENERAL	LOCAL	TOTAL	GENERAL	LOCAL	TOTAL
CHANNEL	XX.X	N/A	XX.X	XX.X	N/A	XX.X

As Designed

PROJECT P.I. NO. 0006049
BRIDGE NO. 1

JBT J.B. Trimble, Inc.
2550 Heritage Ct, SE, Suite 250
Atlanta GA 30339-3062
(770) 952-1022

GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

PRELIMINARY LAYOUT
SR 360 OVER POWDER SPRINGS CREEK

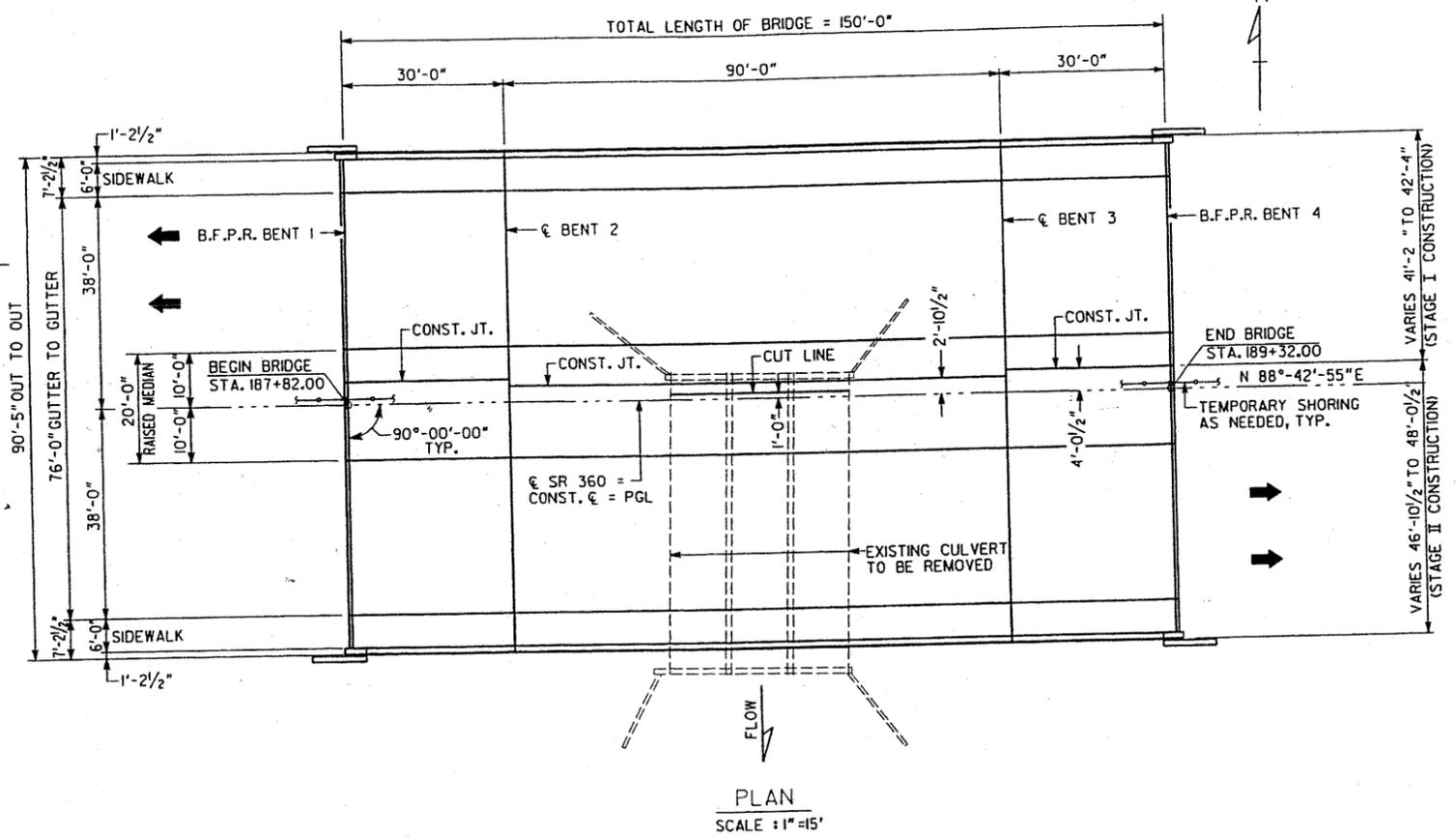
COBB COUNTY CSSTP-0006-00(049)
SCALE: NO SCALE U.N.O. MARCH 2008

DESIGNED: JKM	CHECKED: RLF	REVIEWED: HST
DRAWN: JRH	DESIGN GROUP: SH	APPROVED: PYL



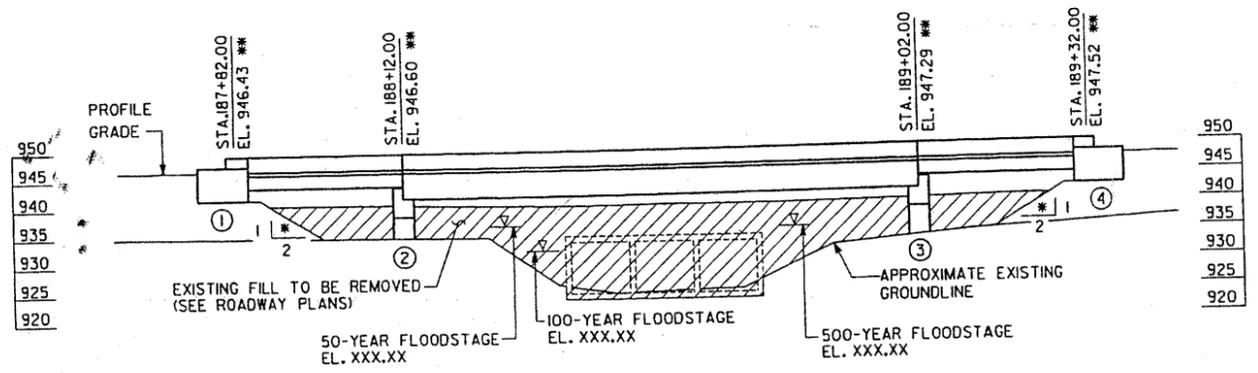
BRIDGE SHEET
1 OF 2

DATE	REVISIONS



AHEAD
TO XXX

PLAN
SCALE: 1"=15'



ELEVATION
SCALE: 1"=15'

NOTES:

- * SLOPE NORMAL TO END BENT.
- ** STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ϵ BENT.
- ALL BENTS ARE PARALLEL.
- END BENT PILES NOT SHOWN.
- THE MINIMUM BOTTOM OF BEAM ELEVATION FOR THE PROPOSED BRIDGE SHALL BE NO LOWER THAN ELEVATION XXX.XX.
- THE APPROXIMATE PROPOSED BOTTOM OF BEAM ELEVATION IS 941.67

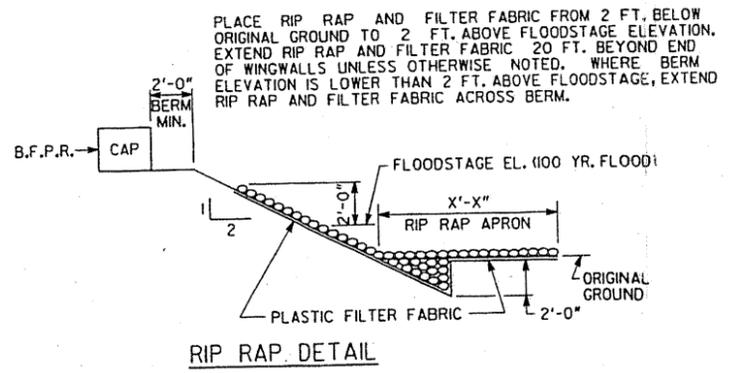
BERM ELEVATIONS

LOCATION	ELEVATION
BENT 1 LEFT	941.42
BENT 1 RIGHT	941.42
BENT 2 LEFT	942.49
BENT 2 RIGHT	942.49

NOTE: FOR BRIDGE ENDROLL STAKING PURPOSES ONLY.

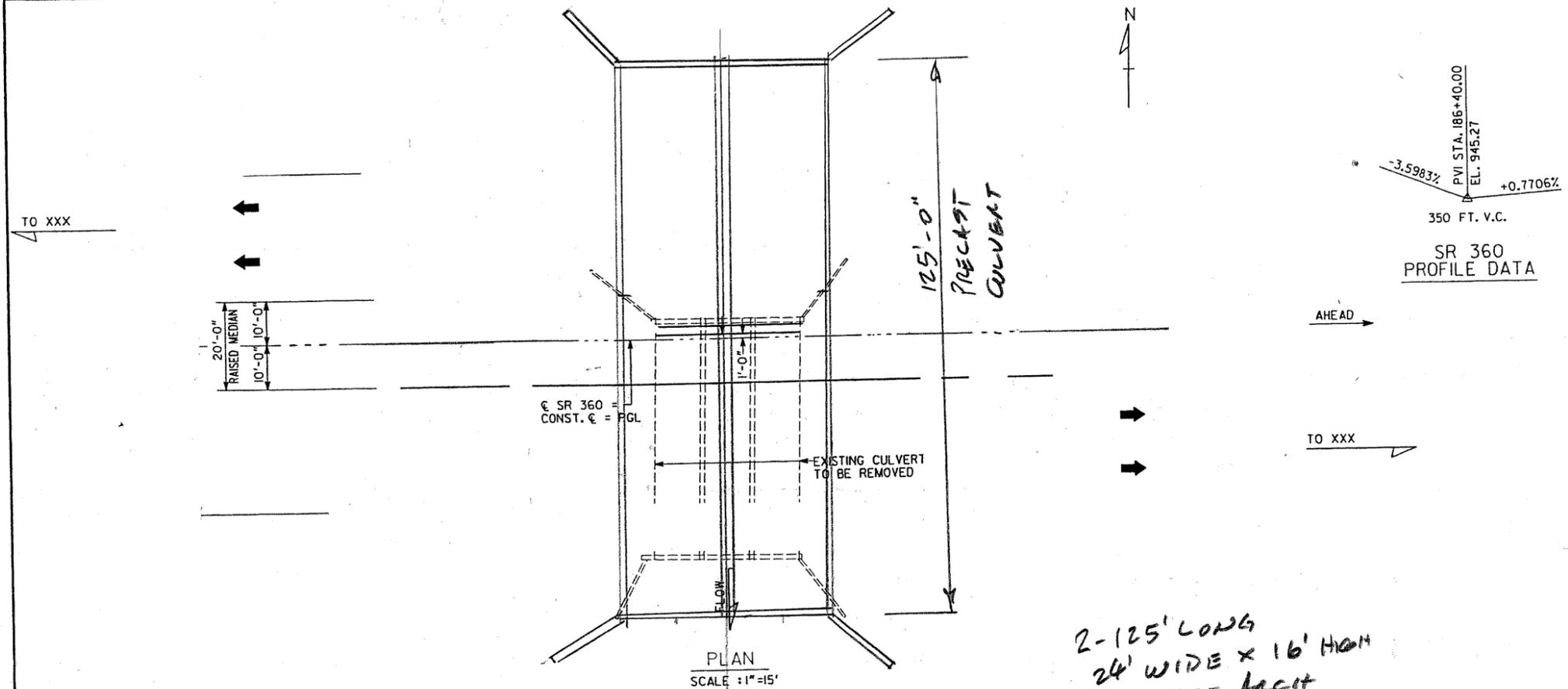
BENCHMARK INFORMATION

CONTROL POINT	BENCHMARK DESCRIPTION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	LOCATION	
					STATION	OFFSET
D-215	1/2" REBAR	1420320.85	2128611.85	942.82	185+94.43	40.68 RT
D-216	1/2" REBAR	1420333.81	2129169.67	945.05	191+52.40	40.23 RT



RIP RAP DETAIL

ALTERNATIVE No
B-1
SHEET 3 OF 6



TRAFFIC DATA

TRAFFIC ----- ADT = XXXX (2010)
ADT = XXXXX (2030)

DIRECTIONAL DIST ----- XX%

DESIGN SPEED ----- XX MPH

TRUCKS ----- XX

24 HOUR TRUCKS ----- XX

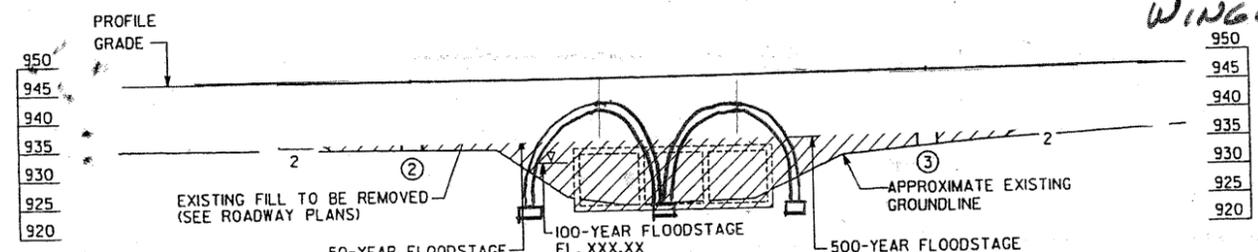
DRAINAGE DATA

DRAINAGE AREA ----- X.X SQ. MI.

FLOOD FREQUENCY	DISCHARGE THRU BRIDGE	MEAN VELOCITY	AREA OF OPENING BELOW FLOODSTAGE	BACKWATER
50 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
100 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
500 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT

PROPOSED UTILITIES
NONE

2-125' LONG
24' WIDE X 16' HIGH
PRECAST ARCH
CULVERTS WITH
HEADWALLS AND
WINGWALLS



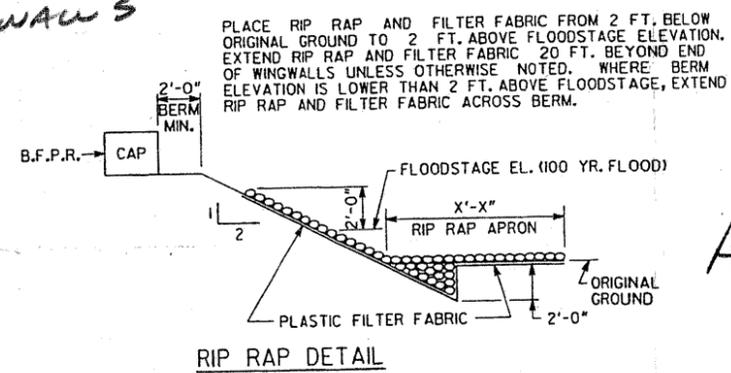
- NOTES:**
- * SLOPE NORMAL TO END BENT.
 - ** STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ϵ BENT.
 - ALL BENTS ARE PARALLEL.
 - END BENT PILES NOT SHOWN.
 - THE MINIMUM BOTTOM OF BEAM ELEVATION FOR THE PROPOSED BRIDGE SHALL BE NO LOWER THAN ELEVATION XXX.XX.
 - THE APPROXIMATE PROPOSED BOTTOM OF BEAM ELEVATION IS 941.67

BERM ELEVATIONS

LOCATION	ELEVATION
BENT 1 LEFT	941.42
BENT 1 RIGHT	941.42
BENT 2 LEFT	942.49
BENT 2 RIGHT	942.49

BENCHMARK INFORMATION

CONTROL POINT	BENCHMARK DESCRIPTION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	LOCATION	
					STATION	OFFSET
D-215	1/2" REBAR	1420320.85	2128611.85	942.82	185+94.43	40.68 RT
D-216	1/2" REBAR	1420333.81	2129169.67	945.05	191+52.40	40.23 RT



PLACE RIP RAP AND FILTER FABRIC FROM 2 FT. BELOW ORIGINAL GROUND TO 2 FT. ABOVE FLOODSTAGE ELEVATION. EXTEND RIP RAP AND FILTER FABRIC 20 FT. BEYOND END OF WINGWALLS UNLESS OTHERWISE NOTED. WHERE BERM ELEVATION IS LOWER THAN 2 FT. ABOVE FLOODSTAGE, EXTEND RIP RAP AND FILTER FABRIC ACROSS BERM.

THEORETICAL SCOUR DEPTHS (FT)

LOCATION	100 YEAR STORM			500 YEAR STORM		
	GENERAL	LOCAL	TOTAL	GENERAL	LOCAL	TOTAL
CHANNEL	XX.X	N/A	XX.X	XX.X	N/A	XX.X

ALTERNATIVE DESIGN

PROJECT P.I. NO. 0006049
BRIDGE NO. 1

JBT J.B. Trimble, Inc.
2550 Heritage Ct, SE, Suite 250
Atlanta GA 30339-3062
(770) 952-1022

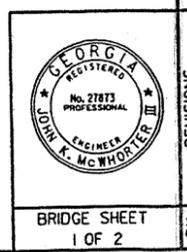
GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

PRELIMINARY LAYOUT
SR 360 OVER POWDER SPRINGS CREEK

COBB COUNTY CSSTP-0006-00(049)

SCALE: NO SCALE U.N.O. MARCH 2008

DESIGNED: JKM	CHECKED: RLF	REVIEWED: HST
DRAWN: JRH	DESIGN GROUP: SH	APPROVED: PVL



BRIDGE SHEET
1 OF 2

AS DESIGNED

APPROACH SLABS $2(30)(90)/9 = 600 \text{ SY}$

ALTERNATIVE DESIGN

PAVEMENT $24(2)(150+60)/9 = 1120 \text{ SY}$

CURB & GUTTER $2(150+60) = 420 \text{ LF}$

EMBANKMENT $125(12)(150)/27 = 8333 \text{ CY}$

ASSUMES 12' AVG DEPTH, 150' ALONG E

SIDEWALK $(150+60)(2)(5)/9 = 233 \text{ SY}$

COST FOR MATERIAL FROM LOW SPAN = \$373,000

PROVIDED BY LISA SIMMS OF CONTECH.

ADD \$15,000/DAY FOR CRANE & CREW

TO INSTALL. APPROXIMATELY 60 PIECES

@ 6 PER DAY, TOTAL 10 DAYS

= \$150,000

PRECAST COST INSTALLED = \$523,000

FOUNDATIONS: ASSUME 4' WIDE X 3' DEEP FOUNDATIONS,

PILES @ 6' IN EXT. FOUNDATIONS, 5' IN INT. FOUNDATION

6' X 1'-6" PEDESTAL WALL.

- CONTINUED -



SUBJECT: ALTERNATIVE No.
B-1
JOB NO:

BY:	DATE:
CHKD:	DATE:
SHEET 5 OF 6	

PAGE
SHEET
/

CALCULATIONS CONTINUED

$$\text{CONCRETE } 3(125)(4 \times 3 + 6 \times 1.5) / 27 = 292 \text{ CY}$$

$$\text{REINFORCING @ } 140 \# / \text{CY} = 40,833 \text{ LB}$$

$$\text{PILING : @ } 30' \text{ LONG}$$

$$L = 30(2 \times 22 + 26) = 2100 \text{ LF}$$

VALUE ENGINEERING ALTERNATIVE



**PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **B-2**

**DESCRIPTION: USE A SINGLE-SPAN BRIDGE IN LIEU OF A THREE-SPAN
BRIDGE AT EACH BRIDGE SITE**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (Sketch attached)

At each bridge site, a three-span bridge with two 30-ft. end spans and one 90-ft. intermediate span is shown. The bridges have pile-end bents and concrete intermediate bents. Pile footings are assumed at the intermediate bents.

ALTERNATIVE: (Sketch attached)

At each site, use a single-span bridge with a length of 150 ft.

ADVANTAGES:

- Reduces cost
- Eliminates intermediate bents
- Simplifies construction
- Eliminates disturbance near the creek
(reduces environmental impacts)

DISADVANTAGES:

- Heavier beams to set

DISCUSSION:

By constructing a single-span bridge, the construction is greatly simplified. No excavations or other construction is necessary near the creek. Only one span of beams must be set, although those beams are considerably heavier than in the original design.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,840,852	—	\$ 2,840,852
ALTERNATIVE	\$ 2,655,511	—	\$ 2,655,511
SAVINGS	\$ 185,341	—	\$ 185,341

BRIDGE CONSISTS OF

- 2 - 30'-0" TYPE I MOD PSC BEAM SPANS ----- SPECIAL DESIGN
 - 1 - 90'-0" BULB TEE, 54 IN, PSC BEAM SPAN ---- SPECIAL DESIGN
 - 2 - PILE END BENTS ----- SPECIAL DESIGN
 - 2 - CONCRETE INTERMEDIATE BENTS ----- SPECIAL DESIGN
- 24" TYPE I RIP RAP

DESIGN DATA

SPECIFICATIONS ----- AASHTO 17TH EDITION, 2002
(DESIGNED FOR SEISMIC PERFORMANCE CATEGORY A)

TYPICAL HS20-44 AND/OR MILITARY LOADING ----- IMPACT ALLOWED

FUTURE PAVING ALLOWANCE ----- 30 LBS PER SQ FT

TRAFFIC DATA

TRAFFIC ----- ADT = XXXX (2010)
ADT = XXXXX (2030)

DIRECTIONAL DIST ----- XX%

DESIGN SPEED ----- XX MPH

TRUCKS ----- XX%

24 HOUR TRUCKS ----- XX%

DRAINAGE DATA

DRAINAGE AREA ----- X.X SQ. MI.

FLOOD FREQUENCY	DISCHARGE THRU BRIDGE	MEAN VELOCITY	AREA OF OPENING BELOW FLOODSTAGE	BACKWATER
50 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
100 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
500 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT

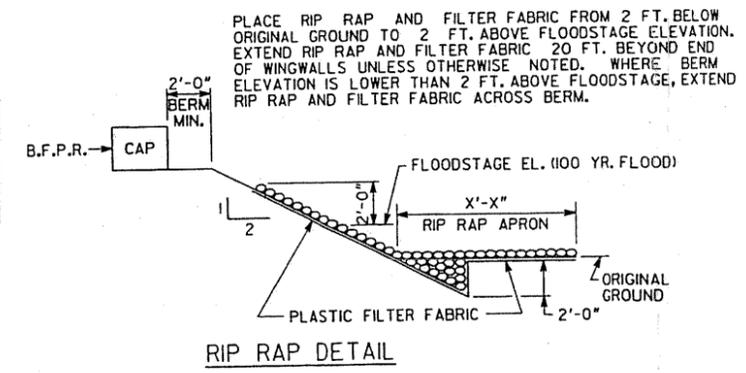
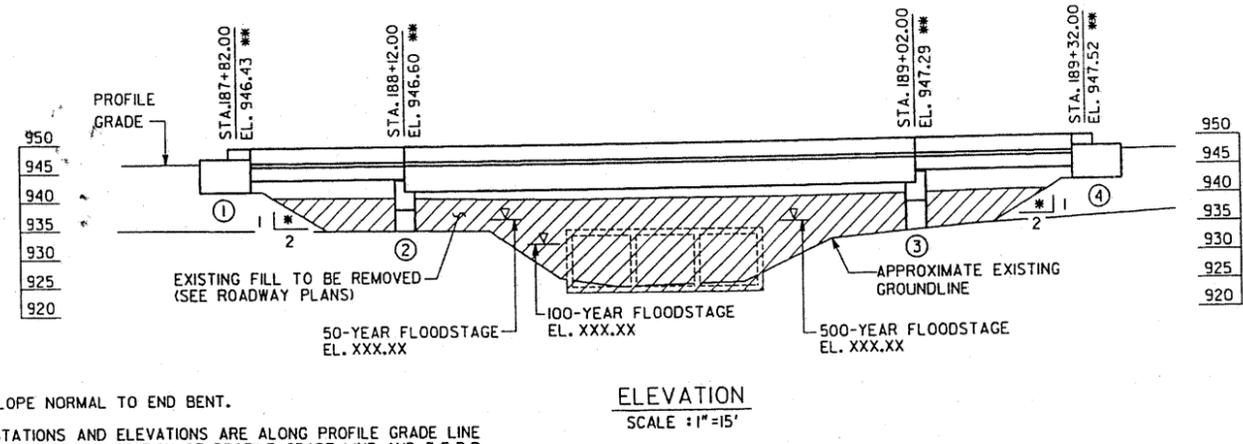
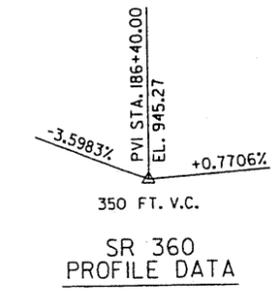
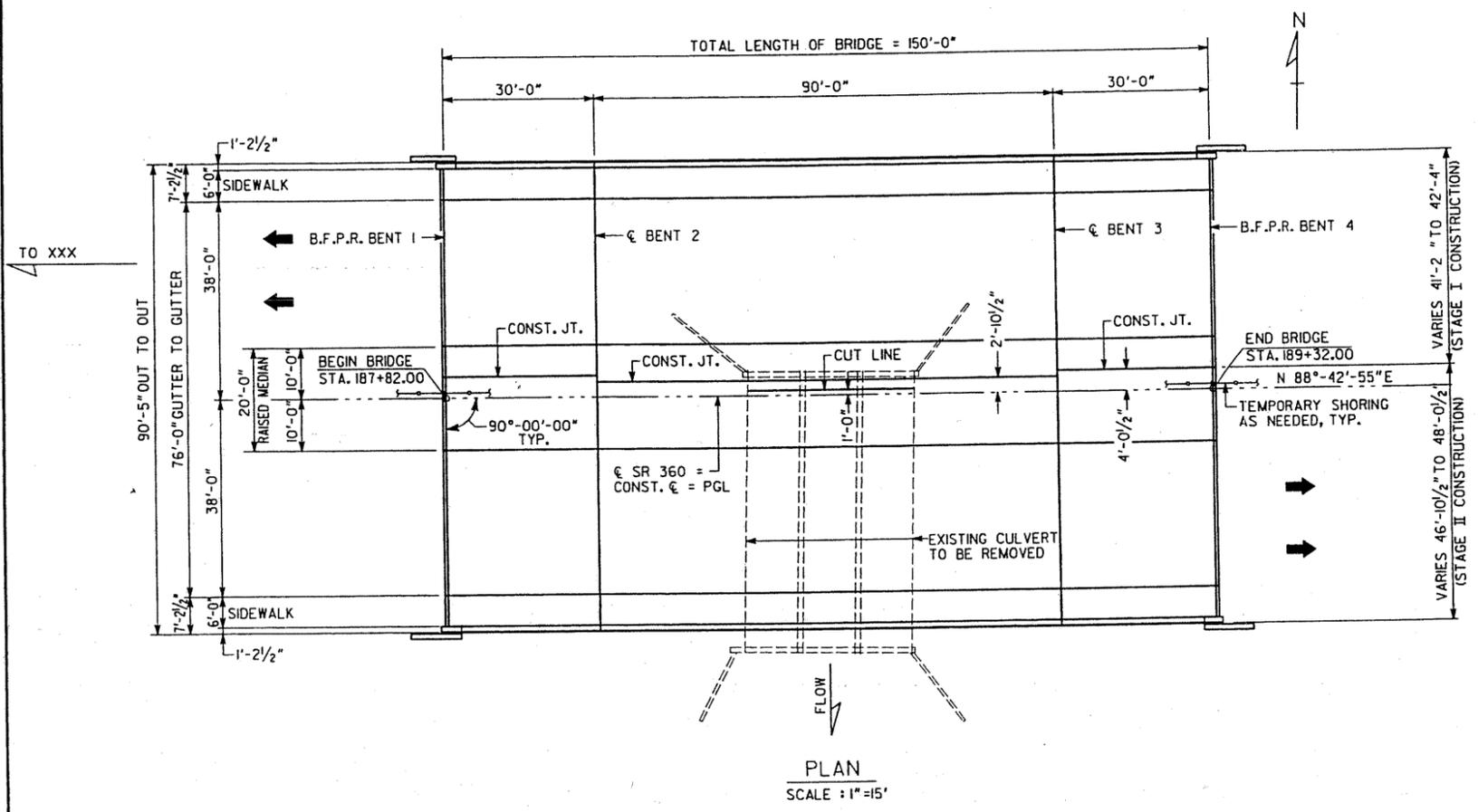
PROPOSED UTILITIES

NONE

THEORETICAL SCOUR DEPTHS (FT)

LOCATION	100 YEAR STORM			500 YEAR STORM		
	GENERAL	LOCAL	TOTAL	GENERAL	LOCAL	TOTAL
CHANNEL	XX.X	N/A	XX.X	XX.X	N/A	XX.X

As Designed



- NOTES:
- * SLOPE NORMAL TO END BENT.
 - ** STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ϵ BENT.
 - ALL BENTS ARE PARALLEL.
 - END BENT PILES NOT SHOWN.
 - THE MINIMUM BOTTOM OF BEAM ELEVATION FOR THE PROPOSED BRIDGE SHALL BE NO LOWER THAN ELEVATION XXX.XX.
 - THE APPROXIMATE PROPOSED BOTTOM OF BEAM ELEVATION IS 941.67

BERM ELEVATIONS

LOCATION	ELEVATION
BENT 1 LEFT	941.42
BENT 1 RIGHT	941.42
BENT 2 LEFT	942.49
BENT 2 RIGHT	942.49

BENCHMARK INFORMATION

CONTROL POINT	BENCHMARK DESCRIPTION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	LOCATION	
					STATION	OFFSET
D-215	1/2" REBAR	1420320.85	2128611.85	942.82	185+94.43	40.68 RT
D-216	1/2" REBAR	1420333.81	2129169.67	945.05	191+52.40	40.23 RT

JBT J.B. Trimble, Inc.
2550 Heritage Ct, SE, Suite 250
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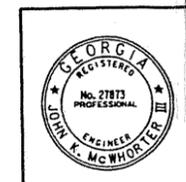
GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

PRELIMINARY LAYOUT
SR 360 OVER POWDER SPRINGS CREEK

COBB COUNTY CSSTP-0006-00(049)

SCALE: NO SCALE U.N.O. MARCH 2008

DESIGNED: JKM	CHECKED: RLF	REVIEWED: HST
DRAWN: JRH	DESIGN GROUP: SH	APPROVED: PVL



- 1 - 150'-0" BULB TEE, 72 IN. PSC BEAM SPAN ---- SPECIAL DESIGN
- 2 - PILE END BENTS ----- SPECIAL DESIGN

24" TYPE I RIP RAP

DESIGN DATA

SPECIFICATIONS ----- AASHTO 17TH EDITION, 2002
(DESIGNED FOR SEISMIC PERFORMANCE CATEGORY A)
TYPICAL HS20-44 AND/OR MILITARY LOADING ----- IMPACT ALLOWED
FUTURE PAVING ALLOWANCE ----- 30 LBS PER SQ FT

TRAFFIC DATA

TRAFFIC ----- ADT = XXXX (2010)
ADT = XXXXX (2030)
DIRECTIONAL DIST ----- XXX
DESIGN SPEED ----- XX MPH
TRUCKS ----- XX
24 HOUR TRUCKS ----- XX

DRAINAGE DATA

DRAINAGE AREA ----- X.X SQ. MI.

FLOOD FREQUENCY	DISCHARGE THRU BRIDGE	MEAN VELOCITY	AREA OF OPENING BELOW FLOODSTAGE	BACKWATER
50 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
100 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT
500 YEAR	XXXX CFS	X.XX FPS	XXX SQ FT	X.XX FT

PROPOSED UTILITIES

NONE

THEORETICAL SCOUR DEPTHS (FT)

LOCATION	100 YEAR STORM			500 YEAR STORM		
	GENERAL	LOCAL	TOTAL	GENERAL	LOCAL	TOTAL
CHANNEL	XX.X	N/A	XX.X	XX.X	N/A	XX.X

ALTERNATIVE DESIGN

JBT J.B. Trimble, Inc.
2550 Heritage Ct, SE, Suite 250
Atlanta GA 30339-3062
(770) 952-1022

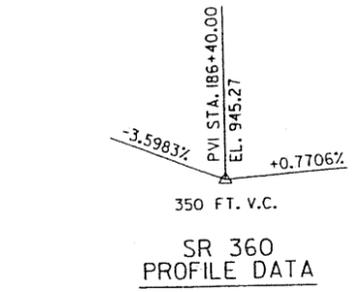
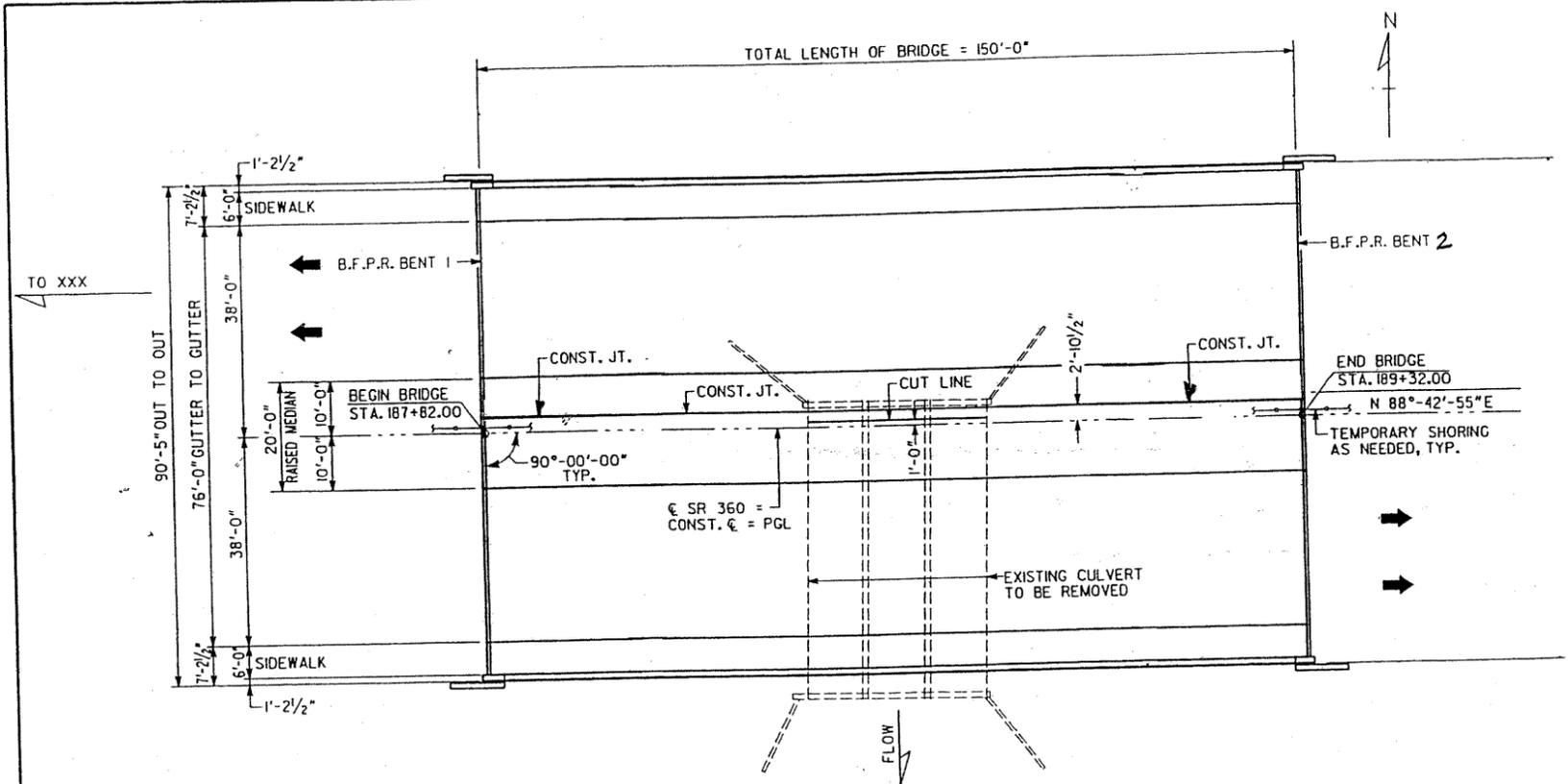
GEORGIA
DEPARTMENT OF TRANSPORTATION
PRECONSTRUCTION DIVISION-OFFICE OF BRIDGE DESIGN

PRELIMINARY LAYOUT
SR 360 OVER POWDER SPRINGS CREEK

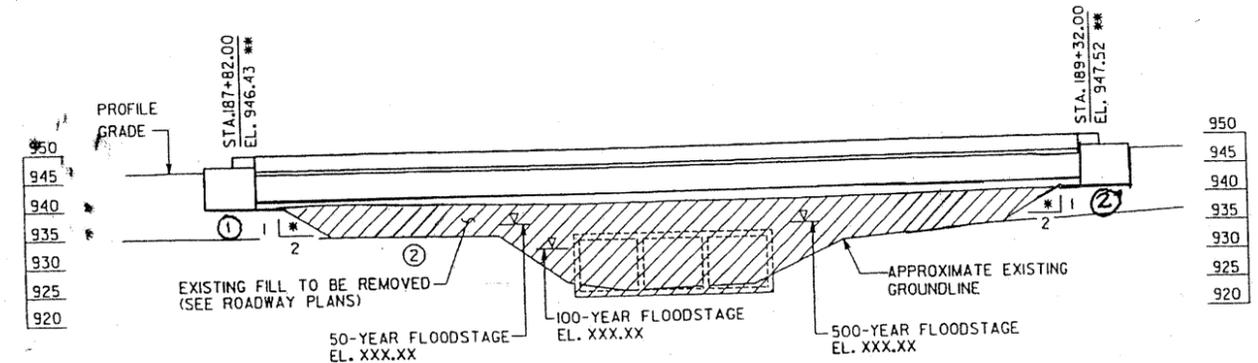
COBB COUNTY CSSTP-0006-00(049)

SCALE: NO SCALE U.N.O. MARCH 2008

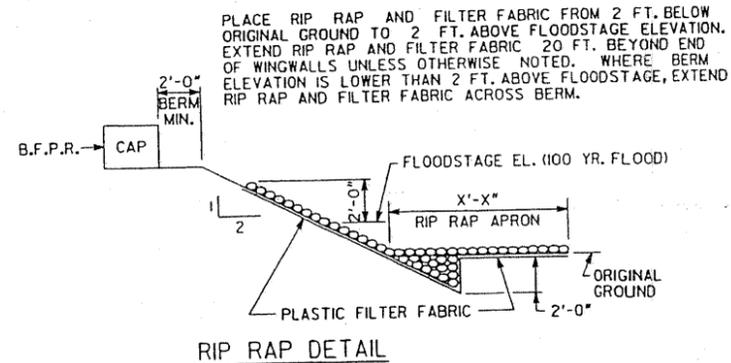
DESIGNED: JKM	CHECKED: RLF	REVIEWED: HST
DRAWN: JRH	DESIGN GROUP: SH	APPROVED: PVL



PLAN
SCALE: 1"=15'



ELEVATION
SCALE: 1"=15'



RIP RAP DETAIL

- NOTES:
- * SLOPE NORMAL TO END BENT.
 - ** STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR ϵ BENT.
 - ALL BENTS ARE PARALLEL.
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 - THE APPROXIMATE PROPOSED BOTTOM OF BEAM ELEVATION IS 941.67

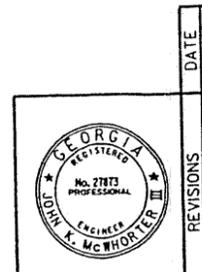
BERM ELEVATIONS

LOCATION	ELEVATION
BENT 1 LEFT	941.42
BENT 1 RIGHT	941.42
BENT 2 LEFT	942.49
BENT 2 RIGHT	942.49

NOTE: FOR BRIDGE ENDROLL STAKING PURPOSES ONLY.

BENCHMARK INFORMATION

CONTROL POINT	BENCHMARK DESCRIPTION	NORTH COORDINATE	EAST COORDINATE	ELEVATION	LOCATION	
					STATION	OFFSET
D-215	1/2" REBAR	1420320.85	2128611.85	942.82	185+94.43	40.68 RT
D-216	1/2" REBAR	1420333.81	2129169.67	945.05	191+52.40	40.23 RT



BRIDGE SHEET
1 OF 2

As DESIGNED:

END SPANS @ 30' : USE 11- TYPE I MOD @ 8'-4" SPACING

LONG SPAN @ 90' : USE 11- 54" BT @ 8'-4" SPACING

BM QUANTITY:

$$\text{TYPE I MOD } L = 2(11)(28.8333) = 634$$

$$54" \text{ BT } L = 11(89.3333) = 983$$

SUBST CONC: CAPS 37'-6" LONG AND 46'-0" LONG,
4' DEEP, 3' WIDE

COLS 3' SQUARE X 12' LONG, 2 PER CAP

FRMS 7'-6" SQUARE X 3'-6", 5- HP 12X53

$$\begin{aligned} \text{CONC: } & (37.5 + 46.0)(2)(4)(3) + 8(3^2)(12) + 8(7.5^2)(3.5) \\ & = 4443 / 27 = 165 \end{aligned}$$

$$\text{REINF} = 180(165) = 29700$$

$$\text{HP 12X53} = 8(5)(30) = 1200 \text{ LF}$$

ALTERNATIVE DESIGN

74" BT : 14 BEAMS @ 6'-5 1/2"

$$\text{QUANTITY} = 14(148.5) = 2079 \text{ LF}$$

COST WORKSHEET



PROJECT: **WIDENING OF SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**

ALTERNATIVE NO.

B-2

Georgia Department of Transportation

SHEET NO.

5 of 5

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
TYPE I MOD BEAMS	LF	634	104.14	66,025	0	—	—
54" BT BEAMS	LF	983	180.22	177,156	0	—	—
72" BT BEAMS	LF	0	—	—	2079	189.23	393,409
SUBST. CONC. C/A	CY	165	515.76	85,100	0	—	—
BAR REINF STEEL	LB	29700	0.90	26,730	0	—	—
HP 12x53 PILING	LF	1200	54.88	65,856	0	—	—
TOTAL				420,867			393,409
X 2 SITES				841,734			786,818
Sub-total				841,734			786,818
Mark-up at 237.5 %				1,999,118			1,868,643
TOTAL				2,840,852			2,655,511

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **S-1**

DESCRIPTION: **PLACE SIDEWALK ON ONE SIDE OF ROADWAY ONLY**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

A 5-ft.-wide sidewalk is currently provided on each side of the roadway.

ALTERNATIVE: (Sketch attached)

Eliminate the sidewalk on the right side (south side) of the road.

ADVANTAGES:

- Reduces cost
- Reduces right-of-way

DISADVANTAGES:

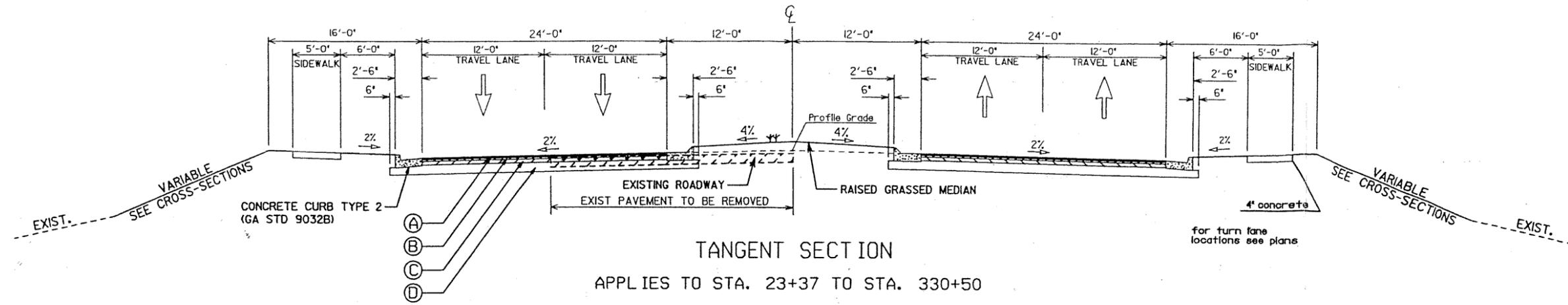
- Pedestrians (if any) can only walk on one side of the road

DISCUSSION:

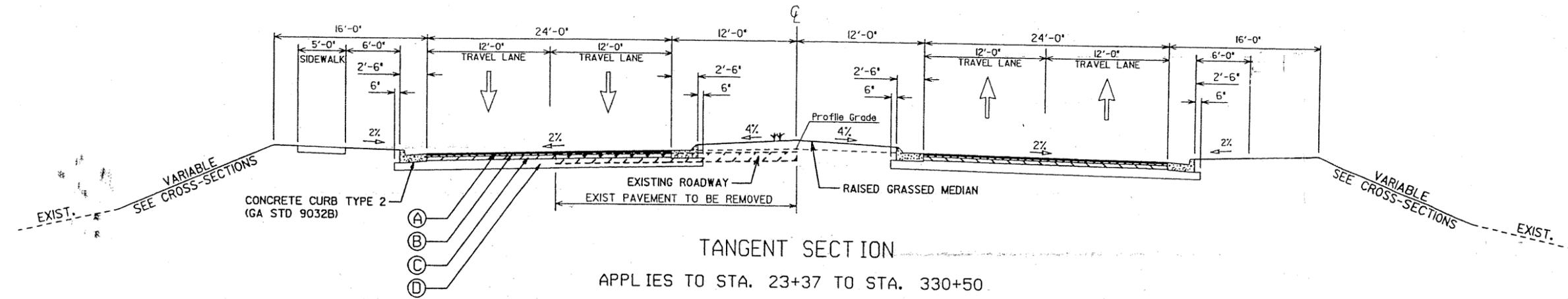
There does not seem to be much pedestrian traffic along the corridor of the project. Also, if there is any foot traffic at all, there are more residences on the north side of the road, so the sidewalk should be placed there. This saves significant project costs.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,148,695	—	\$ 2,148,695
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 2,148,695	—	\$ 2,148,695

TS-01



AS DESIGNED



ALTERNATIVE

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
SR 360

DRAWING No.
5-01

CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.:

S-1

SHEET NO.:

3 of 4

(5' sidewalk)

project length \Rightarrow 32,790

(5)(32790) \rightarrow 163950 SF

\$35 SY

$\overline{9} \rightarrow 1821754$

VALUE ENGINEERING ALTERNATIVE



**PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: **S-2**

DESCRIPTION: USE ASPHALT IN LIEU OF CONCRETE SIDEWALKS

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

Five-ft.-wide, 4-in.-thick concrete sidewalks are provided on both sides of the roadway.

ALTERNATIVE: (Sketch attached)

Retain the 5-ft.-wide sidewalks, but in lieu of 4 in. of concrete, use 4 in. of asphalt in its place.

ADVANTAGES:

- Reduces cost by item selection

DISADVANTAGES:

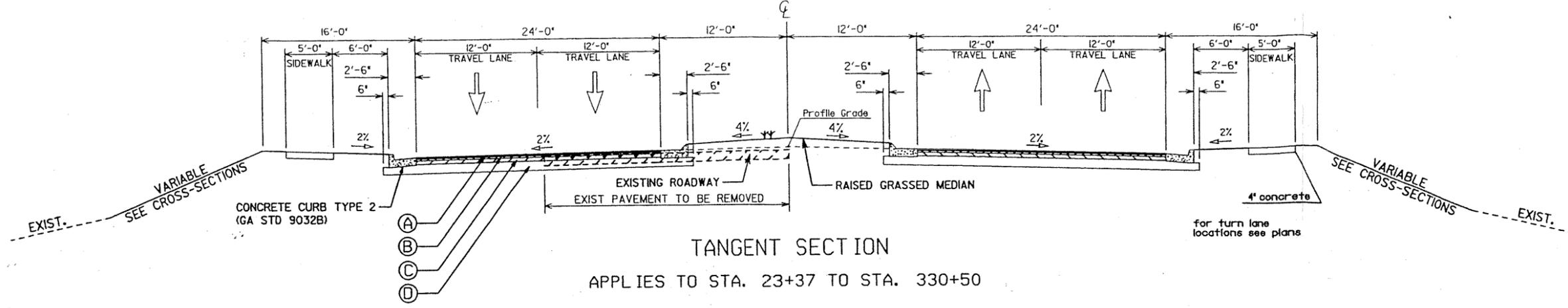
- Requires maintenance of grass alongside – cracks in the asphalt will allow grass to grow

DISCUSSION:

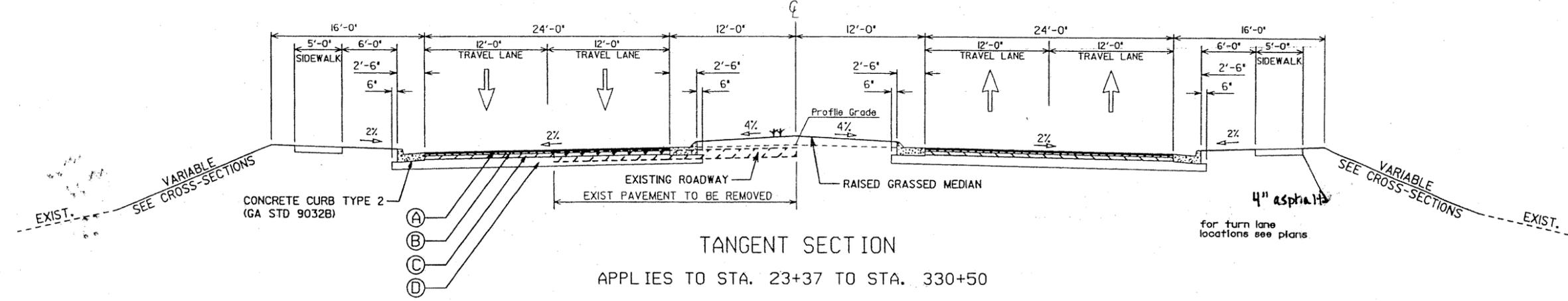
If asphalt is used, it will save costs compared to the concrete. However, asphalt requires more maintenance because grass can easily grow through cracks in the asphalt. If there is minimal pedestrian travel expected, the expense of the concrete would not be worth it.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,303,884	—	\$ 4,303,884
ALTERNATIVE	\$ 2,173,078	—	\$ 2,173,078
SAVINGS	\$ 130,806	—	\$ 130,806

TS-01



AS DESIGNED



ALTERNATIVE

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES		

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
SR 360
DRAWING No. 5-01

CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.:

S-2

SHEET NO.:

3 of 4

\$85 ton asphalt

32,790 → project length

(.33' x 5' x 32790)

↓ 54,103 CF (2) ↓

Both sides of
sidewalk

108,207 CF

108,207 CF x 140 lb/CF = 15,148,980 lbs

15,148,980 lbs x $\frac{1 \text{ ton}}{2000 \text{ lb}}$ ↓

7575 tons

(32,790 x 5) → 163950 SF

1 → 18217 SY (2) = 36434 SY

VALUE ENGINEERING ALTERNATIVE



**PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: S-3

**DESCRIPTION: USE SIDEWALK ONLY ALONG THE NORTH SIDE OF SR
360 FROM SR 176 TO BULLARD ROAD AND ALONG THE
EAST SIDE OF BULLARD ROAD**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (Sketch attached)

Five-ft.-wide, 4-in.-thick concrete sidewalks are provided on both sides of the roadway.

ALTERNATIVE: (Sketch attached)

Eliminate the sidewalk altogether, except in the areas at STA 248+00 to STA 330+00 and along the east side of Bullard Road. At these stations, the sidewalk will only be on the northern side of the roadway. Sidewalk will remain 5 ft. wide and 4 in. thick.

ADVANTAGES:

- Reduces concrete cost
- Provides pedestrian access to homes in close proximity to the shopping center

DISADVANTAGES:

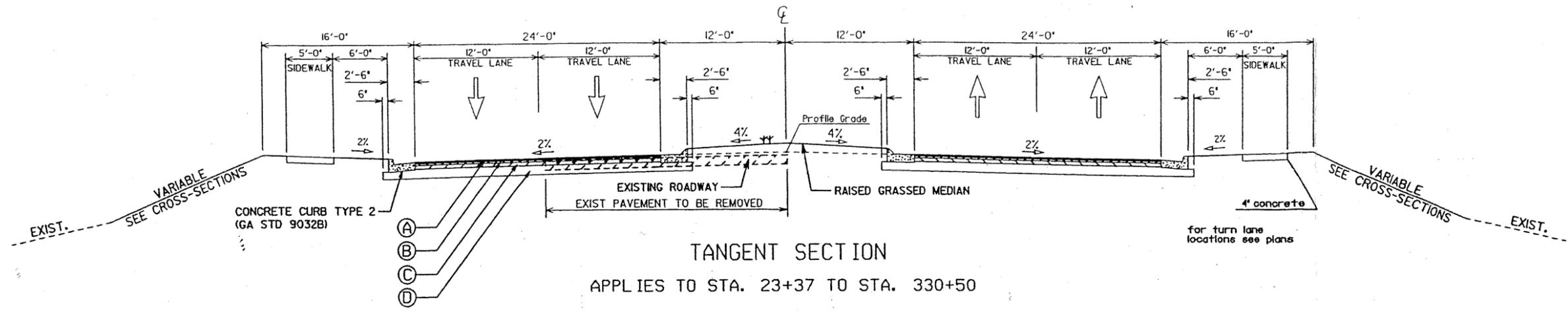
- Sidewalks will have to be built at a future date if pedestrian traffic increases

DISCUSSION:

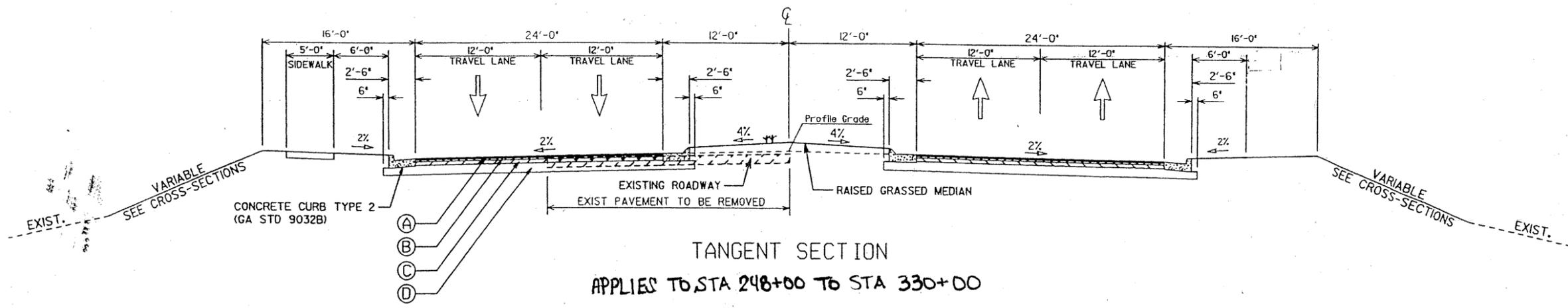
Sidewalk does not appear to be a necessity in this highly traveled area. If sidewalk in fact is needed, the area closest to the Kroger Shopping Center would be most feasible because there are front-facing residences along SR 360.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,394,250	—	\$ 4,394,250
ALTERNATIVE	\$ 538,059	—	\$ 538,059
SAVINGS	\$ 3,856,191	—	\$ 3,856,191

TS-01



AS DESIGNED



ALTERNATIVE

MULKEY
 ENGINEERS & CONSULTANTS
 1255 CANTON STREET, SUITE G
 ROSWELL, GEORGIA 30075
 (678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES		

STATE OF GEORGIA
 DEPARTMENT OF TRANSPORTATION
 OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
 SR 360
 DRAWING No. 5-01

CALCULATIONS



PROJECT:

**WIDENING of SR 360 FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD**
Georgia Department of Transportation

ALTERNATIVE NO.: 5-3

SHEET NO.: 3 of 4

ALTERNATIVE DESIGN

$(8200' \times 5') \rightarrow 41,000 \text{ SF}$

$\frac{41,000 \text{ SF}}{9} \approx 4555 \text{ SY}$

AS DESIGNED

37200 SY FROM COST ESTIMATE

VALUE ENGINEERING ALTERNATIVE



PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY
 PARKWAY TO SR 176/LOST MOUNTAIN ROAD
 Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: E-1

DESCRIPTION: USE 2:1 CUT SLOPES IN LIEU OF 4:1 CUT SLOPES IN
 SELECTED LOCATIONS

SHEET NO.: 1 of 3

ORIGINAL DESIGN: (Sketch attached)

4:1 cut slopes are used throughout the project.

ALTERNATIVE: (Sketch attached)

Use 2:1 cut slopes at selected locations to reduce the impact to properties.

ADVANTAGES:

- Reduces right-of-way costs
- Reduces excavation costs

DISADVANTAGES:

- Produces more slope area that will not be grassed
- Requires additional borrow material

DISCUSSION:

The right-of-way cost is driving the total cost of this project. By increasing the cut slope to 2:1, less area is impacted, thus reducing this cost.

Note that drainage ditches have not been placed at the base of the cut sections. If these will be added later, then the extent of the encroachment onto adjacent properties will increase. The use of the 2:1 cut section will still result in a net reduction of encroachment area.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,319,746	—	\$ 4,319,746
ALTERNATIVE	\$ 2,630,576	—	\$ 2,630,576
SAVINGS	\$ 1,689,170	—	\$ 1,689,170

**Alternative E-1
Use 2:1 Slopes for All Cut Slopes**

Station Limits		End Area	Earthwork Volume	R/W Width	R/W Area	
41+00	44+60	325	4,333	28	10,080	
44+60	48+60	45	667	9	3,600	
50+40	55+40	75	1,389	18	9,000	
59+40	61+20	80	533	20	3,600	
75+00	76+60	8	47	4	640	
115+60	119+00	310	3,904	35	11,900	
126+00	128+40	300	2,667	70	16,800	
131+80	132+60	35	104	10	800	
142+80	143+80	45	167	12	1,200	
144+00	145+00	45	167	8	800	
157+40	159+40	230	1,704	28	5,600	
166+00	168+20	45	367	10	2,200	
169+60	174+20	190	3,237	22	10,120	
Subtotal Paulding					76,340	
182+20	185+00	40	415	12	3,360	
191+60	200+00	380	11,822	50	42,000	
208+00	210+20	250	2,037	40	8,800	
218+20	221+60	45	567	12	4,080	
228+80	230+00	35	156	17	2,040	
248+00	254+00	90	2,000	25	15,000	
255+40	256+80	15	78	18	2,520	
260+00	266+80	25	630	10	6,800	
267+80	270+00	45	367	17	3,740	
275+60	279+00	320	4,030	55	18,700	
280+20	285+60	280	5,600	55	29,700	
300+00	303+00	70	778	16	4,800	
306+60	308+40	380	2,533	38	6,840	
313+80	315+40	80	474	16	2,560	
318+80	320+80	8	59	5	1,000	
321+80	323+60	170	1,133	38	6,840	
Subtotal Cobb					158,780	
		Totals	51,962	CY	235,120	SF

VALUE ENGINEERING ALTERNATIVE



PROJECT: SR 360 WIDENING – FROM SR 120/CHARLES HARDY
PARKWAY TO SR 176/LOST MOUNTAIN ROAD
Cobb and Paulding Counties, Georgia

ALTERNATIVE NO.: E-3

DESCRIPTION: USE 2:1 FILL SLOPES IN LIEU OF 4:1 FILL SLOPES,
MOVE THE SIDEWALK CLOSER TO THE EDGE OF
ROAD, AND ADD W-BEAM GUARDRAIL AT THE EDGE
OF THE EMBANKMENT

SHEET NO.: 1 of 3

ORIGINAL DESIGN: (Sketch attached)

4:1 fill slopes are used throughout the project except where the fill is exceptionally high, and then 2:1 fill slopes are used. At locations where a 2:1 fill slope is used, the sidewalk is moved from 6 ft. from the back of the curb to 2 ft. from the back of the curb and a W-beam guard rail is placed 2 ft. behind the sidewalk.

ALTERNATIVE: (Sketch attached)

Use more 2:1 fill slopes with relocated sidewalks and W-beam guardrail to reduce impacts to adjacent properties.

ADVANTAGES:

- Reduces right-of-way costs
- Reduces embankment costs

DISADVANTAGES:

- Increases areas where the mow strip between the sidewalk and edge of curb is reduced to 2 ft.
- Increases guardrail to maintain

DISCUSSION:

The total cost of this project is driven by the right-of-way costs. Moving the edge of disturbance caused by the addition of embankment material will reduce the needed right-of-way. In many instances, the proposed changes in slope just extend a section where a 2:1 slope already exists or closes in areas between two existing sections where 2:1 slopes are used with guardrail. This eliminates guardrail end sections and enhances safety.

Note that drainage ditches have not been placed at the base of the fill sections. If these will be added later, then the extent of the encroachment onto adjacent properties will increase. The use of the 2:1 fill section will still result in a net reduction of encroachment area.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 3,151,189	—	\$ 3,151,189
ALTERNATIVE	\$ 581,850	—	\$ 581,850
SAVINGS	\$ 2,569,339	—	\$ 2,569,339

Alternative E-3
Use 2:1 Slopes for Fill Slopes

Station Limits		End Area	Earthwork Volume	R/W Width	R/W Area	
20+60	22+20	80	474	18	2,880	
34+80	35+00	10	7	5	100	
36+40	37+20	25	74	15	1,200	
38+00	39+60	60	356	24	3,840	
59+60	60+00	25	37	20	800	
61+80	62+20	10	15	10	400	
63+40	64+20	12	36	10	800	
67+20	67+80	20	44	15	900	
69+40	70+20	40	119	28	2,240	
70+60	73+40	20	207	10	2,800	
75+00	77+60	35	337	18	4,680	
82+20	83+00	225	667	30	2,400	
86+20	87+20	50	185	15	1,500	
88+60	89+80	50	222	15	1,800	
91+40	92+40	45	167	15	1,500	
92+40	95+00	200	1,926	30	7,800	
102+00	103+00	100	370	15	1,500	
105+00	111+80	80	2,015	13	8,840	
113+40	115+60	320	2,607	32	7,040	
119+20	120+20	50	185	10	1,000	
122+00	124+60	75	722	10	2,600	
126+60	132+20	80	1,659	17	9,520	
135+80	143+60	25	722	5	3,900	
146+00	150+60	80	1,363	20	9,200	
159+40	162+40	80	889	18	5,400	
Subtotal Paulding			15,406		84,640	
177+40	178+80	65	337	18	2,520	
198+80	200+40	85	504	16	2,560	
214+40	217+60	65	770	13	4,160	
174+80	176+20	75	389	14	1,960	
177+40	178+80	125	648	22	3,080	
199+00	200+40	110	570	14	1,960	
214+40	217+00	65	626	13	3,380	
223+20	223+80	80	178	20	1,200	
238+60	241+60	65	722	14	4,200	
241+60	245+80	180	2,800	34	14,280	
245+80	246+80	65	241	11	1,100	
253+80	257+00	180	2,133	26	8,320	
288+80	290+60	90	600	18	3,240	
295+20	295+60	40	59	8	320	
298+00	298+60	45	100	14	840	
308+60	309+20	35	78	10	600	
324+40	325+20	80	237	18	1,440	
333+20	336+40	65	770	17	5,440	
Subtotal Cobb			11,763		60,600	
		Totals	27,169	CY	145,240	SF

PROJECT DESCRIPTION

The widening of SR 360 from SR 120 (Macland Road)/Charles Hardy Parkway to SR 176/Lost Mountain Road project widens SR 360 from two lanes to four lanes with a raised median divider. The project will actually begin 1,287 feet west of SR 120 in Paulding County and end 751 feet east of SR 176 in Cobb County for a total project length of about 6.2 miles with approximately an equal amount in each county. See the attached location map.

This corridor serves as an urban minor arterial and provides access to Marietta via SR 120 and the City of Dallas via US 278. The corridor is experiencing decreasing levels of service due to increases in traffic volumes. The increase in traffic is spurred by development along SR 360 and many urban collector and arterial streets as well as urban and rural local streets that connect to the corridor. Recent developments include several residential neighborhoods and commercial establishments that correspond to the increasingly suburbanized nature of the once rural landscape. Additionally, SR 360 links two important routes, two sizeable cities, and several smaller communities. Improvements are needed to increase the existing capacity and improve operational deficiencies including:

- Substandard capacity for existing and predicted traffic volumes;
- Substandard horizontal and vertical geometry that create hazardous sight-distance problems; and
- Numerous side streets, driveways and shopping center intersections without turn lanes that cause frequent stops in traffic flow.

The purpose of this project is to enhance mobility along the SR 360 corridor to accommodate traffic generated by residential and commercial growth in Cobb and Paulding Counties, and to improve access between Dallas and Marietta. The transportation solution could also correct existing operational deficiencies, improve safety, and improve access to numerous side streets and driveways that cause frequent stops in traffic flow. The traffic analysis indicates that trucks will comprise 2% of the design hourly traffic volume and 4% of the 24-hour traffic volume.

The typical section will consist of four 12-ft. lanes (two in each direction), a 24-ft.-wide raised median with 30-in.-wide curb and gutter sections at the outside edges, and 5-ft. sidewalks in urban shoulders that are 16 ft. wide from the edge of the gutter to the break in the shoulder. See attached Typical Section. The design speed is 45 mph. On the east side of SR 176, the lanes will be 11 ft. wide, with a 7-ft.-wide sidewalk behind the curb and gutter and a retaining wall to minimize the impacts to the church and avoid impacts to an historic resource in the northeast quadrant of the intersection. At this intersection, two left-turn lanes for the southbound to eastbound movement and westbound to southbound movements will be provided.

The proposed right-of-way will be approximately 150 ft. wide. Some areas may require varying right-of-way widths to avoid or minimize impacts. Construction of the widened roadway will require some embankment areas and some cut areas which will expand the need for right-of-way, and in some cases, require the displacement of existing structures. A total of 27 residences and eight businesses will be displaced. A retaining wall will be constructed in front of a dentist's office to avoid taking this property.

Signalized intersections will be provided at the following locations:

- SR 120 (Charles Hardy Parkway)
- SR 92 (Hiram Acworth Highway)
- Lake Road/Smith Road (New)
- Poplar Springs Road (New)
- Florence Road/Corner Road
- North Bullard Road (New)
- Old Lost Mountain Road
- SR 176 (New Macland Road)

Tee intersections will be provided for the following roads:

- Bullard Road (from south of SR 360)
- Line Tree Lane
- Old Atlanta Road
- Macland Circle
- Richmond Drive
- Covington Drive
- Maxwell Road
- Ansley Road
- Harthwood Place
- Ragsdale Road

Other median openings will be provided at:

- Macland Springs Road and Old Mill Road
- Cowboy Path and an automobile dealership
- Two churches
- Three U-turns between intersections

At each intersection, right-turn lanes will be added to the outside of the two through lanes and left-turn lanes with a 4-ft.-wide buffer zone between the inside through lane and left-turn lane will be constructed within the median, leaving an 8-ft.-wide paved nosing strip (edge of gutter to edge of gutter). At the U-turns, a left-turn lane with 4-ft.-wide buffer zone will be provided in the median and a short widening of the outside lane.

As part of the project, the Florence Road and Bullard Road intersection south of SR 360 will be upgraded.

Eleven streams will be crossed, necessitating two bridges and nine culverts. The first bridge will replace an existing triple box culvert (10 ft. x 9 ft. high) over Powder Springs Creek. It will consist of a three-span structure with precast, prestressed concrete AASHTO girders and a cast-in-place concrete deck with cast-in-place concrete traffic barriers at the perimeter. The second will span another stream; its construction has yet to be decided.

The pavement section will consist of 10-1/2 in. of hot mix asphalt over 12 in. of graded aggregate base. Five-ft.-wide concrete sidewalks will be provided throughout the length of the project except where noted above. Thermoplastic paving markings will be used.

As part of the project, existing utilities, including a water trunk line feeding Paulding County, electric, gas and telephone lines, will be relocated. Both a closed, piped drainage system and ditch system to the outside of the urban shoulder will be provided for storm water control. Grass and mulch will also be provided. Where fill slopes are less than 4 horizontal to 1 vertical, W-beam guardrail will be placed behind the sidewalk, which will be moved two ft. from the back of the concrete curb.

This project is a long-term project in the GDOT capital plan and as such has not been funded for construction. The total project cost is \$187.5 million in 2018 dollars.

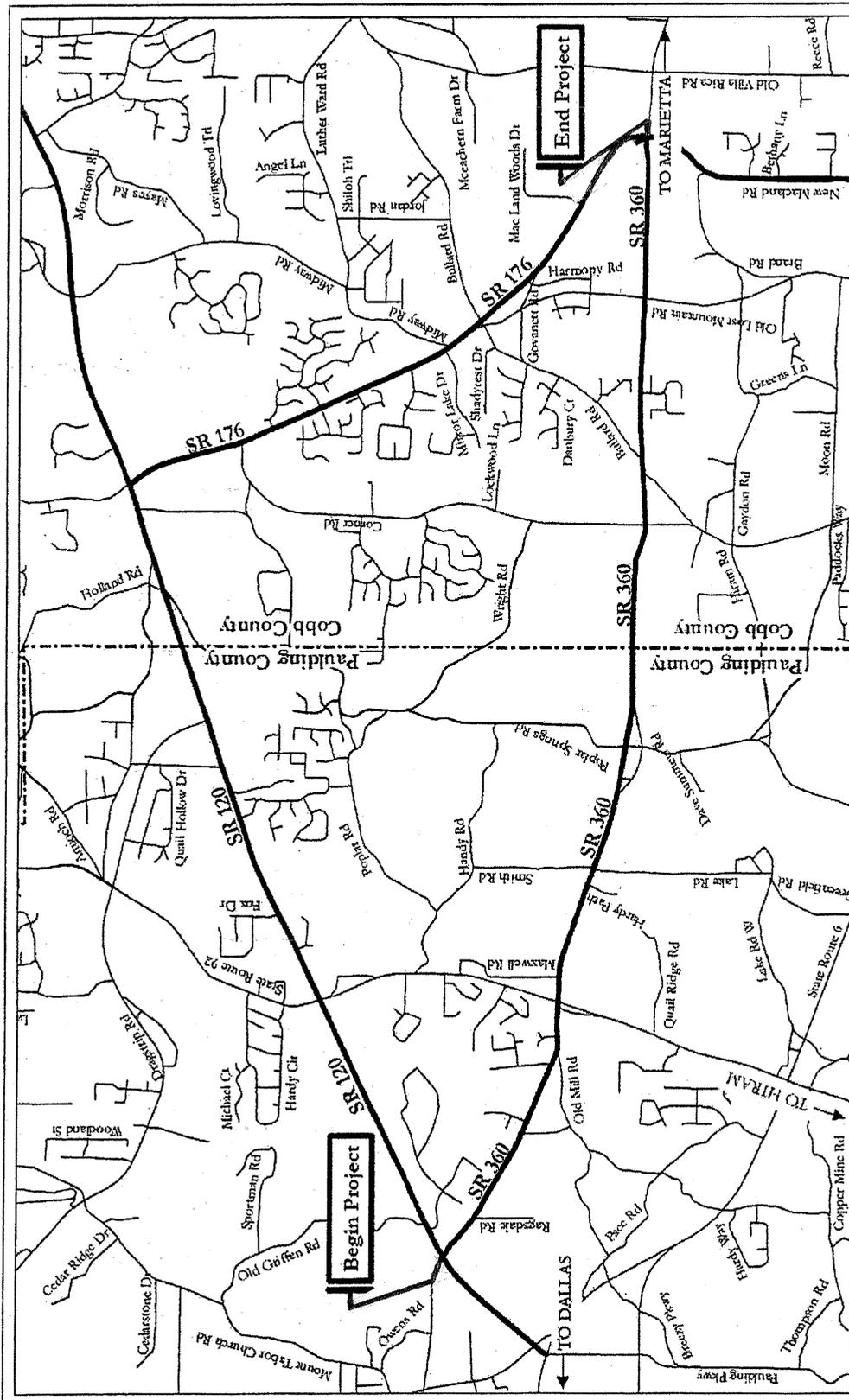
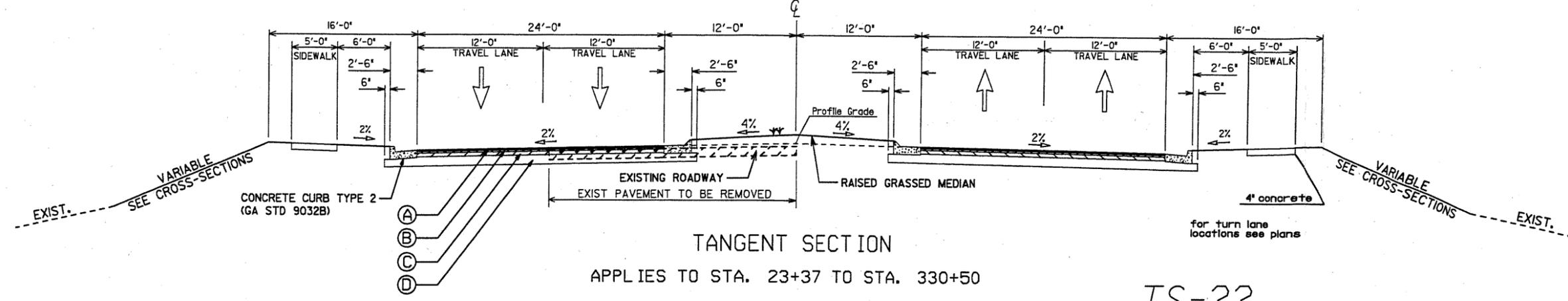
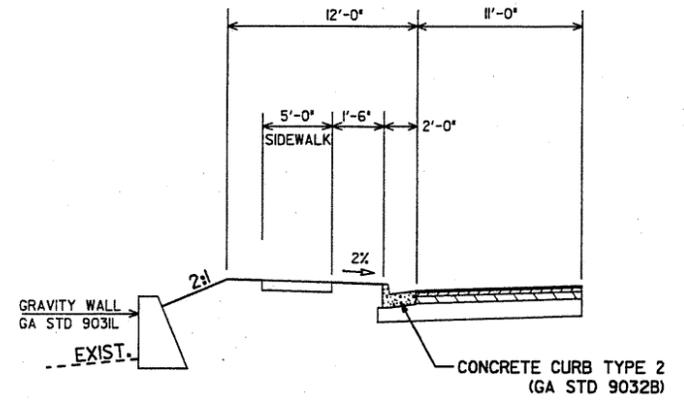


Figure No. 1	
Project Location Map SR 360 from SR120 to SR 176 Project Number CSSTP-0006-00(049), PI 0006049 Cobb & Paulding Counties, Georgia	
Courtesy of Georgia Department of Transportation Roads and Highways County Boundaries	
1:42,000 0 0.5 1 2 Miles	
Prepared for: 	
	

TS-01

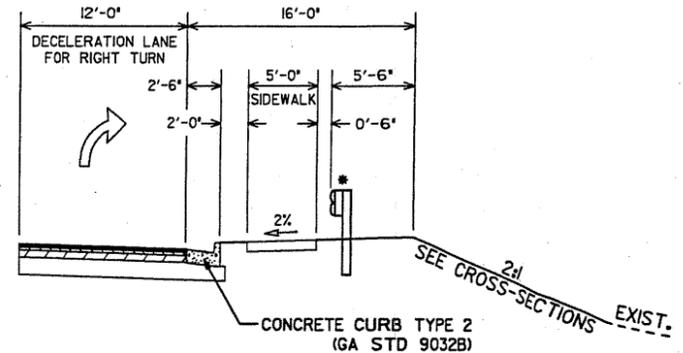


TS-04



GRAVITY WALL APPLIES TO STA. 26+00 TO STA. 28+50 RIGHT

TS-??



* SEE PLANS FOR GUARDRAIL LOCATIONS

FULL DEPTH PAVEMENT

- Ⓐ 1.5" (165 LB/SY) 12.5 mm SUPERPAVE, MDL "B"
- Ⓑ 4" (440 LB/SY) 19 mm SUPERPAVE, MDL "B"
- Ⓒ 5" (330 LB/SY) 25 mm SUPERPAVE, MDL "B"
- Ⓓ 12" GRADED AGGREGATE BASE CRS, INCL MATL

MULKEY
ENGINEERS & CONSULTANTS
1255 CANTON STREET, SUITE 6
ROSWELL, GEORGIA 30075
(678) 461-3511

DRAWING NOT TO SCALE

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: OFFICE OF CONSULTANT DESIGN
TYPICAL SECTIONS
SR 360

DRAWING No.
5-01

VALUE ANALYSIS AND CONCLUSION

INTRODUCTION

This section describes the value methodology followed during the value engineering study on the widening of SR 360 from SR 120/Charles Hardy Parkway to SR 176/Lost Mountain Road (Federal Aid Project CSSTP-0006-00(049)) for the Georgia Department of Transportation. It is followed by narratives and conclusions concerning:

- Value Engineering Workshop Participants
- Economic Data
- Cost Model
- Function Analysis
- Creative Idea Listing and Judgment of Ideas

A systematic approach was used in the VE study and the key procedures involved were organized into three distinct parts: 1) preparation; 2) VE orientation meeting and workshop; and 3) post-study. A Task Flow Diagram that outlines the procedures included in the VE study follows.

PREPARATION EFFORT

Preparation for the workshop consisted of scheduling workshop participants and tasks and gathering necessary project documents for team members to review before attending the workshop. These documents, listed below, were used as the basis for generating VE alternatives and for determining the cost implications of the selected VE alternatives:

- Plan and Profile of Proposed Widening of SR 360 from SR 120/Charles Hardy Pkwy to SR 176/ Lost Mountain Road, dated 2/5/2008, prepared by Mulkey Engineers & Consultants
- Project Concept Report, Project No. CSSTP-0006-00(049), P.I. Number: 0006049, approved 1/22/07
- Estimate Report for file "CSSTP-0006-00(049), PI 0006049 (Plans)," dated 1/22/2008
- Preliminary Right-of-Way Cost Estimate, dated 14 Sept. 06
- Report of Soil Survey for SR 360 (Macland Road) From SR 120 (Charles Hardy Parkway) to SR 176 (Lost Mountain Road/New Macland Road), Federal Aid Project CSSTP-0006-00(049), P.I. Number: 0006049, dated August 23, 2007, Revised October 11, 2007, Revised November 21, 2007, prepared by NOVA Engineering and Environmental
- Drainage Design Data, CSSTP-0006-00(049), P.I. Number: 0006049, SR 360/Macland Road from SR 120/Charles Hardy Parkway to SR 176/New Macland Road
- SR 360/Macland Road from SR 176 to SR 120 Corridor/Arterial Study, Georgia Department of Transportation, Project No. CSSTP-0006-00(049), P.I. Number: 0006049, Volumes 1, 2 and 3, dated May 2007, prepared by Grice & Associates
- Project Notebook, CSSTP-0006-00(049), PI 0006049, SR 360 From SR 176/New Macland Road to SR 120, P.I. Number: 0006049, prepared by Mulkey Engineers & Consultants



Value Engineering Study Task Flow Diagram

Preparation Effort

Coordinate Project

- Verify Schedule
- Suggest Format for Designer Presentation
- Outline Project Responsibilities
- Outline Needed Background Data
- Define *Project Value Objectives*
- Identify Project Constraints

Prepare for Workshop

- Collect Project Data
- Distribute Data to Team Members
- Verify Cost Data
- Team Members Become Familiar with Project

Construct Cost Models

- Construct Cost Models
- Construct Graphic Function Analysis
- Outline High Cost Areas

LCC Model

- Process Areas
- Staffing
- Chemicals
- Energy
- User Impact

Workshop Effort

Information Phase

- Introduction by VETL
- Project Description and Presentation by Designer
- Outline Owner Requirements
- Review Project Data
- Visit Project Site (Alt.)

Function Identification and Analysis Phase

- Analyze Project Costs and Energy Usage
- Perform Function Analysis and FAST Diagram
- Identify High Cost and Energy Areas
- Calculate Cost/Worth Ratios
- Identify Paradigms
- List Ideas Generated During Function Analysis

Creative Phase

- Introduction by VETL
- Creative Idea Listing:
 - Quantity of Ideas
 - Association of Ideas
- Brainstorming
- Creative Thinking:
 - Group & Individual
- Use Checklist for Ideas

Evaluation Phase

- Eliminate Impractical Ideas
- Rank Ideas with Advantages/Disadvantages
- Evaluate Alternatives (Include Non-Economic considerations: Safety, Reliability, Environment, Aesthetics, O & M, etc.)
- Select Best Ideas for Implementation

Development Phase

- Develop Proposed Alternatives
- Prepare Alternative Design Sketches
- Estimate Costs
- Perform Life Cycle Comparison
 - Initial Cost
 - Redesign Cost
 - O & M Cost
 - LCC Cost

Presentation Phase

- Summarize Findings
- Present VE Ideas to Owner/User/Designer
- Oral Presentation

Post-Workshop Effort

VE Study Report

- Prepare Preliminary VE Report
- Designer Prepares Responses to VE Report
- Owner Evaluates Recommendations

Implementation Phase

- Participate in Implementation Meeting with Owner/User/Designer/VE Team, as needed
- Prepare Final VE Report

Final Acceptance

- Redesign by Designer

Information relating to the project's purpose and need, owner concerns, project stakeholder concerns, design criteria, project constraints, funding sources and availability, regulatory agency approval requirements, and the project's schedule and costs is very important as it provides the VE team with insight about how the project has progressed to its current state.

Project cost information provided by the designers is used by the VE team as the basis for a comparative analysis with similar projects. To prepare for this exercise, the VE team leader used the cost estimate prepared by Mulkey to develop a cost model for the project. The model was used to distribute the total project cost among the various elements or functions of the project. The VE team used this model to identify the high-cost elements or functions that drive the project and the elements or functions providing little or no value so that the team could focus on reducing or eliminating their impact.

VALUE ENGINEERING WORKSHOP EFFORT

The VE effort consisted of a three-day, 24-hour workshop followed by a presentation on the morning of the fourth day. During the workshop, the VE job plan was followed. The job plan guided the search for alternatives to enhance value. It includes six phases:

- Information Gathering Phase
- Function Identification and Analysis Phase
- Creative Idea Generation Phase
- Evaluation/Judgment Phase
- Alternative Development Phase
- Presentation Phase

Information Phase

At the beginning of the study, the decisions that influenced the development of the design must be reviewed and understood. For this reason, the designers from Mulkey Engineers & Consultants presented information about the project to the VE team on the first day of the VE session.

The cost histogram developed during the workshop preparation was reviewed to identify the major construction elements.

Function Identification and Analysis Phase

Function Analysis was used to evaluate the project to see if the expenditures actually perform the requirements of the project, or if there are disproportionate amounts of money spent on support functions. These elements add cost to the final product, but have a relatively low worth to the basic function. This creates a high cost-to-worth ratio, and the VE team targets these areas for value improvement.

Creative Phase

This VE study phase involved the creation and listing of ideas. During this phase, the VE team developed as many ideas as possible to provide the necessary functions within the project at a lower total life cycle cost or to improve the quality of the project. Judgment of the ideas was restricted at this point. The VE team was looking for a large quantity of ideas and free association of ideas.

GDOT and its design consultants may wish to review the creative list since it may contain ideas that can be further evaluated for use in the design.

Evaluation Phase

During this phase of the workshop, the VE team judged the ideas generated during the creative phase. Advantages and disadvantages of each idea were discussed to find the best ideas for development. Ideas found to be irrelevant or not worthy of additional study were discarded. Those that represented the greatest potential for cost savings or improvement to the project were then developed further.

The VE team would like to develop all ideas, but time constraints usually limit the number that can be developed. Therefore, each idea was compared with the present design concept in terms of how well it met the design criteria. Advantages and disadvantages were discussed and recorded and the ideas were rated on a scale of one to five, with the best ideas rated five. Generally, only ideas rated four or five were developed into alternatives. In cases where there was little cost impact, but an improvement to the project was anticipated, the designation DS, for design suggestion, was used. The design team should review this listing for possible incorporation of ideas into the project.

The creative listing was re-evaluated frequently while developing alternatives. As the relationship between creative ideas became more clearly defined, their importance and ratings may have changed, or they may have been combined into a single alternative. For these reasons, some of the originally highly-rated items may not have been developed into alternatives.

Development Phase

During the development phase, the best ideas were expanded into workable solutions. The development consisted of a description of the alternative, life cycle cost comparisons, where applicable, and a descriptive evaluation of the advantages and disadvantages of the proposed alternatives. Each alternative was written with a brief narrative to compare the original design to the proposed change. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives are included in the Study Results section.

Presentation Phase

The last phase of the VE team's work is to present the alternatives. This is done in two parts; first there was an informal presentation of the developed alternatives and design suggestions on the last day of the VE study. Secondly, this written report is submitted as a record of the works of the VE team, and to serve as a tool for GDOT and its consultant staffs to work out an implementation plan for the best, selected alternatives and design suggestions.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study includes the preparation of this report. Professionals from GDOT and the design team will analyze each alternative and prepare a short response, recommending either incorporating the alternative into the project, offering modifications before implementation, or presenting reasons for rejection. LZA is available at your convenience as you review the alternatives.

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise on the project elements involved. Team members consisted of a multidisciplinary group with professional planning, design, and construction experience. The VE team included the following:

Howard B. Greenfield, PE, CVS	VE Team Leader	Lewis & Zimmerman Associates
James Daniel Hood, PE	Highway Engineer	HNTB, Inc.
John Tiernan, PE	Bridge/Structural Engineer	ARCADIS U.S., Inc.
Vinique Word	Cost/Constructability	Delon Hampton and Associates

The study was conducted at GDOT's Central Office, Atlanta, Georgia February 12 – 15, 2008.

DESIGNER'S PRESENTATION

Mulkey Engineers & Consultants presented an overview of the project on Tuesday, February 12, 2008. The purpose of this meeting, in addition to being an integral part of the Information Phase of the VE study, was to bring the VE team up-to-speed regarding the overall project. Additionally, the meeting afforded the design team the opportunity to highlight in greater detail those areas of the project requiring additional or special attention. The attendees at that meeting are indicated on the following sign-in sheet.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted on Friday, February 15, 2008. The purpose of this meeting was to review the alternatives developed during the study. In addition to the VE team, the following attended the meeting:

Lisa L. Myers	VE Coordinator	GDOT
Ronald Wishon		GDOT
Stanley Hill		GDOT
James Magnus	Client Relations	GDOT
John R. McGuire	Highway Design	Mulkey
Kenneth McDuff	Highway Design	Mulkey

VE STUDY SIGN-IN SHEET

Project No.: CSSTP-0006-00(049)

County: Cobb Paulding

PI No.: 0006049

Date: 2/12-15/08

NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
Lisa L. Myers	00244168	Engineering Services	404-651-7468	lmyers@dot.ga.gov
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John R. McGuire		Mulkey	678-461-2072	jmcguire@mulkeyinc.com
Ken McEliff		Mulkey	678-461-3612	kmcdiff@mulkeyinc.com
Vinique Ward		Dehon Hampton	404-419-8438	vward@delonhampton.com
HOWARD GREENFIELD		LEWIS & ZIMMERMAN	301-984-9590	hrgreenfield@lza.com
EMMANUELLA MYRTHI	00841437	EDOT/DEL	404-699-6967	emmyrthi@dot.ga.gov
TAW HOOD		HNTB	404 946-5700	JHOOD@HNTB.COM
Wesley Brock	00342794	GDOT/ROW	404 656-3738	wbrock@dot.ga.gov
Kenny Beckwith	0028409	GDOT/D6	770-387-3605	Kbeckwith@dot.ga.gov
James Magnus	00208161	GDOT	404-656-5306	jmagnum@dot.ga.gov
JAMES HARRAY	00276732	GDOT	770-528-3238	JHARRAY@dot.ga.gov
VinSITA Poyram	00684767	GDOT	4-463-2987	vpyram@dot.ga.gov
Steve Gaston	00352939	GDOT - Bridge	4-656-5197	sgaston@dot.ga.gov
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ECONOMIC DATA

The economic criteria used to evaluate ideas were developed by the VE team with information gathered from documents provided by GDOT. To express costs in a meaningful manner, the VE team alternatives are presented on the basis of discounted present worth. Criteria for planning project period interest rates are based on the following parameters:

Year of Analysis:	2018
Current Construction Cost Estimate: (Includes escalation at 8% per year for 10 years)	\$137.7 million
Right-of-Way Costs:	\$47.8 million
Reimbursed Utilities Cost:	\$1.7 million
Construction Duration	24 – 36 months

Mark-ups

Right-of-Way	247% (Fees & Escalation)
Construction	237.5% (Escalation)

COST MODEL

The VE team prepared a cost histogram model, or Pareto Chart, for the project that follows this page. This cost model displays the major construction elements in each project and reflects the information that appeared in the GDOT cost estimate for the construction. The Pareto Chart is an aid to identify high cost areas in the projects.

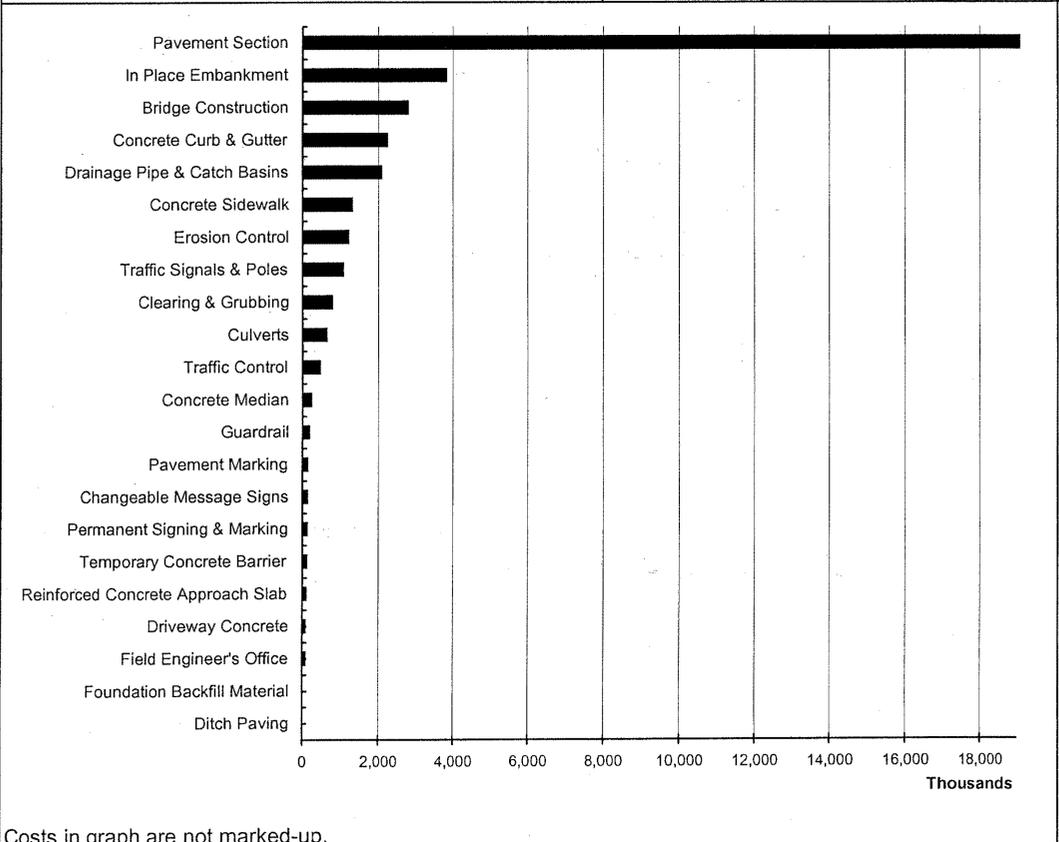
The high cost elements are:

- Right-of-Way
- Pavement
- In-place Embankment
- Bridge Construction
- Concrete Curb and Gutter

COST HISTOGRAM



PROJECT: SR 360 WIDENING - CSSTP-0006-00(049) - P.I. #0006049				
Pavement Section		19,591,835	52.83%	52.83%
In Place Embankment	82% of	3,814,100	10.28%	63.11%
Bridge Construction	Costs	2,800,000	7.55%	70.66%
Concrete Curb & Gutter		2,236,400	6.03%	76.69%
Drainage Pipe & Catch Basins		2,082,662	5.62%	82.31%
Concrete Sidewalk		1,302,000	3.51%	85.82%
Erosion Control		1,203,962	3.25%	89.07%
Traffic Signals & Poles		1,076,797	2.90%	91.97%
Clearing & Grubbing		780,000	2.10%	94.07%
Culverts		621,750	1.68%	95.75%
Traffic Control		450,000	1.21%	96.96%
Concrete Median		227,400	0.61%	97.58%
Guardrail		166,040	0.45%	98.02%
Pavement Marking		129,160	0.35%	98.37%
Changeable Message Signs		120,000	0.32%	98.70%
Permanent Signing & Marking		114,840	0.31%	99.01%
Temporary Concrete Barrier		112,500	0.30%	99.31%
Reinforced Concrete Approach Slab		91,866	0.25%	99.56%
Driveway Concrete		79,740	0.22%	99.77%
Field Engineer's Office		77,403	0.21%	99.98%
Foundation Backfill Material		4,000	0.01%	99.99%
Ditch Paving		3,000	0.01%	100.00%
Subtotal		\$ 37,085,455	100.00%	
E&C @ 10.00%		\$ 3,708,546		
Escalation to 2018 237.50%		\$ 96,885,751		
TOTAL CONSTRUCTION COST		\$ 137,679,752		
Right-of-Way		\$ 47,800,000		
Reimbursed Utilities		\$ 1,692,500		
GRAND TOTAL PROJECT COST		\$ 187,172,252	Comp Mark-up:	271%



Costs in graph are not marked-up.

FUNCTION ANALYSIS

Function Analysis was performed to define the requirements for each project element and ensure a complete and thorough understanding by the VE team of the basic function(s) needed to attain a given requirement. A random function analysis worksheet for the overall project is attached. This sheet stimulated the VE team members to think of the areas in which to channel their creative idea development.

RANDOM FUNCTION ANALYSIS



PROJECT: **SR 360 WIDENING (P.I. No. 0006049)**
Cobb and Paulding Counties, Georgia

SHEET NO.: **1 of 1**

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
Pavement \$19.6M	Support	Loads	B
\$17.0M Target	Smooth	Surface	B
Right-of-Way \$47.8M	Create	Space	B
\$40.0M Target			
Embankment \$3.8M	Establish	Profile	B
\$3.5M Target			
Bridges \$2.8M	Span	Streams	S
	Protect	Environment	
Concrete Curb and Gutter \$2.2M	Direct	Storm Water	S
\$1.5M Target	Prevent	Erosion	S
	Define	Traffic Way	S
	Channel	Traffic	B
Drainage \$2.1 M	Collect	Storm Water	S
	Transport	Storm Water	S
Concrete Sidewalk \$1.3M	Support	Loads	B
\$1.0M Target			

Function defined as:	Action Verb	Kind:	B = Basic	HO = Higher Order
	Measurable Noun		S = Secondary	LO = Lower Order
	? VE Team opinion- not sure		RS = Required Secondary	U = Unwanted

CREATIVE IDEA LISTING AND JUDGMENT OF IDEAS

During the creative phase, numerous ideas, alternatives proposals and/or recommendations were generated using conventional brainstorming techniques as recorded on the following pages. These ideas were then discussed and compared against the value objectives determined by conversations with the GDOT and design teams. Based on these conversations, the top criteria to consider when determining the viability of an ideas to be developed for this project:

1. Saves Costs
2. Reduces Displacements
3. Enhances Safety
4. Preserves Environment
5. Enhances Constructability

The ideas were then ranked on a scale of one to five on how well the VE team believed the idea met these criteria overall. The higher rated ideas were then developed into formal alternatives and included in the Study Report. Typically, all ideas rated four or above are included in the Study Report. When this is not the case, an idea was combined with another related idea or discarded, as a result of additional research that indicated the concept as not being cost-effective or technically feasible.

The reader is encouraged to review the Creative Idea Listing since it may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING



PROJECT: **SR 360 WIDENING – Project No.: CSSTP-0006-00(049),**
Pl. No. 000604
Cobb and Paulding Counties, Georgia

SHEET NO.: **1 of 2**

NO.	IDEA DESCRIPTION	RATING
SIDEWALK (S)		
S-1	Place sidewalk on one side of road only	4
S-2	Use asphalt in lieu of concrete sidewalk	4
S-3	Only use sidewalks at shopping centers and where multiple residents front on SR 360	4
S-4	Delete sidewalks	3
CURB AND GUTTER (CG-1)		
CG-1	Delete some curb and gutter	3
BRIDGES (B)		
B-1	Use Con/Span [®] bridges	4
B-2	Use a single-span bridge	4
PAVEMENT (P)		
P-1	Use all 11-ft.-wide lanes	4
P-2	Use 11-ft.-wide through lanes	5
P-3	Use 11-ft.-wide inside through lanes and 12-ft.-wide outside through lanes	5
P-4	Reduce all turn lanes to 11 ft. wide	4
P-5	Remove some median openings	See others
P-6	Reduce length of pocket	4
P-7	Take out U-turn at STA 191+00	4
P-8	Take out U-turn at STA 53+00	4
P-9	Take out U-turn at STA 307+50	4
P-10	Delete eastbound deceleration lane at Old Macland Circle	2
P-11	Reuse existing pavement	2
P-12	Use a cement treated aggregate base and reduce pavement section	2
GENERAL (G)		
G-1	Improve intersection at Poplar Spring and Old Atlanta Road/Macland Circle and Remove the SR 360 intersections	5

Rating: 1 = Not to be developed	2 = Possible development potential	3 = Most likely to be developed
DS = Design suggestion	ABD = Already being done	

