VALUE ENGINEERING REPORT

SR 400/SR 53/Dawson Forest Road Interchanges
APD–056-1(63)
Dawson County

November 2, 2007

OWNER:

Georgia Department of Transportation
No.2 Capitol Square
Atlanta, GA 30334

VALUE ENGINEERING CONSULTANT:

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SR400/SR53/DAWSON FOREST INTERCHANGES
APD–056-1(63)

VALUE ENGINEERING STUDY

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EXECUTIVE SUMMARY

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Executive Summary

VALUE ENGINEERING STUDY

SR 400/SR 53/Dawson Forest Interchanges
Dawson County
APD-056-1(63)

Introduction

This project was a good candidate for value engineering and the study was done at a good point in the development process. The original scope included a grade-separated interchange between SR 400 and SR 53. At the time of the VE study, the scope had increased to include several other significant elements, including a grade-separated interchange between SR 400 and Dawson Forest Road, located approximately 1 mile south of SR 53. More information about the project can be found in the **Study Identification** section of this report.

The VE Team appreciated the assistance of the Design Team in assembling the numerous documents provided, and conducting an informative Design Presentation at the beginning of the study.

This section of the report includes a brief overview of the Team's recommendations. More detail on these recommendations is included in the **V.E. Recommendations** section.

At the conclusion of the study, the VE Team made a brief presentation of its findings and recommendations. The following were in attendance, in addition to the VE Team:

Todd Long - GDOT Preconstruction Division Director
Lisa Myers – GDOT Engineering Services - VE
Ron Wishon – GDOT Engineering Services
Rick Reasons – GDOT Office of Consultant Design
Mike Reynolds – Kissinger Campo and Associates
Ian MacRae KCA – Kissinger Campo and Associates

Considerations

The design concept for this project had not been determined at the time of the VE study. The Team assumed that the "under" concept, in which SR400 would be fully depressed under SR 53, was the baseline for the study. This concept included an interchange at Dawson Forest Road at which SR 400 would pass over Dawson Forest, and an extensive system of frontage roads/CD roads/ramps. The Team concentrated its analysis on the high-cost and high-complexity elements of the project – retaining walls, bridges, pavement, and right-of-way. A complete record of the Team's activities and findings is included in the **Appendix** of this report.

Results Obtained

The Team developed 8 recommendations with the potential for significant savings in construction and right-of-way cost plus enhancement in operations and maintenance.

Recommendation Highlights

W-3 Construct the "Over" Alternate

Based on the limited analysis the Team was able to make, we believe that raising SR 400 to cross over SR 53 would likely provide the highest overall value for this project. This approach would avoid potential groundwater problems and would have a lower construction cost, based on the estimates provided to the team.

The total potential savings if accepted was not estimated.

R-2 Eliminate Direct Access to Properties Where Alternate Access Exists

The baseline plan indicates direct access to several commercial properties from the frontage road/CD system which also have an acceptable access elsewhere. Eliminating these direct access points would probably add to the cost of the project but would enhance operations and safety.

The total potential savings if accepted was not estimated.

P-2 Reduce Width of Frontage Road/CD System

The VE Team was not able to analyze the traffic volumes supplied during the study, but they seemed very high in some areas. These volumes are driving the width of the frontage roads, which include three through lanes for much of the project, plus turn lanes. The Team recommends that the traffic volumes be revisited to see if fewer frontage road lanes can be constructed.

The total potential savings if accepted is $1,200,000.

P-3 Reduce Width of Outside Shoulders on Frontage Roads

The baseline calls for a 20' shoulder in many areas but the Team believes that a 12' shoulder would suffice in this situation.

The total potential savings if accepted is $200,000.

B-9 Eliminate the Braided Ramp Flyover Structure

The VE Team recommends the construction of an enhanced Collector-Distributor system on the east side of SR 400 between Dawson Forest Road and SR 53 which would eliminate the undesirable weave between ramps and avoid the need for the structure and its right of way impacts.

The total potential savings if accepted is $1,000,000.

R-3 Eliminate Local Service Roads

The baseline includes two local service roads to access the existing outlet mall. This business appears to have sufficient access from both SR 53 and Dawson Forest Road. The Team recommends that these service roads be eliminated, which would reduce construction cost and R/W requirements.

The total potential savings if accepted is $1,300,000.

W-1 Use Cast-in-Place Retaining Walls in lieu of Tie-Back Walls

If the "under" concept is selected for this project, the VE Team recommends this change in order to save a substantial amount of construction cost and also to avoid possible corrosion problems due to groundwater.

The total potential savings if accepted is $5,200,000.

B-2 Use a Two-Span Bridge For SR 53 Over SR 400

If the "under" concept is selected, we recommend the use of a two-span bridge in lieu of the 150' single-span proposed in the baseline. This would reduce the depth of the required superstructure and allow for less excavation and walls. The existing median on SR 400 is sufficiently wide to allow for a pier.

The total potential savings if accepted is $1,500,000.

SR 400/SR 53/Dawson Forest Interchanges

SUMMARY OF V.E. RECOMMENDATIONS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	COMMENTS
	General Project Concept						
W-3	Use the "Over" Project Concept			Not Est.			Reduce Wall Cost; Avoid Groundwater; Avoid Possible Blasting; Mitigate Visibility; Requires All Borrow
	Independent of Concept Chosen						
R-2	Eliminate Access Points Where Alternates Exist			Not Est.			May cost more but improves operations
P-2	Reduce Width of Frontage Roads			$1.2M			Based on AC Section in Plans
P-3	Reduce Width of Shoulder on Frontage Roads			$0.2M			Earthwork only; potential wall savings

SR 400/SR 53/Dawson Forest Interchanges

SUMMARY OF V.E. RECOMMENDATIONS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	COMMENTS
B-9	Relocate or Eliminate Weave Structure	$2.1M	$1.1M	$1.0M			Savings on R/W could be higher
R-3	Eliminate Service Road to Mall			$1.3M			Alternate Access Exists
	Supporting the "Under" Concept						
W-1	Use Cast-in-Place Walls	$13M	$7.8M	$5.2M			Cost of tie-back wall likely higher than current estimate
B-2	Two-Span Bridge Across SR 400	$10.6M	$9.1M	$1.5M			Reduced excavation, walls; requires pier in median

STUDY IDENTIFICATION

Study Identification

Project: SR 400/SR 53/Dawson Forest	**Date: October 22-25, 2007**
Location: Atlanta	

VE Team Members

Name:	Discipline:	Organization:	Telephone:
Rod Curtis, PE CVS	VE Team Leader	MACTEC	
Alex Wiley, PE	Construction/Roadway	MACTEC	
Aruna Sastry, PE	Structural Design	Sastry	
Jim Chambers, PE	Roadway Design	StreetSmarts	

Project Description

This project was in the conceptual phase at the time of the V.E. study. The original Project Concept Report, dated 3/20/2001, proposed to construct a new grade-separated interchange between SR 400 and SR 53 to replace the existing at-grade intersection. A nearby mall is generating heavy development and increased traffic volumes at the intersection. In the original scope, SR 400 would cross over SR 53. Frontage roads would be provided on both sides of SR 400 and access control would be acquired. The frontage/CD roads would be up to three lanes in each direction, plus turn lanes as required.

At the time of the study, there were five significant variations to this scope under consideration:

- Reversing the interchange such that SR 400 passes under SR 53
- Including a half-diamond interchange between SR 400 and Dawson Forest Road, which crosses SR 400 approximately 1 mile south of the intersection with SR 53. This would lengthen the project along SR 400 significantly.
- Grade-separating the frontage roads as they cross Dawson Forest Road, and providing a fly-over structure to reduce a weave on the east side, which would have significant right of way impact.
- Using PCC rather than AC pavement, on the ramps and possibly on the mainlines as well.
- Adding a half-diamond interchange at Carlisle Road to the south of Dawson Forest Road.

The first four of these potential revisions to the project scope are discussed in the Revised Concept Report, which is not dated. The FHWA has recently indicated an interest in expanding

the scope to include an interchange at Carlisle. The Design Team is awaiting guidance from Dawson County and GDOT management as to the appropriate project concept to be used.

As shown in the Cost Model in the Appendix of this report, the cost of the "under" concept, including the interchange at Dawson Forest Road and the frontage/CD system including the braided ramp, has been estimated at approximately $60M for the major elements, not including miscellaneous items and markups. The Design Team roughly estimates the overall project, including an interchange at Carlisle, at $100M.

A brief kick off meeting was conducted on the first morning of the VE study, with the following in attendance:

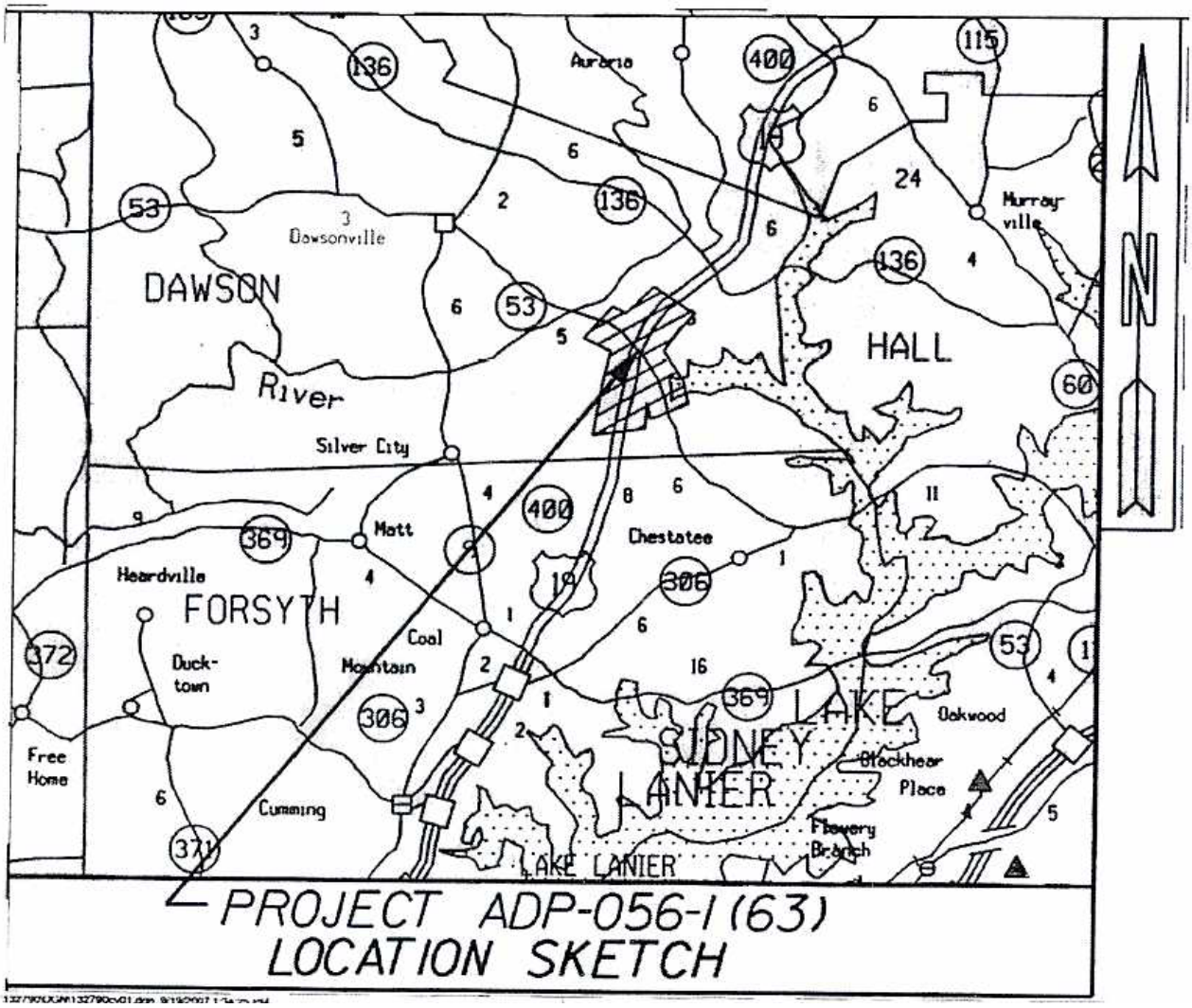
Rick Reasons – GDOT OCD
Ron Wishon – GDOT Eng Services
Ken Werho – GDOT Design Review
Judy Meisner – GDOT Bridge
Damon Frost – GDOT District One
Mike Haithcock – GDOT OCD
Amber Perkins – GDOT OEL:
Hiral Patel – GDOT District One
Jerry Milligan – GDOT R/W
Mike Reynolds - KCA
Ian MacRae - KCA
VE Team

The following items were noted during the Design Presentation by Mike Reynolds and Ian MacRae of Kissinger Campo and Associates:

- The Design Team requested the VE team to assist in the determination of the project concept, specifically the "over" or "under" approach, including feedback as to construction staging issues.
- Dawson County representatives are not happy with the perceived visibility problems associated with the "over" concept.
- The flyover structure, required to avoid an undesirable weave between ramps on the east side, would have significant impact on existing businesses and is not favored by the community.
- The FHWA would like to see an Environmental Assessment prepared; the Design Team feels that this is not necessary.
- Dawson Forest Road is a major intersection on SR 400 and must be included in the project to avoid operational problems at SR 53.
- The "under" concept would drain by gravity.
- There are two corridor studies currently underway for SR 400 including this area.
- This project is not currently funded for construction.
- Logical termini is an issue – difficult to determine regarding interchanges.

Project Location Map

STATE ROUTE NO: 400



VE RECOMMENDATIONS

DEVELOPMENT AND RECOMMENDATION PHASE		
SR 400/SR 53/Dawson Forest Interchanges		
IDEA No.: W-3	**Sheet No.:** 1 of 1	**CREATIVE IDEA:** Use The "Over" Concept
Prepared By: Team	**Date: 10/24/07**	**Checked By: RHC** **Date: 10/26/07**

Original Concept:

The VE Team assumed that the "under" concept, which would fully depress SR 400 at SR 53, is the current baseline concept for this project. This concept also includes an interchange at Dawson Forest Road at which SR 400 would pass over Dawson Forest. The project would also include a significant system of frontage roads, CD roads, and ramps on both sides of SR 400. We did not include the potential interchange at Carlisle which is now under consideration.

The construction cost of this concept is approximately $60M for the major elements, not including markups and incidentals (see Cost Model in the Appendix).

Proposed Change:

The VE Team did not have the time or resources to prepare formal cost estimates for the Over and Under alternate concepts for this project, but based on our limited analysis, we believe that the Over concept would likely provide the higher-value solution for this project for the following reasons:

- Retaining Walls – even with the use of cast-in-place walls instead of tie-back walls as recommended by the VE Team, the cost for walls will be significantly higher for the Under concept.
- The Over approach avoids potential problems with groundwater.
- The concern about visibility of the commercial areas from east to west, caused by the Over concept, was not considered to be a serious problem by the Team. It could be mitigated by using longer bridges over SR 53 thus opening up the visibility and reducing any "tunnel" effects. (We note that a 150' or more span is already planned for these bridges).
- The Over concept avoids the potential of difficult excavation and possible blasting, based on the few borings we reviewed.

One possible disadvantage of the Over concept is that it creates an all-borrow earthwork project. Assuming that SR 400 traffic would be detoured to the frontage road alignments during construction, the contractor would probably be able to use scrapers to move earth from SR 53 to Dawson Forest Road. This could be less costly and less disruptive than trucking in all the required material. We recommend that the Design Team take this factor into consideration as well.

If the Under concept is selected, the potential problems mentioned above could possibly be mitigated by using a "half and half" approach, i.e. raising SR 53 as much as possible rather than a fully-depressed SR 400. In addition, VE Recommendations W-1 and B-2 would reduce the cost of the Under concept.

DEVELOPMENT AND RECOMMENDATION PHASE

SR 400/SR 53/Dawson Forest Interchanges

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:**
R-2	1 of 1	Eliminate Direct Property Access From Frontage Roads/CD's Wherever Alternate Access Exists.

Prepared By: JRC **Date:** 10-24-07 **Checked By:** **RHC** **Date: 10/26/07**

Original Concept: The baseline concept includes direct access to developed properties from the proposed frontage roads. In some cases, driveway turnouts serve only one property, in some cases two or more properties are served.

Proposed Change: Eliminate direct property access from frontage roads from station 125+00 to station 175+00 wherever alternate access exists (typically at the back of the property).

Justification: The developed properties between stations 125+00 and 175+00 have access to existing public streets as well as the proposed frontage roads. As a result, the outside lane of each frontage road is a de facto right-turn lane. If direct access to and from the proposed frontage roads is eliminated, the outside lanes of the frontage roads could be eliminated or reduced in length. With reduced numbers of vehicles entering and leaving, frontage roads should operate more safely.

If this recommendation is adopted, access rights will have to be acquired from the affected property owners. Purchasing access rights will add to project right of way costs, although eliminating or shortening right-turn lanes would offset some of this cost.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**TOTAL COST**
INITIAL COST - Original			
- Proposed			
- Savings			
FUTURE COST – Savings			
TOTAL PRESENT WORTH SAVINGS			**Not Estimated**

DEVELOPMENT AND RECOMMENDATION PHASE

SR 400/SR 53/Dawson Forest Interchanges

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:**
P-2	of	Reduce Width of Frontage Roads

Prepared By: JRC **Date:** 10-24-07 **Checked By: RHC** **Date: 10/26/07**

Original Concept: The baseline concept provides for five-lane frontage roads on both sides of SR 400 from a few hundred feet south of Dawson Forest Road to a few hundred feet north of SR 53.

Proposed Change: Reduce the number of lanes in the proposed frontage roads, specifically reduce the through lanes from three lanes to two lanes.

Justification: The VE study team has examined the projected traffic volumes that were provided by GDOT. The projected traffic volumes determined many features of the design, including the number of lanes for the various roadways. Although the VE study team is not able to validate the projected traffic volumes, the design hourly volumes appear to be excessive. The project area includes a large shopping destination which is already attracting much business, and as future proposed development occurs, traffic in and around this area will increase substantially. However, it does not seem reasonable to project typical AM and PM commute-time traffic peaks for a shopping destination. It seems more likely that the average daily traffic will be distributed more evenly with less pronounced peaks.

As noted, the VE study team does not have the time or resources to validate the projected traffic volumes. However, we think that it is likely that at a minimum the proposed three through lanes on the frontage roads can be reduced to two lanes. This change would result in a significant reduction in construction cost and a related reduction in O&M required over time.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**TOTAL COST**
INITIAL COST - Original	1,200,000		
- Proposed	0		
- Savings	1,200,000		1,200.000
FUTURE COST – Savings		significant	
TOTAL PRESENT WORTH SAVINGS			**$1,200,000**

CALCULATIONS	
Project Name: SR 400/SR53/Dawson Forest Interchanges	ITEM No: P-2
	Sheet 2 of 2

The following estimate is based on the conceptual plan set that was provided to the VE study team. The plan set was marked "SR 400 Over with 1/2 diamond at Dawson Forest."

Total length of frontage roads = 6250 feet. Eliminating one through lane on each side gives a total pavement reduction of (6250)(2)(12) = 150,000 SF

Reduction in cost = (150,000 SF)($8.25/SF) = $1,237,500. SAY $1,200,000

Note that this reduction was based on a typical section consisting of 12" GAB and 14.5" asphaltic concrete, as shown in the plans. This typical section is possibly over-designed. Using a lesser pavement section would decrease the overall project savings significantly.

DEVELOPMENT AND RECOMMENDATION PHASE

SR 400/SR 53/Dawson Forest Interchanges

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:**
P-3	1 of 2	Reduce Width of Outside Shoulders on Frontage Roads

Prepared By: JRC **Date:** 10-24-07 **Checked By: RHC** **Date: 10/26/07**

Original Concept: The baseline concept provides for 20-foot-wide outside shoulders on the proposed frontage roads.

Proposed Change: Reduce the width of the outside shoulders to 12 feet.

Justification: The VE study team sees no justification for a 20-foot shoulder, especially since no sidewalks are proposed. Reducing the outside shoulder width to 12 feet would reduce grading costs and right of way requirements. This change might also reduce retaining wall requirement but we did not attempt an estimate for that item.

NOTE: Shoulder widths and curb and gutter locations are based on typical sections, which are not consistent with the plan sheets.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$200,000		
- Proposed	0		
- Savings	$200,000		$200,000
FUTURE COST – Savings		Nominal	0
TOTAL PRESENT WORTH SAVINGS			**$200,000**

CALCULATIONS	
Project Name: SR 400/SR53/Dawson Forest Interchanges	ITEM No: P-3
	Sheet 2 of 2

Total length of curb and gutter shoulder is (6,250)(2) = 12,500 feet. Assume an average elevation difference of 10 feet between the proposed shoulder and the existing terrain. The difference in grading quantity is (12,500)(20 – 12)(10) = 1,000,000 CF = 37,037 CY.

($37,037 CY)($5.00/CY) = $185,185. SAY $200,000

DEVELOPMENT AND RECOMMENDATION PHASE

SR 400/SR 53/Dawson Forest Interchanges

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:**
B-9	1 of 3	Eliminate the Braided Ramp Flyover

Prepared By: AW Date: 10/24/07 Checked By: RHC Date: 10/26/07

Original Concept:

The baseline design proposes to eliminate an undesirable weave, between the NB exit ramp from SR 400 to SR 53 and the NB on ramp from Dawson Forest Road to SR 400, by constructing a flyover structure, estimated at 130' X 44'.

Proposed Change:

The VE Recommendation is to construct a NB CD ramp over Dawson Forest Road and extend the CD to SR 53. Also, construct a slip ramp from the NB CD, north of Dawson Forest Road, to SR 400 south of SR 53. This would eliminate the need for the flyover structure.

Justification:

The baseline concept significantly affects 3 commercial properties, which is reportedly unacceptable to the County and the business community in the area. This change would avoid the taking of these properties.

The NB SR 400 traffic exiting to SR 53 would cross over SR 53 without going through the intersection with Dawson Forest Road. This would accomplish essentially the same function as the braided ramps and the flyover. The NB entrance ramp from Dawson Forest Road SR 400 would continue to merge with the traffic exiting SR 400 and going to SR 53, but with the recommended CD road the SR 53 traffic would not have to go through the Dawson Forest Road Intersection.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	2,100,000		
- Proposed	1,100,000		
- Savings	1,000,000		1,000,000
FUTURE COST – Savings		N/A	0
TOTAL PRESENT WORTH SAVINGS			**$1,000,000**

COST WORKSHEET							
Project Name: SR 400/SR 53/Dawson Forest Interchanges					IDEA No: B-9		
					Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	Nº UNITS	COST/ UNIT	TOTAL COST	Nº UNITS	COST/ UNIT	TOTAL COST
Bridge	SF	1520	$80	121,600	0		0
Walls	SF	0		0	25,000	40	1,000,000
R/W	LS			1,800,000	0		0
SUBTOTAL				1,921,600			1,.000,000
MARK-UP (10 %)				192,160			100,000
TOTAL				2,113,760			1,100,000
TOTAL ROUNDED				2,100,000			1,100,000

CALCULATIONS	
Project Name: SR 400/SR 53/Dawson Forest Interchanges	ITEM No: B-9
	Sheet 3 of 3

Bridges: Add 2 CD lanes to the proposed SR 400 bridge over Dawson Forest Road
Assume a 104' bridge width as compared to 76' needed for two SR 400 lanes only
Difference = 28'X 150' length = 4,200 sf additional

Eliminate the flyover = 130 X 44' = 5720 sf

Net reduction in bridge area = 1520 sf

Assume pavement, base, and earthwork costs would be essentially the same

Retaining Wall – assume that this would require the addition of approximately 1000' of wall on SR 400 – north and south of Dawson Forest = 2000' of wall at say 0' to 25' height

2000' X 12.5' = 25,000 sf of additional wall required

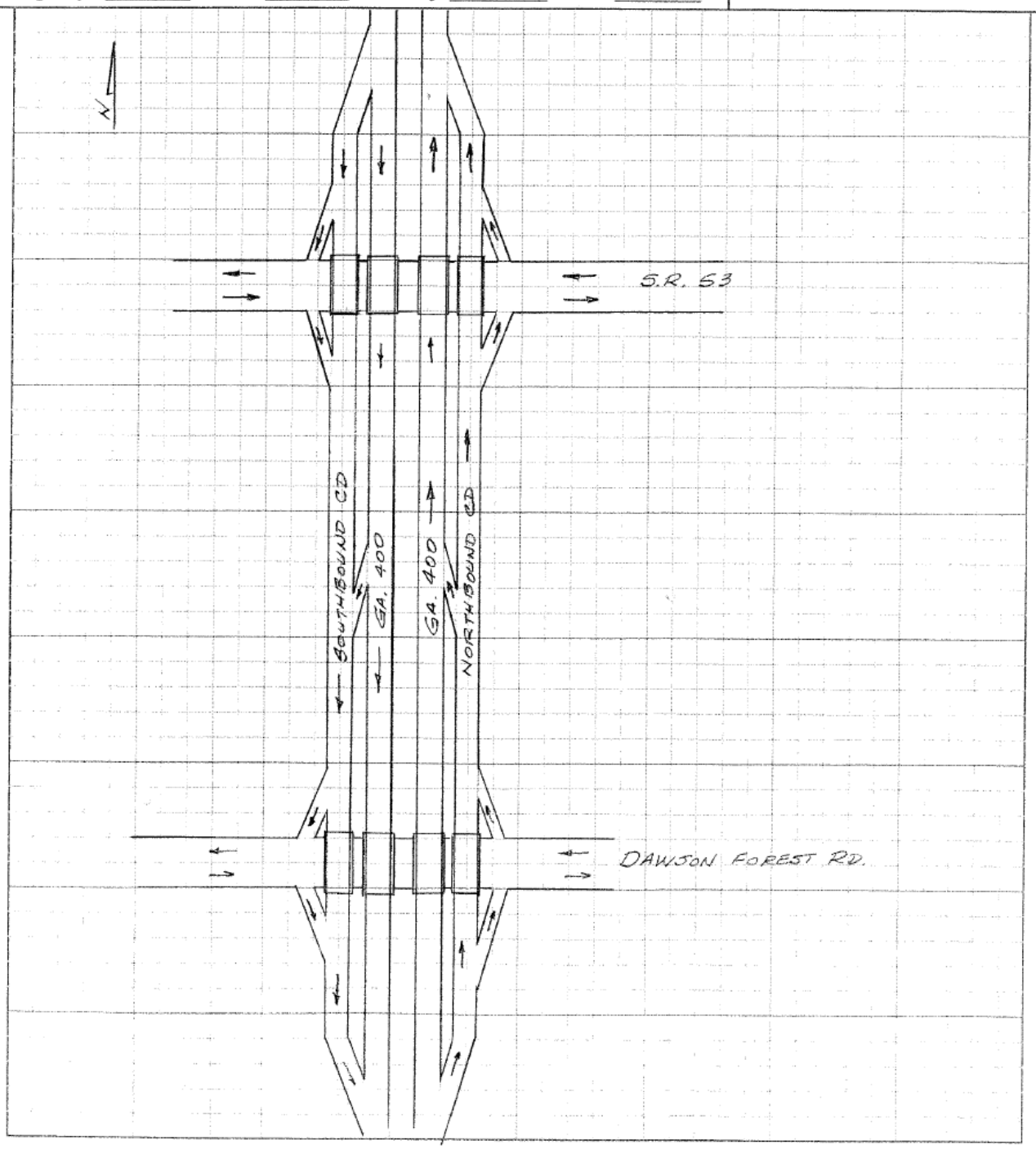
Right of way -

Holbrook tract =	180' +/- X 160' =	28,800 sf
Chick Fil A =	180 X 220 =	39,600
Unknown tract =	580'X210' =	121,800
Home Depot =	300' X 180'=	54,000
		244,200 sf = 5.6 acres X $152,460 = $853,776

Commercial improvements – Say $1,000,000 of the $1.4M estimated by GDOT R/W
Say $1,800,000 savings in R/W and improvements
Note: this estimate does not include the markups shown in the R/W group estimate and is thus considered a very conservative estimate of potential savings in R/W costs to GDOT

SKETCH

Project Name: SR 400/SR 53/Dawson Forest Interchanges	IDEA No: B-9 CLIENT:
Comp By: AW Date: 10/24/07 Ckd By RHC Date 10/26/07	Sheet of



DEVELOPMENT AND RECOMMENDATION PHASE

SR 400/SR 53/Dawson Forest Interchanges

IDEA No.:	**Sheet No.:**	**CREATIVE IDEA:**
R-3	1 of 3	Eliminate Local Service Roads

Prepared By: AW Date: 10/24/07 Checked By: RHC Date: 10/26/07

Original Concept:

The baseline includes local service roads from the outlet mall parking lot to approximately 300' north of Industrial Park Road.

Proposed Change:

The V.E. Team recommends that these roads be eliminated.

Justification:

There are other existing access points to the outlet mall, both from SR 53 and from Dawson Forest Road. The team did not feel that the service roads would provide a needed functionality.

A significant savings in construction, R/W, and O&M costs can be realized by eliminating this project feature.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	1,300, 000		
- Proposed	0		
- Savings	1,300,000		1,300,000
FUTURE COST – Savings		Nominal	0
TOTAL PRESENT WORTH SAVINGS			**$1,300,000**

COST WORKSHEET							
Project Name: SR 400/SR 53/Dawson Forest Interchanges					IDEA No: R-3		
					Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	№ UNITS	COST/ UNIT	TOTAL COST	№ UNITS	COST/ UNIT	TOTAL COST
Pavement and Base	SF	57,960	5.00	289,800	0		0
Curb and Gutter	LF	4530	18.00	81,540	0		0
Right of Way	Acre	5.40	152,460	823,284			0
SUBTOTAL				1,194,624			
MARK-UP (10-__%)				119,462			
TOTAL				1,314,086			
TOTAL ROUNDED				1,300,000			0

CALCULATIONS	
Project Name: SR 400/SR 53/Dawson Forest Interchanges	ITEM No: R-3
	Sheet 3 of 3

Length of Service Roads = No. 1 Sta 114 to Sta 129 = 1500 lf
No. 2 Sta. 42+15 to Sta. 49+90 = 775
Industrial Park Road = 140
2415 lf

Pavement and Base = 24' width X 2415lf = 57960 sf

Use pavement section shown on Drawing 5-11 (7.5" AC over 12" AB)

And assume a cost of $5.00 per SF

Curb and gutter = assume both sides of the entire length, minus approximately 300lf = 2 X 2415 -300 = 4530 lf Use $18 per LF for curb and gutter

Note: reduction in drainage items not included.

Right of Way - from plans takeoff =

R/w 110,000 sf
Easement 124,765 sf
Total = 234,765 / 43,560 = 5.4 acres

Assume commercial land at $ 152,400 per acre as listed in the R/W estimate from GDOT
Assume R/W and easement cost the same per acre

DEVELOPMENT AND RECOMMENDATION PHASE

SR 400/SR 53/Dawson Forest Interchanges

IDEA No.:	Sheet No.:	CREATIVE IDEA:
W1	1 of 2	Cast-in-Place Retaining Walls in lieu of Tie-Back

Prepared By: A.S. **Date: 10/24/07** **Checked By: RHC** **Date: 10/26/07**

Original Concept:

If the "under" concept is selected for this project, the baseline design calls for the use of tie-back type retaining walls for the depressed section of SR 400.

Proposed Change:
The V.E. recommendation is to use Cast-in-Place walls

Justification:
The use of cast-in-place walls would provide significant savings in the cost of construction, based on unit costs received from the GDOT Bridge group. The baseline estimate for the tie-back walls is $65/sf but $100/sf is considered a more appropriate unit cost. Bridge group estimated $60/sf for the cast-in-place walls.

Cast-in-place walls would provide the flexibility of utilizing conventional methods to the general contractor constructing the walls. This option does require temporary shoring to construct the footings and walls. The Team believes that sufficient width would be available for this wall type even with SR 400 detoured to the future frontage road/CD/ramp locations on both sides, as we assumed would be the case.

Also, the close proximity of the groundwater could cause corrosion of the anchor rods on the tie-back walls. Cast-in-place walls would be less susceptible to corrosion problems. This could yield significant savings in O&M over time.

This revision would continue to provide the required functionality of the retaining walls.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	$ 13,000,000		
- Proposed	$ 7,800,000		
- Savings	$5,200,000		$ 5,200,000
FUTURE COST – Savings		Not estimated	
TOTAL PRESENT WORTH SAVINGS			**$ 5,200,000**

COST WORKSHEET							
Project Name: SR 400/SR 53/Dawson Forest Interchanges					IDEA No: W-1		
					Sheet 2 of 2		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	Nº UNITS	COST / UNIT	TOTAL COST	Nº UNITS	COST/ UNIT	TOTAL COST
TIE-BACK WALLS	SF	117878	100/SF	$ 11,787,800.00			
CAST-IN-PLACE (CIP) WALLS	SF				117878	60/SF	$ 7,072,680.00
SUBTOTAL				$ 11,787,800			$ 7,072,680
MARK-UP (10 %)				$ 1,178,780			$ 707,268
TOTAL				$ 12,966,580			$ 7,779,948
TOTAL ROUNDED				$ 13,000.000			$ 7,800.000

DEVELOPMENT AND RECOMMENDATION PHASE

SR 400/SR 53/Dawson Forest Interchanges

IDEA No.:	Sheet No.:	CREATIVE IDEA:
B-2	1 of 3	Two-Span Bridge – SR 53 over SR 400

Prepared By: AW Date: 10/24/07 Checked By: RHC Date: 10/26/07

Original Concept:
If the "under" concept- with SR 400 fully depressed under SR 53- is selected, the baseline calls for a 150' long by 148'+/- wide, single-span bridge carrying SR 53 over SR 400 (22,100 sf per estimate).

Proposed Change:
The VE Team recommends the use of a two-span bridge with equal spans of 75 ft.

Justification:
This change would not affect the functionality of the proposed bridge. Using a two-span concept would reduce the required depth of concrete beams from 7'-2" bulb-tees to 4'-9" Type III AASHTO girders. This would permit the raising of the SR 400 grade approximately 2.5' while maintaining SR 53 at its currently proposed grade and continuing to provide the required clearance.
The existing median on SR 400 is sufficiently wide for a pier to be added at its center point with the required safety devices, even for the eventual future widening of the roadway to the median.
This change would result in a significant reduction of retaining wall and earthwork quantities. The earthwork reduction might not result in an overall savings, however, depending on the amount of embankment required at Dawson Forest Road. The estimates provided indicated the project will be in a borrow condition despite the depressed section. The two-span bridge would likely cost somewhat less given the significant reduction in girder size.
Raising the grade of SR 400 would help to avoid potential problems concerning the groundwater in the area.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
INITIAL COST - Original	10,600,000		
- Proposed	9,100,000		
- Savings	1,500,000		1,500,000
FUTURE COST – Savings		Nominal	0
TOTAL PRESENT WORTH SAVINGS			**$1,500,000**

COST WORKSHEET							
Project Name: SR 400/SR 53/Dawson Forest Interchanges					IDEA No: B-2		
					Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	Nº UNITS	COST/ UNIT	TOTAL COST	Nº UNITS	COST/ UNIT	TOTAL COST
Bridge	SF	22,100	$80	1,768,000	22,100	75	1,657,500
Retaining Wall	SF	117,878	65	7,662,070	101,678	65	6,609,070
Earthwork	CY	45,000	5	225,000	0		0
SUBTOTAL				9,655,070			8,266,570
MARK-UP (_10__%)				965,507			826,657
TOTAL				10,620,577			9,093,227
TOTAL ROUNDED				10,600,000			9,100,000

CALCULATIONS	
Project Name: SR 400/SR 53/Dawson Forest Interchanges	ITEM No: B-2
	Sheet 3 of 3

Assume wall length = 4050 lf – both sides of SR 400

Assume a 2' decrease in wall height overall and a 2' reduction in excavation

Assume a $5/SF reduction in bridge cost from $80 (in the provided estimate) to $75

Assume 22,100 SF bridge as shown in the estimate.

Use $65/SF for tie back walls as shown in estimate (per Recommendation W-1, cost is expected to be closer to $100/SF per info from GDOT Bridge group)

Reduction in wall area = 4050' X 2 sides X 2' = 16,200 sf
Estimate for the under concept = 117,878 sf
New area of walls = 101,678 sf

Earthwork reduction = 150' width X 4050' length X 2' reduction /27 = 45,000 CY

APPENDIX

Sources

Approving/Authorizing Persons

Name:	Position:	Telephone:
Brian Summers	Director, Engineering Services	
Russell McMurry	District One Engineer	
Rick Reasons	GDOT OCD	

Personal Contacts

Name:	Organization	Notes:
Russell McMurray	District One Engineer	Guidance regarding local concerns- by email
Judy Mizner	GDOT Bridge	Cost info on tie back walls

Documents/Abstracts

Reference:	Source:
Concept Level Plans – 4 alternates	Kissinger Campo and Associates
Concept Report – 3/2001	GDOT
Draft Revised Concept – undated	GDOT
Preliminary R/W Estimate – 7/2006	GDOT
Preliminary Cost Estimates – 5 Alts	KCA
Soil Survey – 1/2006	NOVA Engineering
Traffic Volumes – undated	GDOT
Cost Comparison – AC vs PCC	KCA

SR400/SR53 Interchange

Cost Model / Distribution

Item	Description	$ Amount	% of Total Project
P	Pavement	18.0M	30
W	Retaining Walls	12.0 M	20
R	Right of Way	9.9 M	17
	Comm/Industrial Land = $3.2M		
	Improvements = $4.7M		
E	Earthwork	7.0 M	12
B	Bridges	4.7 M	8
T	Utility Relocations	3.9M	7
T/C	Traffic Control	2.1 M	3
D	Drainage	2.0 M	3
	TOTAL	**59.6 M**	**100**
	Based on the "under" concept plus Dawson Forest Interchange and Flyover on ramps		
	Does not include miscellaneous costs or markups		
	Does not include Carlisle work		

F.A.S.T. DIAGRAM

Project Name: SR 400/SR 53 Interchange SR 400 Depressed Concept

Scope Limit ⇦ ⇨ **Scope Limit**

H.O. Function	**Basic Function**				**L.O. Function**
Meet Demand	Increase Capacity	Reduce Conflict Points	Separate Grades	Construct Bridges	Design Project
	Decrease Delay	**"Same Time As"** Minimize Right of Way	Maintain Visibility		
		Or "Caused By" Control Access	Construct Walls		
		Functions	Add Lanes		

HOW?>>>

<<<WHY?

INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 400/SR 53/Dawson Forest Interchanges
Basic Function: Increase Capacity

ITEM	DESCRIPTION	FUNCTION		COST/COMPLEXITY		
		Verb	Noun	C. Cost	O&M	Complexity
	Retaining Walls	Minimize	Right of Way	$12M	Medium	High
		Retain	Earth			
	Bridges	Minimize	Conflict Points	$4.7M	Low	Low
		Separate	Grades			
	Earthwork	Separate	Grades	$7.0M	Low	Medium
		Create	Alignment			
	Pavement and Base	Add	Lanes	$18 M	High	Medium
		Separate	Grades			
	Right of Way	Create	Space	$9.9M	N/A	Low
		Mitigate	Weave			
	Drainage	Reach	Outfall	$2.0M	Medium ?	Low
		Protect	Pavement			

INFORMATION PHASE – FUNCTION ANALYSIS

Project: SR 400/SR 53/Dawson Forest Interchanges
Basic Function: Increase Capacity

ITEM No.	DESCRIPTION	FUNCTION		COST/COMPLEXITY		
		Verb	Noun	C Cost	O&M	Complexity
	Traffic Control	Maintain	Safety	$2.1M	N/A	High
		Create	Work Zone			
		Maintain	Traffic			
	Traffic Engineering	Convey	Information	$1.2M	High	Low
		Control	Traffic			
	Utility Relocations	Create	Space	$3.9M	N/A	Low
	Bold = Selected for Analysis					

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
	WALLS		
1	Use cast-in-place walls	Less expensive compared to tie-back	✓
		Requires more shoring	
		Need for shoring may complicate construction staging	
		Height of walls is close to limit for cast-in-place	
2	Raise the grade of SR 400	Dropped in first cut	X
3.	Use the "over" concept	Less costly; easier staging;	✓
		Minimal shoring required for walls.	
		Visibility from east side to west side is not as good	
		Results in a completely borrow project	
		Bridges at SR 53 will be smaller	
		Avoids possible impact on water table	
4	Over SR 53 and under Dawson Forest	Dropped in first cut	X
5	Eliminate short wall sections	Dropped in first cut	X
6	Move ramps/CD/frontage to reduce walls	Potentially a cost reduction; reduce wall need	✓
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
7	SR 53 elevated over SR 400	Potentially lower construction cost	X
		Easier to construct; reduction in wall quantity	
		Significant impact on business access	
		Potentially takes more improvements/R/W	
8	Half over and half under	Likely reduction in wall quantity	DC
		Compromise solution to the visibility issue.	
		Potential reduction in cost	
		Balance earthwork quantities	
	PAVEMENT		
1	Don't use PCCP	Dropped in first cut	**X**
2.	Reduce width of frontage roads	1- or 2- lane frontage roads should handle traffic	✓
		Potential significant reduction in cost and R/W	
		Applicable whether over or under is chosen	
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
3	Lower shoulder width to 12' and add sidewalk	Reduced cost and R/W; Meets applicable standard	✓
		Adds cost for sidewalk; reduces potential	
		area for landscaping amenities	
4	Use narrower lanes on frontage roads	Dropped in first cut	X
	BRIDGES		
1	Narrower bridge over SR 400	Dropped in first cut	X
2	2-span bridges over 400	Reduces superstructure depth, raise grade	✓
		Reduce earthwork and walls;	
		Avoid the water table	
3	Narrow median on SR 400 in no HOV needed in future	Dropped in first cut	X
4	Narrower bridges over Forest	Width in estimate does not match that on plans	
		Assume this was only a ball park figure	X
5	Eliminate weave bridge	Without eliminating the weave, this does not	To B-9
		solve problem	
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
No.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
6	Use a culvert type structure for weave separation	Dropped in first cut	X
7	Move weave intersection north	Avoids R/W impact – Chick Fil-A and others	To B-9
		May be difficult to achieve alignments	
8	Eliminate NB on-ramp at Dawson Forest	Dropped in first cut	X
9	A split diamond with one-way frontage roads	Cost reduction; less R/W; Simpler operations	✓
		Exit ramp NB would be longer	
10	Soffit Fill construction method for SR 53 bridge	Dropped in first cut	X
11	Use a longer bridge over SR 53 for visibility	Dropped in first cut	X
	R/W		
1	Seek donated R/W	Dropped in first cut	X
2	Eliminate access drives on west side north of SR 53	Improved operations	✓
		Reduce length of ramps on north side of 53	
		Opposition from businesses likely	
		Access road will function as a CD, not frontage	
		Reduce number of lanes required on CD/frontage	
3	Eliminate access road to outlet mall	Access road functions as driveway to mall	✓
		Reduce cost and R/W requirement	