

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

INTERDEPARTMENT CORRESPONDENCE

**FILE:** STP00-0155-01(021) Houston/Peach      **OFFICE:** Engineering Services  
 CSNHS-0008-00(406) Houston  
 CSNHS-0008-00(407) Houston  
 P.I. Nos.: 322450, ~~0008046~~, & ~~0008047~~  
 S.R. 96 widening **0008406, & 0008407**

**DATE:** June 12, 2008

**FROM:** Brian K. Summers, PE, Project Review Engineer *REW*  
**TO:** Babs Abubakari, P.E., State Consultant Design and Program Delivery Engineer  
**SUBJECT:** IMPLEMENTATION OF VALUE ENGINEERING STUDY ALTERNATIVES

Recommendations for implementation of Value Engineering Study Alternatives are indicated in the table below. Incorporate the VE alternatives recommended for implementation to the extent reasonable in the design of the project.

ALT #	Description	Potential Savings/LCC	Implement	Comments
<b>TYPICAL SECTIONS (S)</b>				
TS-1A	Construct 11' travel lanes	\$2,677,013	No	Design Year traffic is 42,750 A.D.T with 8% trucks (14% - 24 hour). These projects currently have an April 2009 MGMT. ROW Date which could be jeopardized with redesign delays.
TS-1B	Construct 11' inside travel lanes	\$1,367,078	No	Design Year traffic is 42,750 A.D.T with 8% trucks (14% - 24 hour). These projects currently have an April 2009 MGMT. ROW Date which could be jeopardized with redesign delays.

STP00-0155-01(021), CSNHS-0008-00(406), CSNHS-0008-00(407) Houston/Peach

P.I. Nos.: 322450, ~~0008046~~, & ~~0008047~~ 0008406 & 0008407

Implementation of Value Engineering Study Alternatives

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ALT #	Description	Potential Savings/LCC	Implement	Comments
<b>TYPICAL SECTIONS (S) - continued</b>				
TS-3	Reduce 24' raised median to 20' raised median	\$1,366,384	No	These projects currently have an April 2009 MGMT. ROW Date which could be jeopardized with redesign delays.
TS-4	Reduce 24' raised median to 18' raised median	\$1,612,923	No	These projects currently have an April 2009 MGMT. ROW Date which could be jeopardized with redesign delays.
TS-5	Reduce 44' depressed median to a 24' raised median.	\$2,452,272	No	The Design Consultant was directed by the Department to use a 44' depressed median, where possible, to secure the Right of Way for a future six lane section. S.R. 96 will need to be a six lane facility by the year 2032.
TS-6A	Replace the bike lanes in the roadbed and one 5' sidewalk with a 10' multi-use path	\$5,574,530	No	Houston County is funding the costs for the sidewalks through a SPLOST program.
TS-6B	Replace the bike lanes in the roadbed and one 5' sidewalk with an 8' multi-use path	\$5,784,162	No	Houston County is funding the costs for the sidewalks through a SPLOST program.
TS-7	Use 24" curb and gutter in lieu of 30" curb and gutter	\$342,775	Yes	This should be done.

ALT #	Description	Potential Savings/LCC	Implement	Comments
<b>TYPICAL SECTIONS (S) - continued</b>				
TS-8	Build 16' urban shoulder instead of 12' urban shoulders	-\$249,630 (cost increase)	Yes	This is necessary to accommodate the many Utilities that are along the corridor that will need to be relocated.
<b>ALIGNMENT (A)</b>				
A-1	Align S.R. 96 along Oglethorpe Road	\$531,742	No	This was investigated earlier and was dismissed due to Right of Way impacts.
<b>INTERSECTIONS (I)</b>				
I-1	Cul-de-sac Granville Drive	Design Suggestion	Yes	This should be done.
I-2	Align the CR 82/CR 81 intersection with a realignment of CR 82	\$216,400	Yes	This should be done.
I-6	Signalize Bear Drive/S.R. 96 intersection in lieu of High School Drive/S.R. 96 access point	Design Suggestion	Yes	This should be done.
I-7	Cul-de-sac connection at Forest Road/S.R. 96 and replace with a new, all movement connection at Forrest Road/Moody Road	-\$16,539 (cost increase)	No	Would result in drainage and/ or environmental issues if the ditch is considered an ephemeral stream. There is also a large grade change that would have to be dealt with on the new connector.

STP00-0155-01(021), CSNHS-0008-00(406), CSNHS-0008-00(407) Houston/Peach

P.I. Nos.: 322450, ~~0008046, & 0008047~~ 0008406 & 0008407

Implementation of Value Engineering Study Alternatives

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ALT #	Description	Potential Savings/LCC	Implement	Comments
<b>INTERSECTIONS (I) - continued</b>				
<b>BRIDGES (B)</b>				
B-2A	In lieu of a double 6' x 6' box culvert, consider a single 12' x 6' box culvert at Sta. 1452+17	-\$51,392 (cost increase)	No	This results in a cost increase. This would also require a special design culvert.
B-2B	In lieu of a double 6' x 6' box culvert, consider a single 12' x 6' three sided concrete culvert at Sta. 1452+17	-\$159,957 (cost increase)	No	This results in a cost increase. This would also require a special design culvert.
B-4	In lieu of one long multi-span bridge, create 2 short bridges with fill in between	\$1,707,602	Yes	This should be done.
B-5	In lieu of one long multi-span bridge, create 2 short bridges with fill in between, retained by MSE walls	\$1,394,831	No	This does not apply since VE Alternative B-4 will be implemented.

A meeting was held on June 6, 2008 and Scott Dubord with PBS & J. Stanley Hill and Vinesha Pegram with Consultant Design, and Brian Summers, Ron Wishon and Lisa Myers of Engineering Services were in attendance.

The results above reflect the consensus of those in attendance and those who provided input.

Approved: Gerald M. Ross Date: 6/7/08<sup>12</sup>  
 Gerald M. Ross, P. E., Chief Engineer

BKS/REW

STP00-0155-01(021), CSNHS-0008-00(406), CSNHS-0008-00(407) Houston/Peach  
P.I. Nos.: 322450, ~~0008046~~, & ~~0008047~~ 0008406 & 0008407  
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Attachments

c: Gus Shanine  
R. Wayne Fedora  
Todd Long  
Babs Abubakari  
Stanley Hill  
Michael Haithecock  
Vinesha Pegram  
James Magnus  
Marc Mastronardi  
Lamar Pruitt  
Brink Stokes  
Paul Liles  
Bill Ingalsbe  
Bill Duvall  
Clayton Bennett  
Laura Rish  
Emmanuella Myrthil  
Ken Werho  
Patrick Allen  
Lisa Myers



# Preconstruction Status Report By PI Number

Print Date: 06/05/2008

PROJ ID	COUNTY	DESCRIPTION	MGMT. ROW DATE	SCHED DATE	MGMT. LET DATE		
322450-	Houston, Peach	SR 96 FM I-75/PEACH TO CS 1121/AKE JOY RD/HOUSTON - PHASE I	Apr-09	Jul-10	Apr-11		
STP00-0155-01(021)	FIELD DIST: 3						
TIP #: WR1-1993(6)	TWIN: 0008835	US:					
MPO: Warner	EST DATE: 1/3/2007						
MODELS							
PROJ MGR: Pegram, Vinesha	PROJ LENGTH: 3.21						
PROG: Reconstruction/Rehabili	TYPE: Widening						
TYPE: tation	WORK:						
CONCEPT: ADD 4R(M20/44)	LET RESP: DCI						
		Phase	Approved	Proposed	Cost	Fund	Status
		PE	1998	1998	5,501,443.86	Q20	AUTHORIZED
		ROW	2008	2008	1,250,000.00	LY205	PRECST
		ROW	1999	1999	237,000.00	RZ	AUTHORIZED
		ROW	2005	2005	1,665,000.00	Q20	AUTHORIZED
		ROW	2008	2009	10,064,688.48	L050	PRECST
		CST	2010	2010	8,254,571,000.00	L050	PRECST

SCHED START	SCHED FINISH	ACTIVITY	ACTUAL START	ACT/EST FINISH	PCT	DISTRICT COMMENTS
		Define Project Concept	9/17/1992	11/29/1994	100	LOCALS WANT SOONER
		Concept Meeting	6/3/1993	6/3/1993	100	[9-9-03] - REALLY NEED THIS
		Concept Submittal and Review	12/1/1994	12/5/1994	100	PROJECT SOONER [8/12/04] -
		Receive Preconstruction Concept Approval	12/5/1994	12/5/1994	100	TURN-KEY [4/27/05], MOVING
		Management Concept Approval Complete	2/2/1995	2/2/1995	100	INTO 2010 CST [9-6-05], PROJ
		Revise or Re-validate Approved Concept	3/20/2006	9/11/2006	100	5/9/06 [2-27-06], ENV DOC
6/25/2008	7/1/2008	Value Engineering Study	7/20/2007		97	CONTROLS DELIVERY
		Public Information Open House Held	5/9/2006	5/9/2006	100	[8-21-06]; 7/07-7/09 RW CST
6/19/2008	6/19/2008	Environmental Approval	10/1/2004		100	[9-1-06], PH IN EARLY 2008
3/6/2009	3/6/2009	Public Hearing Held			0	[9-24-07]
		Mapping	8/11/2004	10/27/2004	100	
6/20/2008	7/9/2008	Field Surveys/SDE	1/24/1996		100	
6/20/2008	9/11/2008	Preliminary Plans	5/3/2006		90	
6/19/2008	6/19/2008	Preliminary Bridge Design	12/4/2006		100	
6/20/2008	7/25/2008	Underground Storage Tanks			0	
6/20/2008	11/6/2008	404 Permit Obtainment			0	
10/3/2008	10/6/2008	PEPR Inspection			0	
11/11/2008	2/2/2009	R/W Plans Preparation			0	
6/20/2008	6/25/2008	R/W Plans Final Approval	8/1/2006		99	
11/11/2008	11/13/2008	L & D Report Development and Approval			0	
6/26/2008	5/6/2010	R/W Acquisition			0	
11/18/2008	12/1/2008	Stake R/W			0	
		Soil Survey	2/26/2007	3/28/2007	100	
11/11/2008	12/16/2008	Bridge Foundation Investigation			0	
11/14/2008	7/24/2009	Final Design			0	
1/14/2009	3/10/2009	Final Bridge Plans Preparation			0	
8/17/2009	8/18/2009	PEPR Inspection			0	
9/1/2009	9/14/2009	PEPR Response			0	

BIKE PROVISIONS INCLUDED?: Y MEASUREMENT SYSTEM: 1 CONSULTANT: 1 UT/EST: 5,454,000.00

PDD: BEFORE (22) HOUSTON ADVANCE ACQ - NO \$ 9/27/99 No activity 9/9/03

Bridge: EIC 02/01/07 - CONSUL - PBS&J

Design: SHL VCP PBS&J Need Env. Doc., resolving history issue 4-1-08

EIS: EAnotapvdjnotonschdROWjppd1-29-08/erm

LGPA: REVISED NOTIFICATION LETTER SENT TO HOUSTON & PEACH 10-19-06

Planning: ADV ACQ DOMINY OIL CO \$137,000

Prog. Develop: PI# 0008406 & 0008407 SPLIT FROM THIS PROJECT 10-06

Programming: ADDITIONAL DEMO \$ ON PI# 0008835 (PR2/P-8-14-97) Q20 ADV ACQ 11-04 0006204#1 03-05#2 11-05#3 2-06#4 12-06#5 11-07#6 12-07

ROW: 05-05-08- PL plan revisions needed

Railroad: NO

Traffic Op: SEND PEPR PLANS FOR REVIEW 6-18-07 \$+

Utility: PRE-RELOCATION PLANS TO UTILS 02/28/07, OCD SUE

EMG: 2104/OLD JOB #M1387 (H85-W/V88), DOT-M/S, C-D

**R/W INFORMATION:**

PREL PARCEL CT: 1 TOTAL PARCEL CT: 11 ACQUIRED BY: DOT ACQ MGR:

UNDER-REVIEW CT: 9 RELEASED CT: 1 OPT-PEND CT: 0 DEEDS CT: 1 COND-PEND CT: 0 COND-FILED CT: 0

RW CERT DT: ACQUIRED CT: 1 RELOCATION CT: 0



# Preconstruction Status Report By PI Number

Print Date: 06/05/2008

PROJ ID	COUNTY	DESCRIPTION	MGMT. ROW DATE	SCHED DATE	MGMT. LET DATE			
0008406	Houston	SR 96 FM CS 1121/LAKE JOY RD TO CS 1116/MOODY RD - PHASE II	Apr-09	Jul-10	Apr-11			
CSNHS-0008-00(406)	FIELD DIST: 3							
TIP #: MPO: Warner	TWIN:	US:	Phase	Approved	Proposed	Cost	Fund	Status
MODELS: Wins	EST DATE: 10/1/2006		ROW	NONE	2009	9,175,407.36	1050	PRECS1
PROJ MGR: Pegram, Yanesha	PROJ LENGTH: 4.01		CST	2010	2010	15,500,000.00	1050	PRECS1
PROG: Reconstruction/Rehabilitation	TYPE: Widening							
TYPE: ADD-4URMED 20)	WORK: Congressional							
CONCEPT: ADD-4URMED 20)	LET RESP: DOT							

SCHED START	SCHED FINISH	ACTIVITY	ACTUAL START	ACT EST FINISH	PCT	DISTRICT COMMENTS
		Define Project Concept	9/17/1992	11/29/1994	100	LOG TERMINAL PROBLEM
		Concept Meeting	6/3/1993	6/3/1993	100	[2-8-08]
		Concept Submittal and Review	12/1/1994	12/5/1994	100	
		Receive Preconstruction Concept Approval	12/5/1994	12/5/1994	100	
		Management Concept Approval Complete	2/2/1995	2/2/1995	100	
		Revise or Re-validate Approved Concept	3/20/2006	9/11/2006	100	
6/25/2008	7/1/2008	Value Engineering Study	7/20/2007		97	
		Public Information Open House Held	5/9/2006	5/9/2006	100	
6/20/2008	6/20/2008	Environmental Approval	10/1/2004		100	
3/6/2009	3/6/2009	Public Hearing Held			0	
		Mapping	8/11/2004	10/27/2004	100	
6/20/2008	7/9/2008	Field Surveys/SDE	1/24/1996		100	
6/20/2008	9/11/2008	Preliminary Plans	5/3/2006		90	
6/19/2008	6/19/2008	Preliminary Bridge Design	12/4/2006		100	
6/20/2008	7/25/2008	Underground Storage Tanks			0	
6/20/2008	11/6/2008	404 Permit Obtainment			0	
10/3/2008	10/6/2008	PFPR Inspection			0	
11/11/2008	2/2/2009	R/W Plans Preparation			0	
6/20/2008	6/25/2008	R/W Plans Final Approval	8/1/2006		99	
11/11/2008	11/13/2008	L & D Report Development and Approval			0	
6/26/2008	5/6/2010	R/W Acquisition			0	
11/18/2008	12/1/2008	Stake R/W			0	
		Soil Survey	2/26/2007	3/28/2007	100	
11/11/2008	12/16/2008	Bridge Foundation Investigation			0	
11/14/2008	7/24/2009	Final Design			0	
1/14/2009	3/10/2009	Final Bridge Plans Preparation			0	
8/17/2009	8/18/2009	FFPR Inspection			0	
9/1/2009	9/14/2009	FFPR Response			0	

BIKE PROVISIONS INCLUDED?: Y MEASUREMENT SYSTEM: CONSULTANT: T UT EST:

Bridge: BRIDGE REQUIRED  
 Design: SH/VCP, PBS&J environmental/contract with 322450 (Turnkey)  
 EIS: EAnotapsdnoonschdROWupd1-29-08jcm  
 LGPA: NOTIFICATION LETTER SENT TO HOUSTON 10-19-06  
 Planning: Project requires bicycle facilities. State Bike Route #49. Amy Goodwin 404-657-6692  
 Programming: SPLIT FROM PI# 322450-  
 Traffic Op: SEND PFPR PLANS FOR REVIEW 6-18-07  
 EMG: REC STR REHAB (WIDENING), TURNKEY (PBS&J)

**R/W INFORMATION:**

PREL PARCEL CT: TOTAL PARCEL CT: ACQUIRED BY: DOT ACQ MGR:  
 UNDER-REVIEW CT: RELEASED CT: OPT-PEND CT: DEEDS CT: COND-PEND CT: COND-FILED CT:  
 RW CERT DT: ACQUIRED CT: RELOCATION CT:



# Preconstruction Status Report By PI Number

Print Date: 06/05/2008

PROJ ID	COUNTY	DESCRIPTION	MGMT. ROW DATE	SCHED DATE	MGMT. LET DATE
0008407	Houston	SR 96 FROM CS 1116/MOODY ROAD TO SR 247/US 129 - PHASE III	Apr-09	Apr-11	Apr-11

CSNHS-0008-00407) **FIELD DIST:** 3  
**TIP #:** **TWIN:** **US:**  
**MPO:** Warner **EST DATE:** 10/1/2006  
**MODEL:** 3Rms  
**PROJ MGR:** Pegram, Vinesha **PROJ LENGTH:** 1.69  
**PROG:** Reconstruction/Rehabilit **TYPE:** Widening  
**TYPE:** tation  
**CONCEPT:** ADD 4U(MED 20) **WORK:** Congressional 8  
**LET RESP:** DOT

SCHED START	SCHED FINISH	ACTIVITY	ACTUAL START	ACT/EST FINISH	PCT	DISTRICT COMMENTS
		Define Project Concept	9/17/1992	11/29/1994	100	LOG TERMINI PROBLEM [2-8-08]
		Concept Meeting	6/3/1993	6/3/1993	100	
		Concept Submittal and Review	12/1/1994	12/5/1994	100	
		Receive Preconstruction Concept Approval	12/5/1994	12/5/1994	100	
		Management Concept Approval Complete	2/2/1995	2/2/1995	100	
		Revise or Re-validate Approved Concept	3/20/2006	9/13/2006	100	
6/25/2008	7/1/2008	Value Engineering Study	7/20/2007		97	
		Public Information Open House Held	5/9/2006	5/9/2006	100	
6/20/2008	6/20/2008	Environmental Approval	10/1/2004		100	
3/6/2009	3/6/2009	Public Hearing Held			0	
		Mapping	8/11/2004	10/27/2004	100	
6/20/2008	7/9/2008	Field Surveys/SDE	1/24/1996		100	
6/20/2008	9/11/2008	Preliminary Plans	5/3/2006		90	
6/19/2008	6/19/2008	Preliminary Bridge Design	12/4/2006		100	
6/20/2008	7/25/2008	Underground Storage Tanks			0	
6/20/2008	11/6/2008	404 Permit Obtainment			0	
10/3/2008	10/6/2008	PFPR Inspection			0	
11/11/2008	2/2/2009	R/W Plans Preparation			0	
3/31/2009	4/3/2009	R/W Plans Final Approval			0	
11/11/2008	11/13/2008	E & D Report Development and Approval			0	
4/6/2009	2/14/2011	R/W Acquisition			0	
8/27/2009	9/9/2009	Stake R/W			0	
		Soil Survey	2/26/2007	3/28/2007	100	
11/11/2008	12/16/2008	Bridge Foundation Investigation			0	
11/14/2008	7/24/2009	Final Design			0	
1/14/2009	3/10/2009	Final Bridge Plans Preparation			0	
8/17/2009	8/18/2009	FFPR Inspection			0	
9/1/2009	9/14/2009	FFPR Response			0	

BIKE PROVISIONS INCLUDED?: Y MEASUREMENT SYSTEM: CONSULTANT: T UT EST:

**Bridge:** BRIDGE REQUIRED  
**Design:** SH/VCP, PBS&J environmental and contrac with 322450(Turnkey)  
**EIS:** EAnotapsdnotonschdROWaipd1-29-08(ern  
**LGPA:** NOTIFICATION LETTER SENT TO HOUSTON 10-19-06  
**Planning:** Project requires bicycle facilities, State Bike Route #40 Amy Goodwin 404-657-6692  
**Programming:** SPLIT FROM PI# 322450-  
**Traffic Op:** SEND PFPR PLANS FOR REVIEW 6-18-07  
**EMG:** RECONSTREHAB(WIDENING), TURNKEY (PBS&J)

**R/W INFORMATION:**

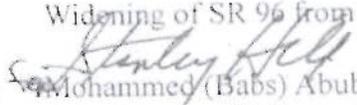
PREL PARCEL CT: TOTAL PARCEL CT: ACQUIRED BY: DOT ACQ MGR:  
 UNDER-REVIEW CT: RELEASED CT: OPT-PEND CT: DEEDS CT: COND-PEND CT: COND-FILED CT:  
 RW CERT DT: ACQUIRED CT: RELOCATION CT:

DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA



INTERDEPARTMENT CORRESPONDENCE

FILE: STP00-0155-01(021), CSNHS-0008-00 (406), &  
CSNHS-0008-00 (407), Peach/Houston Counties  
P.I. Nos. 322450, 0008406, 0008407  
Widening of SR 96 from I-75 to SR 247/US 129

FROM:   
Mohammed (Babs) Abubakari, P.E.,  
State Program Delivery & Consultant Design Engineer

TO: Brian Summers, P.E., State Project Review Engineer  
Attn: Lisa Myers

SUBJECT: Value Engineering Study Responses

OFFICE: Consultant Design

DATE: May 27, 2008

Reference is made to the recommendations that were contained in the Value Engineering Study Final Report issued February 25, 2008 for the above referenced project. Our responses and recommendations are as follows:

1. **Value Engineering Alternative No. TS-1A** – Construct 11' travel lanes throughout the four-lane facility within the project limits (**Cost savings: \$2,677,013**)

**Recommendation**

*Approval of the VE Alternative No. TS-1A is not recommended.*

- *Revising the plans at this time to construct all 11' lanes, would require a redesign of all longitudinal drainage systems, roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The implementation of the project would be delayed by a minimum of 7 months (the preliminary plan duration from the original contract) due to these large scale plan changes. The additional design fee would exceed \$1M for a total savings of approximately \$1.6M.*
- *A design variance would be required in order to construct 11' lanes*
- *The forecast traffic for the SR 96 corridor is 30000 ADT in 2012 and 42750 ADT in 2032, while the truck percentages are 8% trucks, 14% 24-hr truck, respectively. Given these volumes and the geometric conditions, HCS calculations indicate that the maximum service flow rate (MSF) with 12' lanes at LOS D is 1681 pcphpl and 1620 pcphpl for 11' lanes. This results in a 4% reduction in capacity for the corridor.*
- *AASHTO notes that the lane width of a roadway greatly influences the safety and comfort of driving. According to the Revised Concept Report (dated 9/11/06) the accident rates increased yearly between 2002 and 2003 and increased so significantly by 2004 so as to exceed the statewide average for similar facilities.*

2. **Value Engineering Alternative No. TS-1B** - Construct 11' travel lanes for the inside lanes and retain 12' lanes for the outside lanes throughout the four-lane facility within the project limits (Cost savings: \$1,367,078)

### Recommendation

*Approval of the VE Alternative No. TS-1B is not recommended.*

- *Revising the plans at this time to construct 11' inside travel lanes would require a redesign of all longitudinal drainage systems, roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The implementation of the project would be delayed by a minimum of 7 months (the preliminary plan duration from the original contract) due to these large scale plan changes. The additional design fee would exceed \$1M, for a total savings of approximately \$300K.*
  - *A design variance would be required in order to construct 11' lanes*
  - *The forecast traffic for the SR 96 corridor is 30000 ADT in 2012 and 42750 ADT in 2032, while the truck percentages are 8% trucks, 14% 24-hr truck, respectively. Given these volumes and the geometric conditions, HCS calculations indicate that the maximum service flow rate (MSF) with 12' lanes at LOS D is 1681 pcphpl and 1620 pcphpl for 11' lanes. This results in a 4% reduction in capacity for the corridor.*
  - *AASHTO notes that the lane width of a roadway greatly influences the safety and comfort of driving. While lane width reductions of the inner lane are acceptable on multi-lane facilities in urban settings, according to the Revised Concept Report (dated 9/11/06) the accident rates increased yearly between 2002 and 2003 and increased so significantly by 2004 so as to exceed the statewide average for similar facilities.*
3. **Value Engineering Alternative No. TS-3** - Eliminate the 2' inside shoulders for a revised 20' median (Cost savings: \$1,366,384)

### Recommendation

*Approval of the VE Alternative No. TS-3 is not recommended.*

- *Revising the plans at this time to construct a 20' raised median would require a redesign of all longitudinal drainage systems, roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The implementation of the project would be delayed by nearly 4 months due to these large scale plan changes.*

- *Raised medians are required for Non-GRIP arterials with base year traffic over 18,000 ADT and design year traffic over 24,000 ADT. According to Chapter 6.8.2, Table 6.8 of the GDOT Design Policy Manual (Version 2.0), a 24 foot raised median is desirable for arterials with the base year and design year traffic of SR 96 (30000 ADT in 2012 and 42750 ADT in 2032, while the truck percentages are 8% trucks, 14% 24-hr truck, respectively), but 20 foot raised medians are allowed without a design exception.*
  - *A 20' median width does not provide the required positive separation of opposing traffic that the 24' median allows.*
  - *According to the Revised Concept Report (dated 9/11/06) the accident rates increased yearly between 2002 and 2003 and increased so significantly by 2004 so as to exceed the statewide average for similar facilities.*
4. **Value Engineering Alternative No. TS-4** – Eliminate the 2' inside shoulders and reduce the distance between the curbs by 2' for a revised 18' median (**Cost savings: \$1,612,923**)

#### Recommendation

*Approval of the VE Alternative No. TS-4 is not recommended.*

- *Revising the plans at this time to construct an 18' raised median would require a redesign of all longitudinal drainage systems, roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The implementation of the project would be delayed by nearly 4 months due to these large scale plan changes.*
  - *Raised medians are required for Non-GRIP arterials with base year traffic over 18,000 ADT and design year traffic over 24,000 ADT. According to Chapter 6.8.2, Table 6.8 of the GDOT Design Policy Manual (Version 2.0), a 24 foot raised median is desirable for arterials with the base year and design year traffic of SR 96 (30000 ADT in 2012 and 42750 ADT in 2032, while the truck percentages are 8% trucks, 14% 24-hr truck, respectively). An 18 foot median would require a design exception.*
  - *An 18' median width does not provide the required positive separation of opposing traffic that the 24' median allows.*
  - *According to the Revised Concept Report (dated 9/11/06) the accident rates increased yearly between 2002 and 2003 and increased so significantly by 2004 so as to exceed the statewide average for similar facilities.*
5. **Value Engineering Alternative No. TS-5** – Conform at the west end of Phase 1 to the existing 44' median, tapering out to a 24' raised median beginning at Station 1079+00, the Johnson Road intersection. Revise all of the project's remaining 44' depressed median to a 24' raised median (**Cost savings: \$2,452,272**)

### Recommendation

*Approval of the VE Alternative No. TS-5 is not recommended.*

- The directive that PBS&J was given at the beginning of the project was to design the corridor with a 44' depressed median footprint in any and all areas where impacts would be minor. This was done to secure the necessary right-of-way footprint for a future 6-lane widening. SR 96 will need to be widened to a 6-lane facility by the year 2032. It was the Department's position that the present cost of this right-of-way width would be significantly less than the 2032 cost for the same area.*
  - Revising the plans at this time to construct a 24' wide raised median rather than the 44' depressed median shown as noted above, would require approximately 3.4 miles of additional longitudinal drainage systems, revised roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The implementation of the project would be delayed due to this large scale plan change. Based on the cost and duration established in the original engineering contract for Preliminary Plans, the design changes would take approximately 3 months and cost over \$400,000.*
- 6. Value Engineering Alternative No. TS-6A – Eliminate the bike lanes from both sides of the road. Keep a 5' sidewalk on one side of the road and replace the opposite sidewalk with a single 10' wide multi-use path. The multi-use path pavement section would consist of 2" asphalt concrete over 4" GAB on a compacted subgrade. (Cost savings: \$5,574,530)**

### Recommendation

*Approval of the VE Alternative No. TS-6A is not recommended.*

- Revising the plans at this time to modify the typical section to reduce the roadbed width throughout the corridor, would require a redesign of all longitudinal drainage systems, roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The implementation of the project would be delayed due to these large scale plan changes. Based on the cost and duration established in the original engineering contract for Preliminary Plans, the design changes would take approximately 7 months and cost over \$1M.*
- The SR 96 corridor is on the Georgia State Bicycle Route system (The "TransGeorgia" bike route). The desirable typical section for such corridors includes an in-pavement bicycle lane section as shown on the current typical section.*
- A portion of the project costs are scheduled to be funded by Houston Co. Special Purpose Local Option Sales Tax (SPLOST) monies. Available SPLOST funds will total approximately \$10M. An agreement with Houston and/or Peach Counties*

would have to be reached if these funds, originally dedicated for sidewalks, were to be used for a wider and more expensive multi-use path.

- The 16' shoulder section for the multi-use path that was analyzed is substandard for a shared-use pathway according to GDOT's Pedestrian & Streetscape Guide, Toolkit 4. According to Table 34 from that manual, the path should have a 5' separation from edge of travel, be 12' wide (desirable) and provide a 2' shoulder for a total width of urban shoulder of 19'. This increase in trail width (from 10' to 12', 1 side) and shoulder width (from 16' to 19', 1 side) would reduce the savings identified by the 4' roadbed width reduction by \$890,050, using the unit costs noted in the VE study.
  - In accordance with ADA requirements and summarized in GDOT's Construction Detail A1, the location of the multi-use path relative to the edge of pavement at valley gutter driveways would need to be 8.5' (2.5' curb & gutter, 6' valley gutter). Utilizing a 12' path and the 2' outside shoulder, the total shoulder width at these drives would equal 22.5'. Therefore, additional r/w will be required at valley gutter drives than what was indicated using the standard 16' shoulder. Assuming 250, standard 14' wide valley gutter driveways at \$5.11 per SF, the additional r/w cost would be approximately \$171,000.
7. **Value Engineering Alternative No. TS-6B** – Eliminate the bike lanes and the 5' wide concrete sidewalks on both sides of the road and replace with two 8' wide multi-use paths/per direction. The multi-use path pavement section would consist of 2" asphalt concrete over 4" GAB on a compacted subgrade. (Cost savings: \$5,784,162)

### Recommendation

*Approval of the VE Alternative No. TS-6B is not recommended.*

- Revising the plans at this time to modify the typical section to reduce the roadbed width throughout the corridor, would require a redesign of all longitudinal drainage systems, roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The implementation of the project would be delayed due to these large scale plan changes. Based on the cost and duration established in the original engineering contract for Preliminary Plans, the design changes would take approximately 7 months and cost over \$1M.
- A portion of the project costs are scheduled to be funded by Houston Co. Special Purpose Local Option Sales Tax (SPLOST) monies. Available SPLOST funds will total approximately \$19M. An agreement with Houston and/or Peach Counties would have to be reached if these funds, originally dedicated for sidewalks, were to be used for a wider and more expensive multi-use path.
- The 16' shoulder section for the multi-use path that was analyzed is substandard for a shared-use pathway according to GDOT's Pedestrian & Streetscape Guide, Toolkit 4. According to Table 34 from that manual, the path should have a 5' separation from edge of travel, be 12' wide (desirable) and provide a 2' shoulder for a total width of urban shoulder of 10'. This increase in trail width (from 8' to

12', both sides) and shoulder width (from 16' to 19', both sides) would reduce the savings identified by the 4' roadbed width reduction by \$2,103,235, using the unit costs noted in the VE study.

- In accordance with ADA requirements and summarized in GDOT's Construction Detail A1, the location of the multi-use path relative to the edge of pavement at valley gutter driveways would need to be 8.5' (2.5' curb & gutter, 6' valley gutter). Utilizing a 12' path and the 2' outside shoulder, the total shoulder width at these drives would equal 22.5'. Therefore, additional r/w will be required at valley gutter drives than what was indicated using the standard 16' shoulder. Assuming 250, standard 14' wide valley gutter driveways at \$5.11 per SF, the additional r/w cost would be approximately \$171,000.

8. **Value Engineering Alternative No. TS-7** – Use a 24-inch curb & gutter on both sides of the raised median and along side the urban shoulders (**Cost savings: \$342,775**)

#### Recommendation

Approval of the VE Alternative No. TS-7 is not recommended.

- Revising the plans at this time to modify the typical section to reduce the gutter width throughout the corridor, would require a redesign of all longitudinal drainage systems, roadway cross-sections, driveway profiles, and any other design items controlled by the project footprint. The redesign of the longitudinal drainage is of particular concern, due to the reduction in width to accommodate gutter spread. Cost of redesign (based on the original contract amount for preliminary plans was \$1M, with a 7 month duration) would outweigh construction & r/w cost savings identified by the 2' of overall width reduction.
  - According to Chapter 6.5.3 of the GDOT Design Policy Manual (Version 2.0), a 2.5' (30") curb & gutter width is recognized as the GDOT standard for both sloped and barrier type curbs. A 24" curb & gutter would require a design variance. In addition, GDOT has not studied the use of 24" curb and gutter versus 30" curb and gutter. Additional maintenance and operational problems could arise once detailed analyses are performed.
9. **Value Engineering Alternative No. TS-8** – Build 16-foot urban shoulders since the required right-of-way is being set to accommodate a shoulder 16-feet wide. Increase the grass strip to 6-feet wide. (**Cost increase: \$249,630**)

#### Recommendation

Approval of the VE Alternative No. TS-8 is recommended.

- *The right-of-way width set for the SR 96 project corridor is 16' offset from the proposed edge of pavement. Therefore, increasing the outside urban shoulder width to 16' will not impact the r/w cost, but will allow the sidewalks to be offset 6' from back of curb and remain in-line at valley gutter locations for continuity.*
- *This change will require revisions to all cross-sections and plan view sidewalk locations throughout the project. This should not cause a significant delay in project schedule*

**10. Value Engineering Alternative No. A-1** – Revise the SR 96 alignment in this vicinity to follow along Oglethorpe Road. Use the existing Oglethorpe Road right-of-way to relocate SR 96. The new alignment would allow approximately 700-ft between the relocated SR 96/Old Perry Road and the Old SR 96/Old Perry Road intersections. The relocation of Old SR 96 just east of Old Perry Road would be eliminated. (Cost savings: \$531,742)

#### **Recommendation**

*Approval of the VE Alternative No. A-1 is not recommended.*

- *Revising the plans at this time to re-align SR 96, would require a redesign of approximately 0.8 miles of roadway. Environmental studies would also need to be redone to account for this corridor change. Based on the cost and duration established in the original engineering contract for Preliminary Plans, the design changes would take approximately 1 month and cost approximately \$100,000.*
- *This alignment was investigated as an early alternate once it was discovered that a grade separation at SR 247 and the Norfolk Southern Railroad was required due to the large volume of trains per day. The alternate was quickly dismissed from consideration at a January 13, 2006 project meeting (see attached meeting minutes) over concern about a major arterial replacing small residential street adjacent to a large subdivision and the impacts to the Perdue parcel between Oglethorpe Rd and SR 96. The current alignment has no displacements in this area.*

**11. Value Engineering Alternative No. I-1** – Eliminate the intersection by making Granville Drive a cul-de-sac. Eliminate the concrete island and the right-turn lane into Granville Drive (Cost savings: Undetermined – design suggestion)

#### **Recommendation**

*Approval of the VE Alternative No. I-1 is recommended.*

- *The current design calls for right-in right-out access from SR 96 to Granville Road. If Granville Rd is to be cul-de-saced, SR 96 can be accessed via Moody Road, a total distance of approximately 0.3 miles.*

- *Concur with the VE team recommendation, pending GDOT, County government and local resident's approval.*

**12. Value Engineering Alternative No. I-2** – Align CR 82 to intersect SR 96 opposite existing CR 81/Smyrna Church Road and eliminate construction of curb and gutter on CR 81. Increase the length of curb and gutter on CR 82 to 600 ft. Make opposite changes in the median opening (**Cost savings: \$216,400**)

**Recommendation**

*Approval of the VE Alternative No. I-2 is recommended.*

- *The current design calls for the re-alignment of Smyrna Church Rd to the east to align with existing Johnson Rd. A design decision was made in the early stages of Concept Development to maintain the 250' r/w width along SR 96 from the beginning of the project to this intersection. This additional required r/w would make the Dent parcel in the NW quadrant of the intersection a displacement regardless of how the intersection was re-aligned. Therefore, it was decided to re-align Smyrna Church Road to gain the most separation from adjacent driveways off SR 96.*
- *Concur with the VE team recommendation, pending GDOT approval of reduced r/w width in the NW quadrant and relocation of driveway serving the parcel in the NE quadrant of the intersection.*

**13. Value Engineering Alternative No. I-6** – Move the proposed signal from High School Drive to Bear Drive (**Cost savings: Undetermined – design suggestion**)

**Recommendation**

*Approval of the VE Alternative No. I-6 is recommended, pending changes noted below.*

- *The current design calls for a signal at the intersection of SR 96 and the H.S. main entrance driveway and not the intersection of SR 96 with Bear Drive. The signal at the High School Drive entrance was a request by representatives from the Houston County School system at a meeting with GDOT representatives held on 9/1/05. Bear Drive provides access to the student parking and a future parking expansion project. The main entrance driveway accesses a small visitor and faculty parking lot. The two intersections are 1500' apart.*
- *Concur with the VE team recommendation for a signal at Bear Drive. However, current signal proposed at High School Drive must also remain, as it was a previous commitment made by the State to the County and local PTA. Changes recommended, pending GDOT, Houston County Board of Education and County approval.*

14. **Value Engineering Alternative No. I-7** – Cul-de-sac Forest Road at SR 96 and provide a new connection at Forest Road/Moody Road where a displaced, full-take parcel is available. **(Cost increase: \$16,539)**

**Recommendation**

*Approval of the VE Alternative No. I-7 is not recommended.*

- *While it is understood that the presence of the right-turn lane from SR 96 EB to Forest Road is not ideal (due to the substandard decel length), it was justified due to the low traffic volumes making that movement (Forest Rd south serves only four residences) and concerns over the increase in cost by providing a new access road.*
- *With regard to recommendation I-7, there could be design problems with a direct connection from the end of Forest Road to Moody Road at the location identified. There is a 42" pipe under Moody Rd. draining into a large ditch beneath where the VE team has recommended the Connector. This could present drainage problems or environmental concerns if the ditch is considered an ephemeral stream. There is also about a 16' grade differential between Moody & Forest over a length of approximately 220' that could present a grade issue for the proposed Connector Rd.*
- *The proposed access point where the Forest Rd Conn. would tie into Moody Rd. is within the deceleration lane taper. This is not a desirable location. Relocating the access point further south could cause additional displacements.*
- *If the State is amenable to a Forest Rd Connector solution, consider relocating the roadway to the east and intersecting with Sasser Rd. rather than Moody Rd. This would eliminate the grade, drainage and decel taper issues and would allow the decel lane for SR 96 EB to Sasser Road to be designed to standard lengths. This solution would also result in one displacement.*

15. **Value Engineering Alternative No. B-2A** – Consider a single 12' x 6' box culvert in lieu of Double 6'x6' box culverts at Sta. 1452+17 (Cainey Branch Trib. #2) **(Cost increase: \$51,392)**

**Recommendation**

*Approval of the VE Alternative No. B-2A is not recommended.*

- *A 12'x6' box culvert is not a current GDOT design standard design. This solution would require a special design.*
- *Savings gained (as shown in the VE report) from eliminating the interior culvert wall would be offset by the additional cost of thicker exterior walls and slabs needed to support a 12' span. As-is, the VE recommendation represents an overall cost-increase*

- *Site visits do not support claims of debris collection issues at this location.*

**16. Value Engineering Alternative No. B-2B** – Consider a single 12' x 6' three-sided concrete culvert in lieu of Double 6'x6' box culverts at Sta. 1452+17 (Cainey Branch Trib. #2) (Cost increase: \$159,957)

#### Recommendation

*Approval of the VE Alternative No. B-2B is not recommended.*

- *A 12'x6' bottomless concrete culvert is not a current GDOT design standard design. This solution would require a special design.*
- *Savings gained (as shown in the VE report) from eliminating the interior wall would be offset by the additional cost of thicker exterior walls and slabs needed to support a 12' span. As-is, the VE recommendation represents an overall cost-increase.*
- *Site visits do not support claims of debris collection issues at this location.*
- *The Department has been hesitant to utilize bottomless culverts in the southern portion of the state due to the fact that there are potential scour problems with the foundation of this structure type. Also, foundation for three-sided culverts must be supported by piles. The costs of the piles at the foundation were not accounted for in the VE cost for B-2B. See GDOT's Bridge Design Manual, Section 6.3 for further discussion on bottom-less culvert usage.*

**17. Value Engineering Alternative No. B-4** – Create two short bridges with fill in-between in lieu of one long multi-span bridge. Fill spans 3 and 4 with earth filling and revise lengths of spans 1, 2, 5 & 6. Convert intermediate bents 3 & 5 to end bents. Provide MSE walls in front of the end bents to retain earth-fill. MSE walls to be installed parallel to the centerline of the railroad and SR 247 (Cost savings: \$1,707,602)

#### Recommendation

*Approval of the VE Alternative No. B-4 is not recommended.*

- *The Department does not agree with the cost assumptions made in the VE Report for bridge structures or MSE walls. The Department accepts that the VE Alternative B-4 will be less expensive. Our calculations show the cost to be the following:  
Assuming \$85/sf of bridge and 60/SF MSE wall (see p. 77 of VE Report for quantities) – the existing bridge structure would be \$4,685,000 and the "Two bridge and fill" alternate would be \$3,730,000 (including fill between walls) for a savings of approx. \$955,000.*

- *The GDOT Bridge office has been hesitant to construct MSE walls in lieu of bridges in similar instances. The varying settlement rates between the MSE walls and the fill between the walls and bridge (which does not settle at all), makes it difficult to get proper compaction between the bridges and causes a poor riding condition on the roadway.*

**18. Value Engineering Alternative No. B-5** – Create two short bridges with fill in-between in lieu of one long multi-span bridge. Fill spans 3 & 4 with earth-fill and revise the lengths of spans 1, 2, 5 & 6. Convert intermediate bents 3 and 5 to end bents. Install MSE walls to retain the earth-fill on all four sides. **(Cost savings: \$1,394,831)**

#### Recommendation

*Approval of the VE Alternative No. B-5 is not recommended.*

- *There would be an issue with constructability with respect to the 4 MSE walls. The contractor would be essentially boxing himself in during the construction. It would be very difficult to get compaction equipment and other equipment on the embankment. Additionally, the wall would have to be constructed with special closure panels increasing the cost of the wall construction.*
- *The Department does not agree with the cost assumptions made in the VE Report for bridge structures or MSE walls. The Department accepts that the VE Alternative B-5 will be less expensive. Our calculations show the cost to be the following:  
*Assuming \$85/sf of bridge and 65/SF MSE wall (see p. 81 of VE Report or quantities) – the existing bridge structure would be \$4,685,000 and the “Two bridge and MSE walls” alternate would be \$4,060,000 for a savings of approx. \$625,000.**
- *The GDOT Bridge office has been hesitant to construct MSE walls in lieu of bridges in similar instances. The varying settlement rates between the MSE walls and the fill between the walls and bridge (which does not settle at all), makes it difficult to get proper compaction between the bridges and causes a poor riding condition on the roadway.*

MBA/VCP

cc: Todd Long, Director of Preconstruction

### 6.8.2. Arterial (Non-GRIP) Medians

The required medians for arterials (non-GRIP) with posted speeds or design speeds less than or equal to 45 mph are described in Table 6.8.

**Table 6.8. Medians for Non-GRIP Arterials  
with Posted Speeds or Design Speeds  $\leq$  45 mph**

Median	ADT (Base Year)	ADT (Design Year)
5-lane section (flush median)	$\leq$ 18,000	$\leq$ 24,000
5-lane section (flush median) <sup>(1)</sup>	$\leq$ 18,000	$>$ 24,000
20-ft. raised median <sup>(2)</sup>	$>$ 18,000	$>$ 24,000

<sup>(1)</sup> The project shall be designed to incorporate a future 20-ft. raised median or preferably a 24-ft. raised median depending on impacts. Right-of-way shall be purchased for footprint determined by raised 20-ft. or 24-ft. median typical section. The need and implementation of a raised median section shall be determined by monitoring of accidents and traffic volumes on a five-year cycle by the Safety Engineer in the GDOT Office of Traffic Operations.

<sup>(2)</sup> GDOT prefers the use of a 24-ft. raised median if there are minimal impacts associated with a wider median.

Raised medians shall be constructed on multi-lane facilities at intersections that exhibit one of the following characteristics:

- high turning volumes relating to 18,000 ADT (base year) and 24,000 ADT (design year)
- accident rate greater than the state average for its classification
- excessive queue lengths (as determined by District Traffic Engineer) in conjunction with excessive number of driveways

All arterials with design speeds greater than 45 mph will require:

A 24-ft. raised median with a sloped curb (Type 7 curb-face), which will require a 2-ft. additional paved shoulder offset from the edge of travel to the edge of the gutter (4-ft. inside shoulder width from the edge of travel to the face of the curb).

A 44-ft. depressed median or a positive barrier system depending upon functional classification, the type of development along the corridor, type of access management and right-of-way impacts.

All multi-lane facilities with three or more lanes in each direction shall include positive separation of opposing traffic using a median. The type of median required shall depend on guidelines stated above.

All rural multi-lane roadways interchanging with an interstate highway shall have a raised median for a minimum distance of 1,000-ft. from the ramp termini or the first major intersection. A median break may be provided in accordance with the GDOT's access guidelines, which are described in Chapter 3, Design Controls of this Manual.

Recommended Dimensions for Trails and Paths		
Trail/Pathway Element	Recommended Dimensions	Comments
<b>RECREATION TRAILS</b>		
Paved Pedestrian-Only Trail Width	5 ft minimum	These trails are for exclusive use by pedestrians (see Figure 34).
	6 ft desirable	
Unpaved Pedestrian-Only Trail Width	2 ft minimum	Best as limited purpose facility in rural or semi-primitive areas; can provide interim solution (see Figure 35); minimum width should only be used in constrained areas.
	4-6 ft desirable	
Unpaved Shared Use Trail Width	6 ft minimum	Only suggested as an interim solution and not appropriate for high use trails; best in rural or semi-primitive areas (see Figure 36).
	8-10 ft desirable	
Pedestrian Mall/Corridor (Urban) Width	10 ft minimum	Pathways in urban areas or those that receive heavy use should be wide enough to accommodate several people walking side-by-side or groups of people walking in opposite directions.
	12 ft desirable	
	15 ft optimum	
Vertical Clearance	8 ft minimum	Additional clearance improves visibility. Ten feet is minimum when equestrian use is expected.
	10 ft desirable	
<b>SHARED USE PATHS</b>		
Shared Use Path Width	10 ft minimum	Minimum width should only be used where volumes are low and sight distances are good; width should be based on relative speed of users; higher speed users (bicyclists and skaters) require greater widths.
	12 ft desirable	
	14 ft optimum	
Roadway Separation	5 ft minimum	Minimum separation for parallel, adjacent path; a physical barrier should be installed where minimum separation cannot be met.
Shoulders	1 ft minimum (peds. only)	Shoulders provide pull-off/ resting and passing space; should be graded to the same slope as the path; minimum shoulder width of 1 ft should only be used in constrained areas.
	2 ft minimum (shared use)	
Clear Zones	1 ft minimum*	Clear zones are additional lateral clearance on each side of the path beyond the shoulders. All obstructions (e.g. trees, signs, etc.) should lie outside of the clear zones.
	2 ft desirable*	
Vertical Clearance	8 ft minimum	Additional clearance improves visibility.
	10 ft desirable	
* If less than 1.2 m (4 ft) total lateral clearance is provided (including shoulder) between the edge of trail, and there is a vertical grade drop greater than 0.8 m (30 in), steeper than 2:1, railing may be required. See discussion later in this toolkit section.		

Table 34



### 6.5.1. Outside Curb Location Relative to Travel Lanes, Guardrail, etc.

For a typical roadway section with curb and gutter, the curb is offset from the through travel lane as shown in Chapter 5 of the AASHTO *Roadside Design Guide* (2006). When used to delineate raised islands, like those commonly placed at intersections, the curb should be offset from the travel lane as discussed in Section 6.5.5. of this Manual. Additional discussion on the location of curbs is provided in Chapters 4 and 9 of the AASHTO *Green Book* (2004).

The relationship of curb-to-guardrail is critical. If the curb is not properly located, the guardrail will not function as intended. Chapter 5 of the AASHTO *Roadside Design Guide* (2006) discusses the location of curb with respect to the face of the guardrail. For additional information, refer to GDOT *Construction Standards and Details*, Ga. Std. 4280.

### 6.5.2. Curb Types

#### Sloped Curbs or Barrier Curbs

Curb shapes are generally classified as either sloped or barrier curbs. The sloped curb has a flat sloping face. The barrier curb is characteristic of a steep face.

Generally, barrier curb is only used when sidewalks are provided and in the curb return of turnouts to intersecting streets. See Table 6.7 for proper use of curb.

#### Concrete or Asphaltic Curbs

Portland cement concrete is used for most curbs. Asphaltic curbs are limited primarily to header curbs in parking areas. Asphaltic curbs are also used to control runoff and erosion on high fills (>20-ft.) with 2:1 side slopes or in guardrail sections along rural roadways. See GDOT *Construction Standards and Details*, Construction Detail S-4 for information regarding the placement of asphaltic curbs behind guardrail.

### 6.5.3. Methods of Construction

#### Integral

For concrete pavements, integral curb is preferred to curb and gutter because of economy in initial construction and maintenance. With this method, the concrete curb is poured when the concrete slab for the roadway is still in a plastic state. This creates an integral bond between the roadway and the curb. An alternate, and more popular, method of construction is to place tie bars in the concrete of the roadway slab. Later, when the pavement has hardened, the curb is poured so that the tie bars hold the curb firmly in place on the roadway. Although not truly integral with the pavement, this curb is commonly referred to as integral/tied curb. The depth of integral/tied curb should match the depth of the roadway slab.

#### Curb and Gutter

Concrete curb and gutter, as shown in the GDOT *Construction Standards and Details*, Ga. Std. 9032B, is generally used with asphaltic concrete pavement. Under this method, both the curb and the gutter are poured together, but not at the same time as the roadway pavement. The GDOT standard curb and gutter width is 2.5-ft. for both sloped and barrier type curb and gutter. Where curb and gutter is placed adjacent to concrete pavement on curbed sections, tie bars should be used to connect the curb and gutter to the adjacent pavement. This prevents separation of the curb and gutter from the edge of the pavement.

### **6.3 Three-Sided or Bottomless Culverts**

Bottomless culverts are allowed only when no other practical solution (such as a bridge or standard box) will satisfy the project requirements. This may occur in extremely rare instances where the only way to obtain an environmental clearance is through the use of a bottomless culvert. In this case the detailed plans for the bottomless culvert must be included in the contract documents. The foundation design for the bottomless culvert must be included in these details and sealed by a Professional Engineer registered in the State of Georgia. In addition, the foundation design must detail how the bottomless culvert foundation will be protected from scour. In general, rip-rap is NOT considered satisfactory for protecting a spread footing from scour -- footings must be keyed into solid rock or founded on piling embedded well below the scour line.

The provisions for the sizing of Bottomless culverts are outlined in the GDOT drainage manual.