COMPASS
INFRASTRUCTURE GROUP

Addendum to Structure Type Study

Far East Freeway
FAI/LIC-70-0.00/0.00

PID 96808

Rehabilitation/Replacement of FAI-TR219-00.044 Bridge

June 2024

Addendum to Structure Type Study

This Addendum has been prepared by Compass Infrastructure Group for ODOT District 5 to examine the merits and costs of using a precast four-sided box culvert vs. a precast concrete arch on spread footings. The four-sided box culvert was originally presented as Option 1 in the Structure Type Study (STS) and it was later decided that the precast arch alternative should also be evaluated and compared with the precast four-sided box option. The following items will be addressed in this narrative: constructability, hydraulics, foundation recommendations, and cost.

The names of the two options being compared are:

- Option 1 – Precast Four-Sided Box Culvert
- Option 1A – Precast Arch Culvert on Spread Footings

Option 1A – Culvert Replacement with Precast Arch Culvert on Spread Footings

Option 1A is replacing the existing 60’ long, 20’ x 10’ box culvert with a longer 20’ x 10’ CONSPAN B-series arch under the proposed alignment of Taylor Road. The CONSPAN B-series will consist of 38 – 8’ long normal precast sections resulting in a total length of 304’ with cast in place wingwalls and headwalls. Per discussion with Contech, it is recommended to place the arch culvert units on a cast-in-place slab footing that spans between the legs of the units. The outlet of the proposed culvert will be located at the same location as the existing culvert outlet. The inlet of the proposed culvert will be placed 300’ linearly upstream to match the existing channel resulting in a skew of approximately 28.4° with respect to the proposed centerline of Taylor Road. The existing box culvert including the wingwalls and the spread footing foundations will be removed to avoid a potential conflict with the proposed foundations. The invert of the proposed precast arch culvert slab footing will be depressed 1’ to allow it to fill in to a natural bottom, similar to the existing culvert.

Over 40’ of type 1 structural fill will be required over the culvert. Contech confirmed that the CONSPAN B Series with this much fill is feasible, however the unit thickness will be 12”, which is greater than the normal thickness.

Hydraulics

The proposed culvert is oversized per LDv2 Section 1002.3.1 as it provides 5.40’ of freeboard above the 1% AEP storm. There is no change to the hydraulics or freeboard for Option 1A when compared to Option 1 because the water level stays in the lower, straight legged portion of the arch and both structures have a 10’ rise.

Advantages and Disadvantages of this option when compared to a bridge option are the same as those for Option 1, so those are not listed here. The Advantages and Disadvantages of this Option compared with Option 1 include the following:

Advantages:

- This option does not offer any advantages over Option 1.

Disadvantages of this option include the following:

- More costly than Option 1.
- This option will require construction of a long slab footing which will increase construction duration.

The preliminary construction cost of major items for this alternate including roadway and embankment and a 20% contingency is $3,637,000.

Cost Comparison

The following table provides a summary of the costs for both options and provides a comparison with the lowest cost alternative.

Table 1 - Summary of Cost Estimates

Option	Initial Cost	Difference	% Difference
1	$2,521,000*	-	-
1A	$3,637,000	$1,116,000	144%

* Note: this cost was updated since the original Structure Type Study. During further conversations with Lindsay Precast, they indicated that a thicker than normal box culvert would be required due to the height of fill, therefore the cost of the box culvert was increased accordingly.

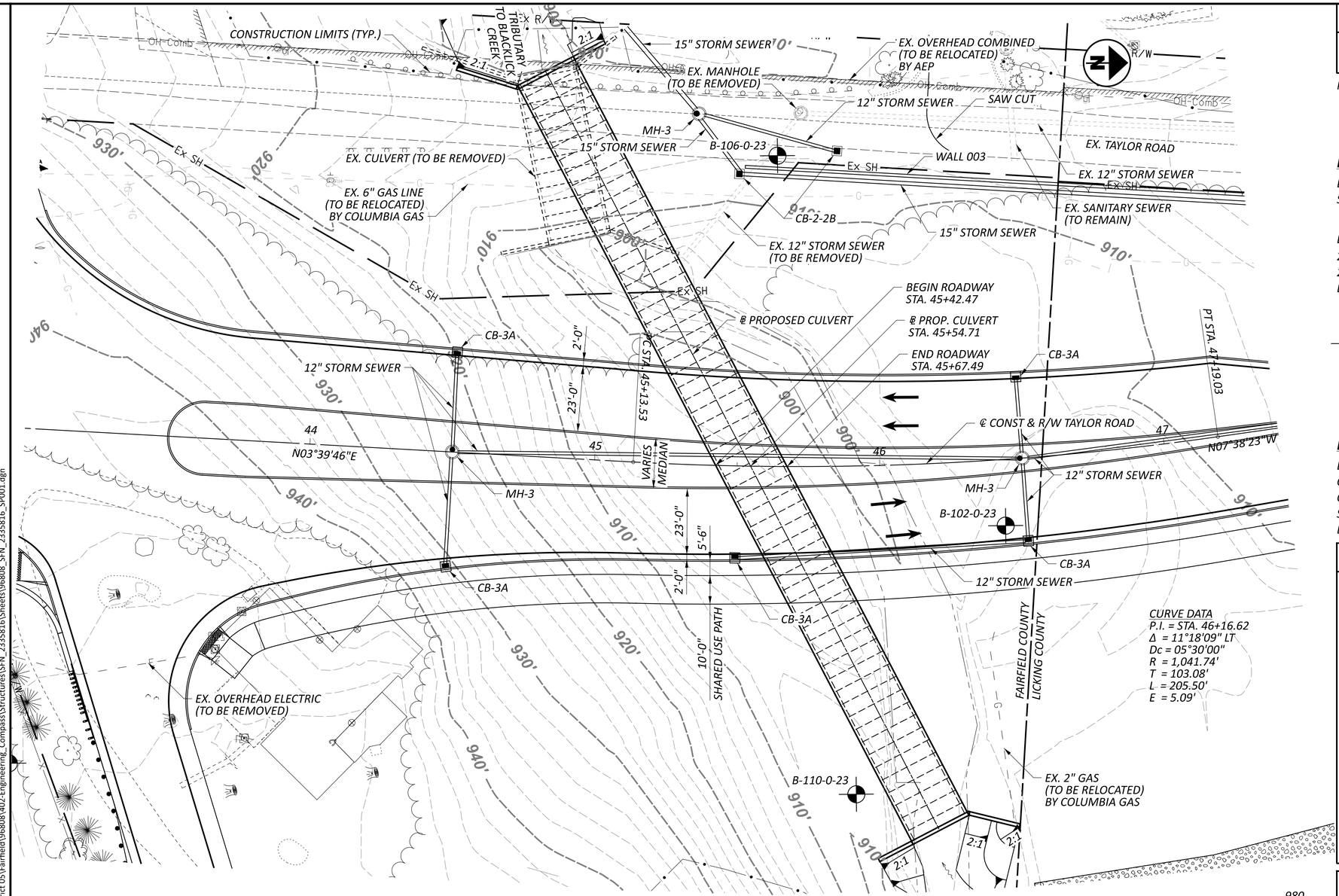
Refer to Appendix B for detailed bridge construction cost estimates.

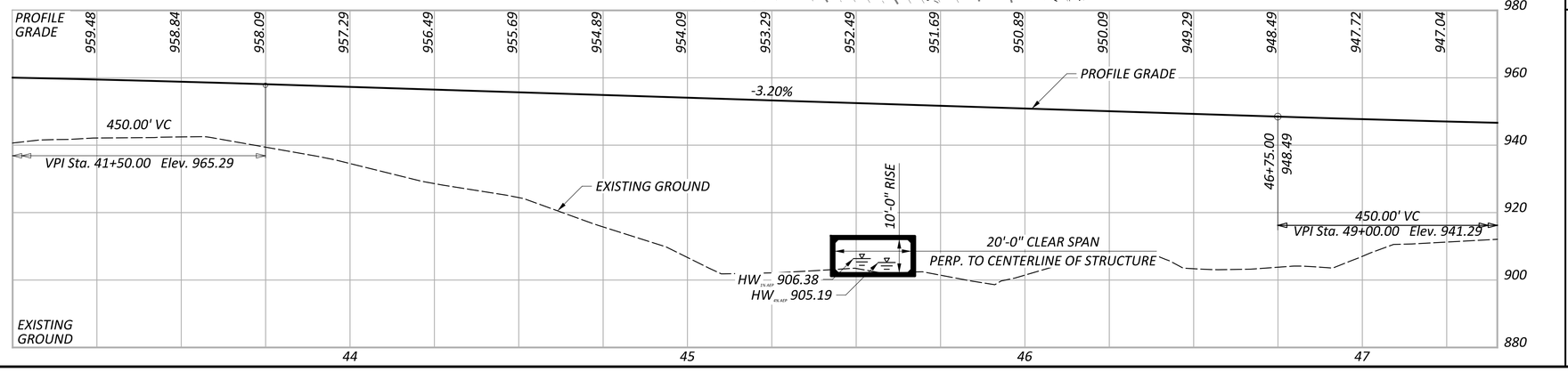
Estimated construction costs for the proposed culvert options were based on various sources including ODOT's Office of Estimating Historical Bid Data, Estimator software, and discussions with Lindsay Precast and Contech. The cost estimates include a 20% contingency. Inflation has not been included in these estimates; however, unit prices are based on the most current available bid data from 2024.

Recommendations

Option 1 will provide a long-lasting, low maintenance structure with the lowest cost and shortest construction duration. **For these reasons, Compass recommends Option 1, a 20' x 10' precast box culvert.**

APPENDIX A – Bridge Plan Sheets





BENCHMARK DATA

C.P. 2010 IR 70 STA. 83+89.09, ELEV. 893.59, OFFSET 128.57' LT.
C.P. 2011 IR 70 STA. 129+97.67, ELEV. 961.36, OFFSET 128.33' LT.

FOR ADDITIONAL BENCHMARK INFORMATION, SEE ROADWAY PLANS

NOTES

EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

DESIGN TRAFFIC:
2030 ADT = 26,320 2030 ADTT = 790
2050 ADT = 36,680 2050 ADTT = 1100
DIRECTIONAL DISTRIBUTION =

LEGEND

BORING LOCATION

HYDRAULIC DATA

DRAINAGE AREA = 1.88 SQ. MILES
Q (4% AEP) = 539 CFS V (4% AEP) = 5.60 FT/S
Q (1% AEP) = 787 CFS V (1% AEP) = 6.30 FT/S
STRUCTURE CLEARS THE 4% AEP
DESIGN HW BY 2.29 FEET.

EXISTING STRUCTURE

TYPE: 20'± X 10'± PRECAST CONCRETE BOX CULVERT

SPANS: 20'-0"± (NORMAL TO ℄ CULVERT)
ROADWAY: 16'-0"±
LOADING: HL-93
SKEW: 13° ± RF
WEARING SURFACE: ASPHALT
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 3/16"±/FOOT
STRUCTURE FILE NUMBER: 2335816
DATE BUILT: 2014
DISPOSITION: TO BE REPLACED

PROPOSED STRUCTURE

TYPE: 20' X 10' PRECAST CONCRETE BOX CULVERT

SPANS: 20'-0" (NORMAL TO ℄ CULVERT)
ROADWAY: VARIES TOE/TOE CURB
LOADING: HL93 AND 60 PSF FUTURE WEARING SURFACE
SKEW: 28°24'30.17" RF
WEARING SURFACE: ASPHALT
APPROACH SLABS: NONE
ALIGNMENT: 11°18'09" CURVE LEFT
CROWN: 0.016 FT/FT
DECK AREA: 6600 SF

COORDINATES: LATITUDE 39°56'19.64" N
LONGITUDE 82°46'22.59" W

SITE PLAN
BRIDGE NO. FAI-TR219-00.044
TAYLOR ROAD OVER TRIBUTARY TO BLACKLICK CREEK

SFN 2335817
DESIGN AGENCY
COMPASS INFRASTRUCTURE GROUP
DESIGNER JFK | CHECKER ERK
REVIEWER XXX MM-DD-YY
PROJECT ID 96808
SUBSET 1 | TOTAL 1
SHEET | TOTAL

FAI/LIC-70-0.00/0.00

MODEL: CLP_TAYLOR - Taylor Road [Sheet] PAPERSIZE: 34x22 (in.) DATE: 6/19/2024 TIME: 12:04:55 PM USER: bkronk
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APPENDIX B – Bridge Cost Estimates

Option 1 -Precast Four-Sided Box Culvert					
Item No.	**Unit**	**Description**	**Part Total**	**Cost/Unit**	**Total Cost**
202E11000	LS	STRUCTURE REMOVED	1	$60,000.00	$60,000
203E20000	CY	EMBANKMENT	41227	$15.00	$618,405
301E56000	CY	ASPHALT CONCRETE BASE, PG64-22, (449)	533	$400.00	$213,200
304E20000	CY	AGGREGATE BASE	423	$100.00	$42,300
407E20000	GAL	NON-TRACKING TACK COAT	96	$4.00	$384
441E50000	CY	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22	67	$330.00	$22,110
441E50300	CY	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, (448)	94	$300.00	$28,200
503E21300	LS	UNCLASSIFIED EXCAVATION	1	$82,000.00	$82,000
509E10000	LB	EPOXY COATED REINFORCING STEEL	30727	$2.10	$64,527
511E46010	CY	CLASS QC1 CONCRETE, RETAINING/WINGWALL NOT INCLUDING FOOTING	45	$1,100.00	$49,500
511E46510	CY	CLASS QC1 CONCRETE, FOOTING	107	$750.00	$80,250
512E10100	SY	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	212	$40.00	$8,480
512E33000	SY	TYPE 2 WATERPROOFING	1611	$25.00	$40,275
516E13600	SF	1" PREFORMED EXPANSION JOINT FILLER.	73	$10.00	$730
518E21200	CY	POROUS BACKFILL WITH GEOTEXTILE FABRIC	65	$160.00	$10,400
601E32200	CY	ROCK CHANNEL PROTECTION, TYPE C WITH FILTER	119	$250.00	$29,750
611E96461	FT	20' X 10' CONDUIT, TYPE A, 706.05, AS PER PLAN	300	$2,500.00	$750,000
TOTAL					**$2,100,511**
TOTAL +20% Contingency					**$2,521,000**

Option 1A - Precast Arch Culvert on Spread Footings					
Item No.	**Unit**	**Description**	**Part Total**	**Cost/Unit**	**Total Cost**
202E11000	LS	STRUCTURE REMOVED	1	$60,000.00	$60,000
203E20000	CY	EMBANKMENT	41227	$15.00	$618,405
301E56000	CY	ASPHALT CONCRETE BASE, PG64-22, (449)	533	$400.00	$213,200
304E20000	CY	AGGREGATE BASE	423	$100.00	$42,300
407E20000	GAL	NON-TRACKING TACK COAT	96	$4.00	$384
441E50000	CY	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22	67	$330.00	$22,110
441E50300	CY	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, (448)	94	$300.00	$28,200
503E21300	LS	UNCLASSIFIED EXCAVATION	1	$82,000.00	$82,000
509E10000	LB	EPOXY COATED REINFORCING STEEL	30727	$2.10	$64,527
511E46010	CY	CLASS QC1 CONCRETE, RETAINING/WINGWALL NOT INCLUDING FOOTING	45	$1,100.00	$49,500
511E46510	CY	CLASS QC1 CONCRETE, FOOTING	907	$750.00	$680,250
512E10100	SY	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	212	$40.00	$8,480
512E33000	SY	TYPE 2 WATERPROOFING	1611	$25.00	$40,275
516E13600	SF	1" PREFORMED EXPANSION JOINT FILLER.	73	$10.00	$730
518E21200	CY	POROUS BACKFILL WITH GEOTEXTILE FABRIC	65	$160.00	$10,400
601E32200	CY	ROCK CHANNEL PROTECTION, TYPE C WITH FILTER	119	$250.00	$29,750
611E71000	FT	CONDUIT, TYPE A, PRECAST REINFORCED CONCRETE ARCH SECTIONS	300	$3,600.00	$1,080,000
TOTAL					**$3,030,511**
TOTAL +20% Contingency					**$3,637,000**