



Appendix A: Future U.S. 401 Alignment Alternatives Scoring

Initial Screening

For Round 1 screening, future U.S. 401 alternatives were divided into three sections for the purpose of alignment evaluation.

- **Section A** goes from U.S. 401 to N.C. 42
- **Section B** goes from N.C. 42 to N.C. 55
- **Section C** goes from N.C. 55 to U.S. 401 with an optional extension to Piney-Grove Rawls Road depending on the alternative.

Three alternatives were created based on a specific set of parameters.

- **Suffix of 1** denotes that the alignment follows the same path as in the Triangle Regional Model.
- **Suffix of 2** denotes that the alignment is a slight variation of '1' minimizing the impact on land parcels by aligning it through parcel boundaries.
- **Suffix of 3** denotes that the alignment maximizes the use of existing roads.
- **Suffixes of 4, 5 and 6** follow newly created alignments minimizing the constraints mentioned previously.

Four key parameters were chosen to evaluate impacts for each alternative. Each parameter contains three or four factors which were calculated using GIS and other tools. These factors were developed in coordination with the CTT and were combined using different relative weights, developed by the SOT and CTT based on importance, to determine how each alternative alignment performs within each parameter. The four parameters and their factors are shown in the table below.

Parameter	Factor	Multiplier
Property Impact	Number of Parcels with Full Residential Take	6x
	Number of Parcels with Partial Residential take	2x
	Number of Parcels with Full Non-residential take	3x
	Number of Parcels with Partial Non-residential take	1x
Agricultural Impact	Total Acres under Agriculture	1x
	Number of VADs bisected by the alignment alternative	20x
	Number of VADs marginally impacted by the alternative	4x
Environmental Impact	Number of Schools, Worship Houses, Cemeteries, and Historic Buildings	10x
	Acres of Floodplains	1x
	Acres of Wetlands	1x
Project Cost	Length of Ground Segment in miles	2x
	Length of Bridge Segment in miles	24x
	ROW acquisition cost (in Million \$)	1x

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The following graphic shows the results of the scoring of Round 1 alternatives and segments.

Impacts	Residential		Non-resi (incl Ag)		ROW impact score	Agriculture takes		VAD		Agricultural impact score	Historic/ Schools/ Cemetery/ Worship		Impacts to Environment		Environmental Impact Score	Project Cost			Project Cost Score
	Full	Partial	Full	Partial		Total Acres under agriculture	# Bisect through	# Skirt by	# of each along the alignment		Acres of floodplain (divide buffer acres by 2)	Acres of Wetland	Length of ground segment	Length of bridge segment (over floodplains only)		ROW cost (Million \$)			
Coefficient	6	2	3	1		1	20	4		10	1	1		2	24	1			
Section A																			
A1	7	7	10	23	109	41	1	1	65.2	1	4.92	3.9	18.8	3.67	0.65	4.5	27.5		
A2	2	5	9	25	74	38	0	2	46.5	0	1.41	3.27	4.7	3.35	0.17	3.8	14.5		
A3	2	3	2	11	35	16	0	0	16.1	1	1.08	1.2	12.3	2.47	0.2	1.2	10.9		
A4	1	1	3	11	28	50	0	2	57.8	1	5.15	3.34	18.5	3.06	0.67	6.2	28.4		
A5	24	18	5	14	209	26	0	1	30.1	1	4.27	5.02	19.3	3.4	0.57	10.9	31.3		
Section B																			
B1	5	15	4	29	101	27	7	1	171.3	0	2.14	3.1	5.2	4.13	0.24	3.3	17.4		
B2	22	14	11	27	220	5	0	5	25.4	0	0.86	3	3.9	4.29	0.11	6.9	18.1		
B3	15	54	12	54	288	26	1	9	81.8	5	0.67	2.04	52.7	5.57	0.08	5.4	18.5		
B4	7	25	12	39	167	52	0	3	64.0	0	1.79	6.96	18.8	5.94	0.23	7.9	25.3		
B5	21	32	9	39	256	22	0	5	42.0	0	1.33	4.46	5.8	5.17	0.18	7.7	22.4		
B6	7	12	7	34	121	59	0	3	70.5	1	1.33	7.6	18.9	5.95	0.17	7.3	23.3		
Section C																			
C1	3	3	3	30	63	42	0	0	41.8	0	0.91	3.69	4.6	5	0.13	3	16.2		
C2	4	13	3	20	79	45	0	1	49.5	0	1.68	2.4	4.33	0.09	2	2	12.5		
C3	17	39	6	34	232	15	0	7	43.0	3	1.31	1.77	33.1	4.69	0.17	3	16.5		
C4	24	10	15	30	239	29	0	1	33.4	2	1.33	3.17	24.5	5.59	0.14	5	19.8		
C5	23	23	5	23	222	35	0	0	34.5	4	1.22	2.25	43.5	4.89	0.16	4	17.9		
C6	4	16	3	29	94	14	0	0	14.2	0	1.16	3.39	4.6	4.8	0.14	2	15.0		
Section D																			
D1	85	50	45	141	886	45	0	5	65.1	1	3.81	7.43	21.2	10.7	0.3	14.0	42.6		
D2	41	17	15	109	434	75	0	5	94.8	0	3.81	9.78	13.6	11.2	0.3	7.0	36.6		
D3	80	46	43	132	833	44	0	6	68.4	3	4.00	7.34	41.3	10.6	0.32	13.8	42.7		
D4	35	22	17	109	414	105	0	6	128.7	0	3.81	9.94	13.8	11.2	0.3	7.0	36.6		

Secondary Screening

This graphic indicates the results of various parameter scoring based on the alternatives advanced as a result of the CAMPO Board Resolution in March 2022.

Impacts	Residential		Non-resi (incl Ag)		ROW impact score	Agriculture takes		VAD		Agricultural impact	Historic/ Schools/ Cemetery		Impacts to Environment		Environmental Impact	Project Cost			Project Cost Score
	Full	Partial	Full	Partial		Total Acres under agricul	# Bisect through	# Skirt by	# of each along the alignment		Acres of floodplain	Acres of Wetland	Length of ground segme	Length of bridge segme		ROW cost (Million \$)			
X	X at 45 mph	12	17	16	64	218	137	2	6	201	2	6.8	14.0	41	12.8	1	17.53	67	
Z	Z at 45 mph (minus NC 210)	25	31	24	57	341	56	0	7	84	0	2.5	7.06	10	7.5	0.4	12.76	37	
XZ	X1 X2 Z3	13	45	12	30	234	96	2	6	160	0	6.4	10.09	17	7.7	0.7	14.52	47	
Wm	US 401 MTP	1	109	6	138	380	3	0	0	2.91	11	5	1	115.97	11	1	6	41.4	
Wp	US 401 Proj	59	70	42	117	737	8	0	0	8.46	11	7	3	119.49	11	2	27	95.9	
W	US 401 Delta	58	-39	36	-21	357	6	0	0	6	0	2	1	4	0	1.40	20.86	54.5	
X	X at 45 mph	0.2	0.2	0.4	0.5	0.30	1.0	1.0	0.9	1.00	0.2	1.0	1.0	0.34	1.0	0.5	0.7	0.70	
Z	Z at 45 mph (minus NC 210)	0.4	0.3	0.6	0.4	0.46	0.4	0.0	1.0	0.42	0.0	0.4	0.5	0.08	0.6	0.2	0.5	0.39	
XZ	X1 X2 Z3	0.2	0.4	0.3	0.2	0.32	0.7	1.0	0.9	0.80	0.0	0.9	0.7	0.14	0.6	0.4	0.5	0.49	
Wm	US 401 MTP	0.0	1.0	0.1	1.0	0.52	0.0	0.0	0.0	0.01	1.0	0.7	0.1	0.97	0.8	0.3	0.2	0.43	
Wp	US 401 Proj	1.0	0.6	1.0	0.8	1.00	0.1	0.0	0.0	0.04	1.0	1.0	0.2	1.00	0.8	1.0	1.0	1.00	
W	US 401 Delta	1.0	-0.4	0.9	-0.2	0.48	0.0	0.0	0.0	0.03	0.0	0.3	0.1	0.03	0.0	0.7	0.8	0.57	
PE Coefficients						367				539				270				100	
X	X at 45 mph					109				539				92				70	
Z	Z at 45 mph (minus NC 210)					170				225				22				39	
Wm	US 401 MTP					189				8				262				43	
Wp	US 401 Proj					367				23				270				100	
W	US 401 Delta					178				15				8				57	
CTP Coefficients						1				0.83				1.18				1.266	
X	X at 45 mph					0.30				0.83				0.40				0.89	
Z	Z at 45 mph (minus NC 210)					0.46				0.35				0.09				0.49	
Wm	US 401 MTP					0.52				0.01				1.15				0.55	
Wp	US 401 Proj					1.00				0.03				1.18				1.27	
W	US 401 Delta					0.48				0.02				0.03				0.72	

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This graphic represents additional analysis for the alternatives advanced as a result of the CAMPO Board Resolution in 2022.

Category	Metric	Wm	Wp	W	X	Z	X+Z
Amount of traffic served by the alternative	Daily Traffic Volume (VMT/miles)	33,517	35,209	1,692	6,611	16,043	6,906
		95%	100%	5%	19%	46%	20%
Travel reliability during peak hours	Peak Delay per vehicle	3.93	4.32	(0.39)	0.82	0.99	0.18
		91%	100%	-9%	19%	23%	4%
Ability to provide multimodal connectivity to existing and proposed development	Parcels within Quarter Mile Radius	2,185	2,185	-	1,114	1,033	1,014
		100%	100%	0%	51%	47%	46%
Ability to provide access to adjacent properties	Maximum number of potential driveways	290	174	-	428	286	300
		68%	41%	0%	100%	67%	70%
Total properties impacted	Total parcels impacted by ROW takes	251	288	37	109	137	100
		87%	100%	13%	38%	48%	35%
Number of Commercial/Industrial Properties impacted	Commercial/Industrial parcels in FLU	137	152	15	13	38	8
		90%	100%	10%	9%	25%	5%
Number of Residential Properties Impacted	Residential (non-rural residential) parcels in FLU	84	102	18	59	77	58
		82%	100%	18%	58%	75%	57%
Number of Agricultural / Rural Residential Properties impacted	R-10 parcels in FLU	-	-	-	21	15	25
		0%	0%	0%	84%	60%	100%
Number of Buildings impacted	Number of primary structures within 100' of the corridor edge	188	228	40	68	105	71
		82%	100%	18%	30%	46%	31%
Impacts to properties identified for economic development	Acres under Highway Corridor Overlay in FLU	146	222	76	17	6	4
		66%	100%	34%	8%	3%	2%
Cost of Construction	Normalized scores of (ROW cost x 1) + (Length of bridge segment X 24) + (Length of ground segment x 2)	41	96	55	67	37	54
		43%	100%	57%	70%	39%	56%