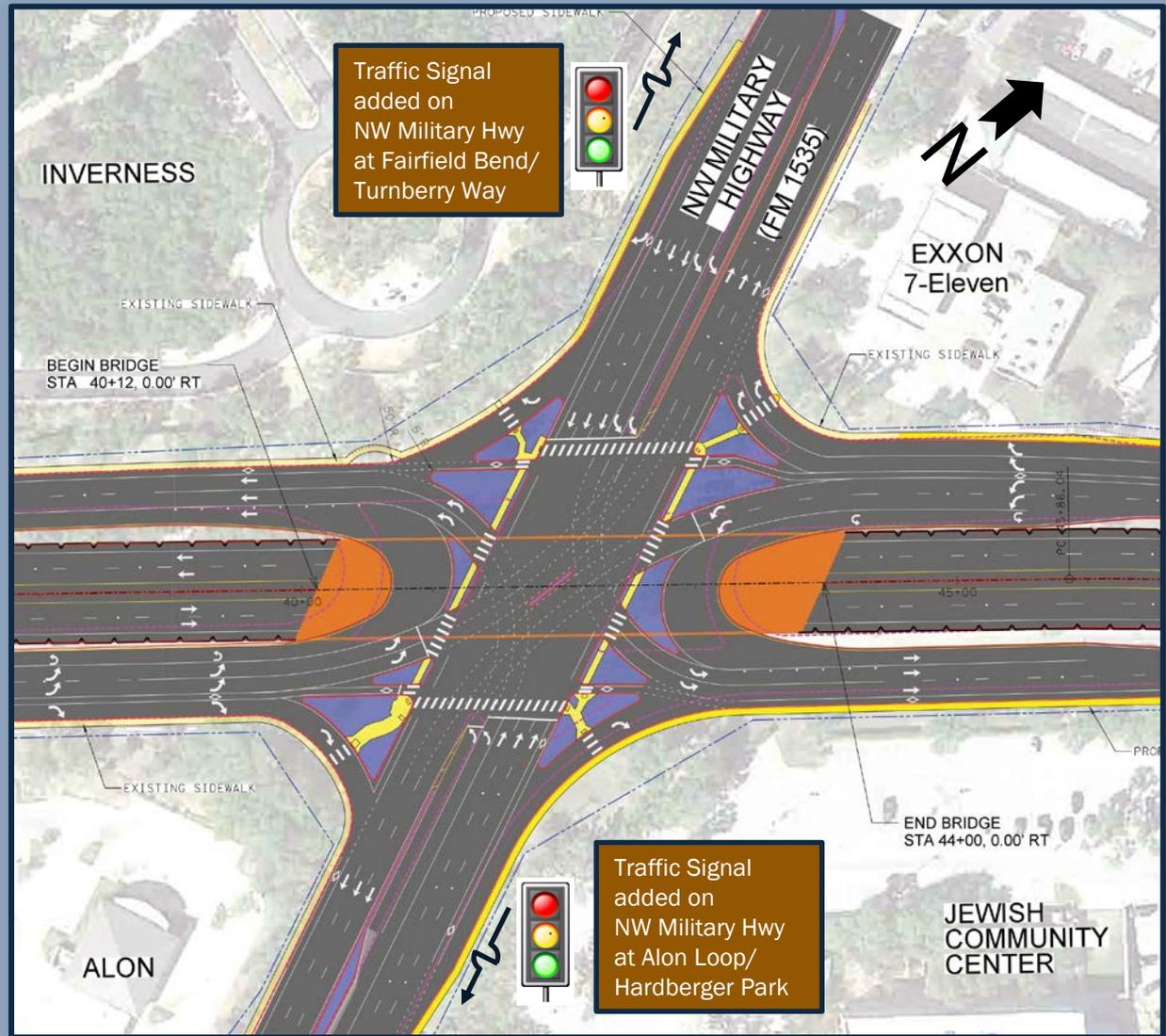


# ① Single Point Urban Interchange (SPUI) with Signals

- ❑ Allows for concurrent left turns on Wurzbach Parkway and on NW Military
- ❑ Large turning radii for left and right turns
- ❑ 3-phase signal operation
- ❑ Includes signals at Turnberry Way/ Fairfield Bend and Alon Loop/ Hardberger Park
- ❑ Cost: \$29 M

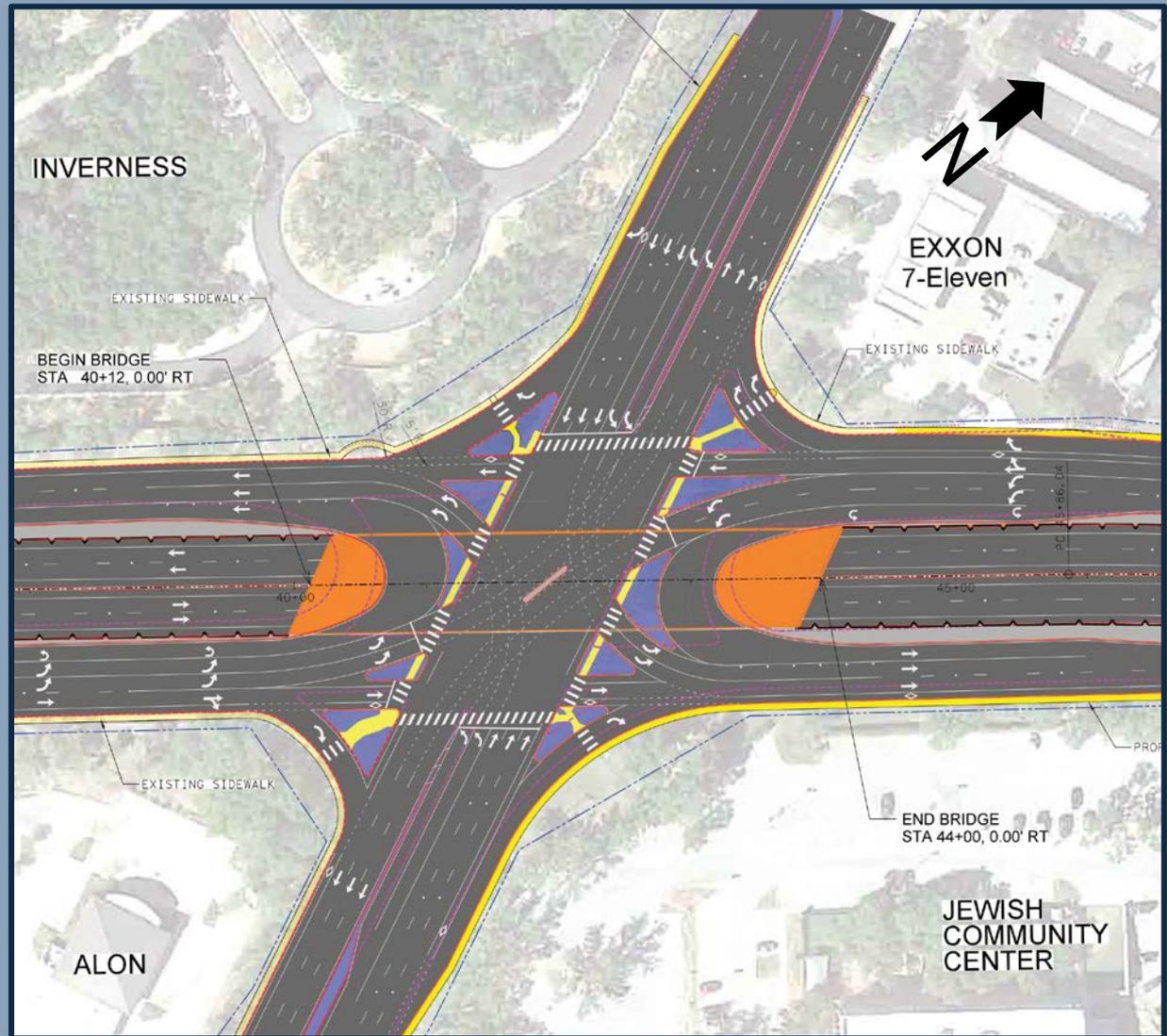


# ① Single Point Urban Interchange (SPUI) with Signals

PROS	CONS
More efficient than all other design options – 3 phase operation	Excludes through movements for Wurzbach Parkway at grade
Larger turning radii increases efficiency; similar to through lane capacity	Less intuitive for drivers
	Tree removal
	High construction costs
	Construction impacts

## ② SPUI with Frontage Roads

- ❑ Like a SPUI but with Frontage Roads included
- ❑ 4-phase signal operation
- ❑ Does not include signals at Turnberry Way/Fairfield Bend and Alon Loop/Hardberger Park
- ❑ Cost: \$28.5M



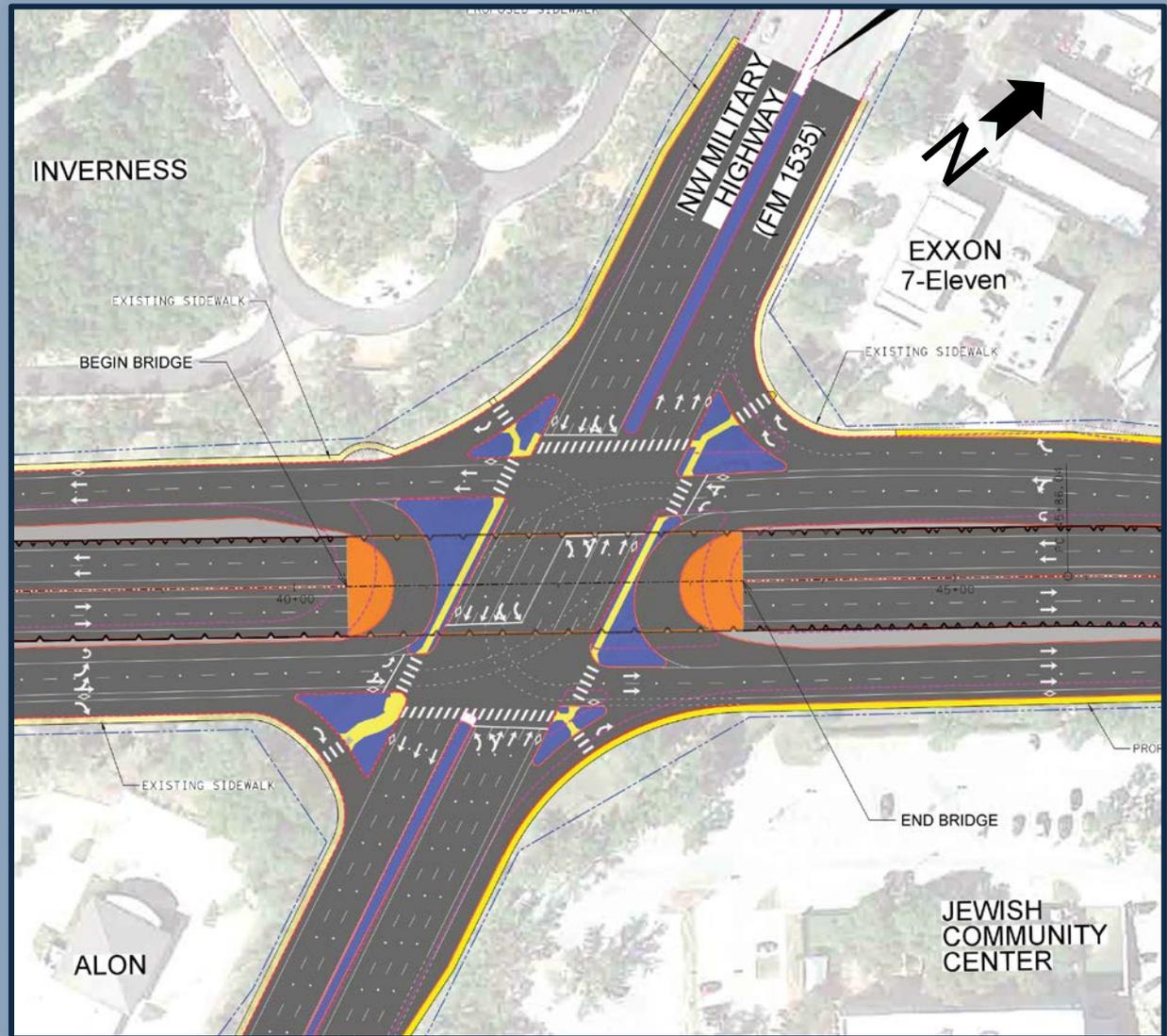
## ② SPUI with Frontage Roads

PROS	CONS
More efficient than all other options except the SPUI with Signals	Less intuitive for drivers
Maintains large turning radii and concurrent left turns which improves capacity and throughput	Tree removal
Maintains adjacent property access	High construction cost
	Construction impacts

## 3

# Diamond Interchange

- ❑ Traditional interchange design
- ❑ Underpass for Wurzbach Parkway through traffic
- ❑ Frontage Roads for Wurzbach included
- ❑ 4-phase signal operation
- ❑ Cost: \$27M



### 3 Diamond Interchange

PROS	CONS
Driver familiarity	Less effective than SPUI options for throughput and reducing delay
Maintains adjacent property access	Tree removal
	High construction costs
	Construction impacts

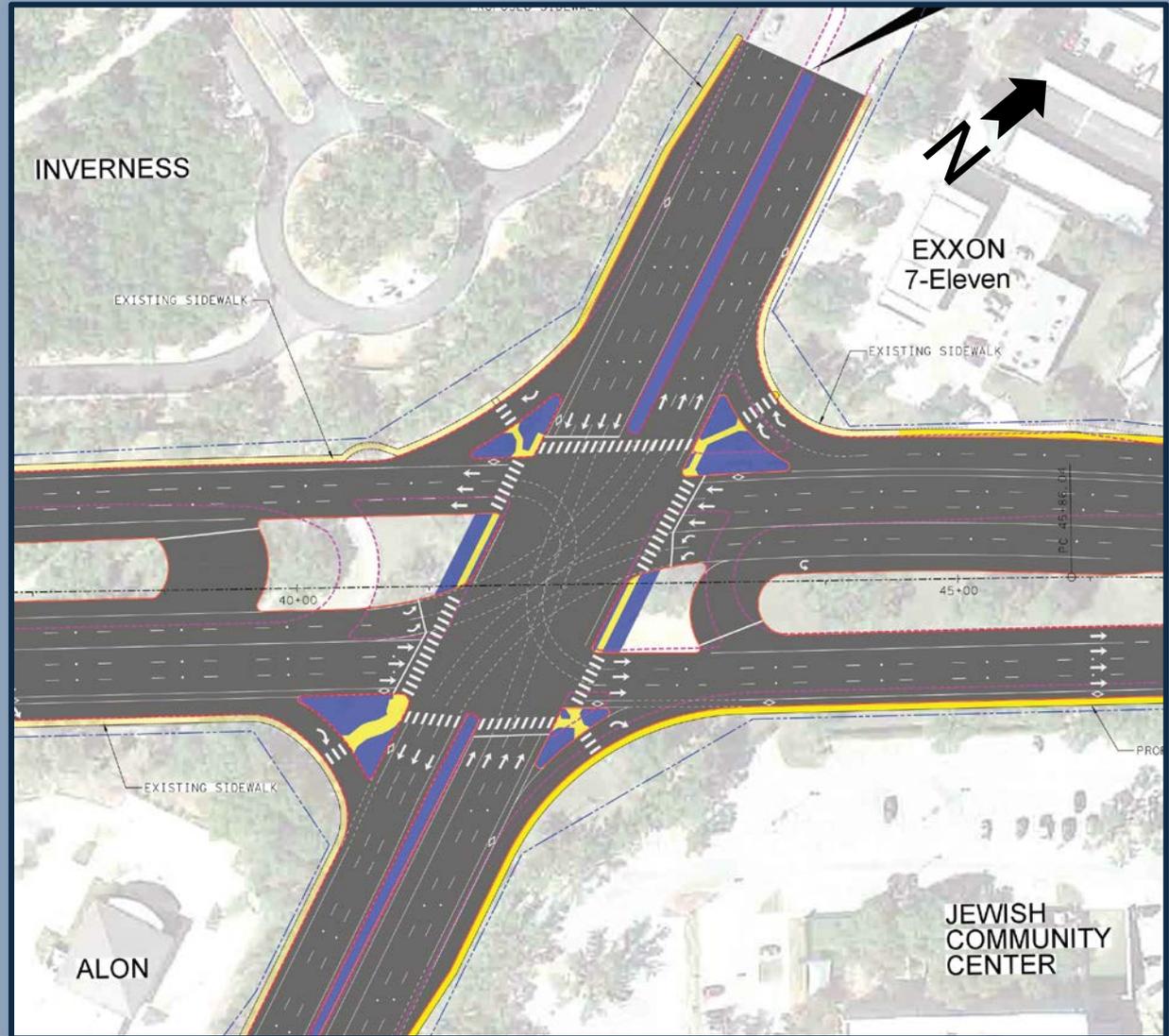


PROS	CONS
Doesn't increase WB congestion downstream at Lockhill-Selma	Very inefficient due to imbalanced signal operation
Maintains adjacent property access	Tree removal
Lower construction cost than other grade separated options	Cost is high relative to capacity benefit
	Construction impacts

## 5

## At-Grade Improvements

- ❑ No underpass; all movements at-grade
- ❑ Adds lanes on Wurzbach Parkway
- ❑ Adds lanes on NW Military Highway
- ❑ 4-phase signal operation
- ❑ Cost: \$7.5M



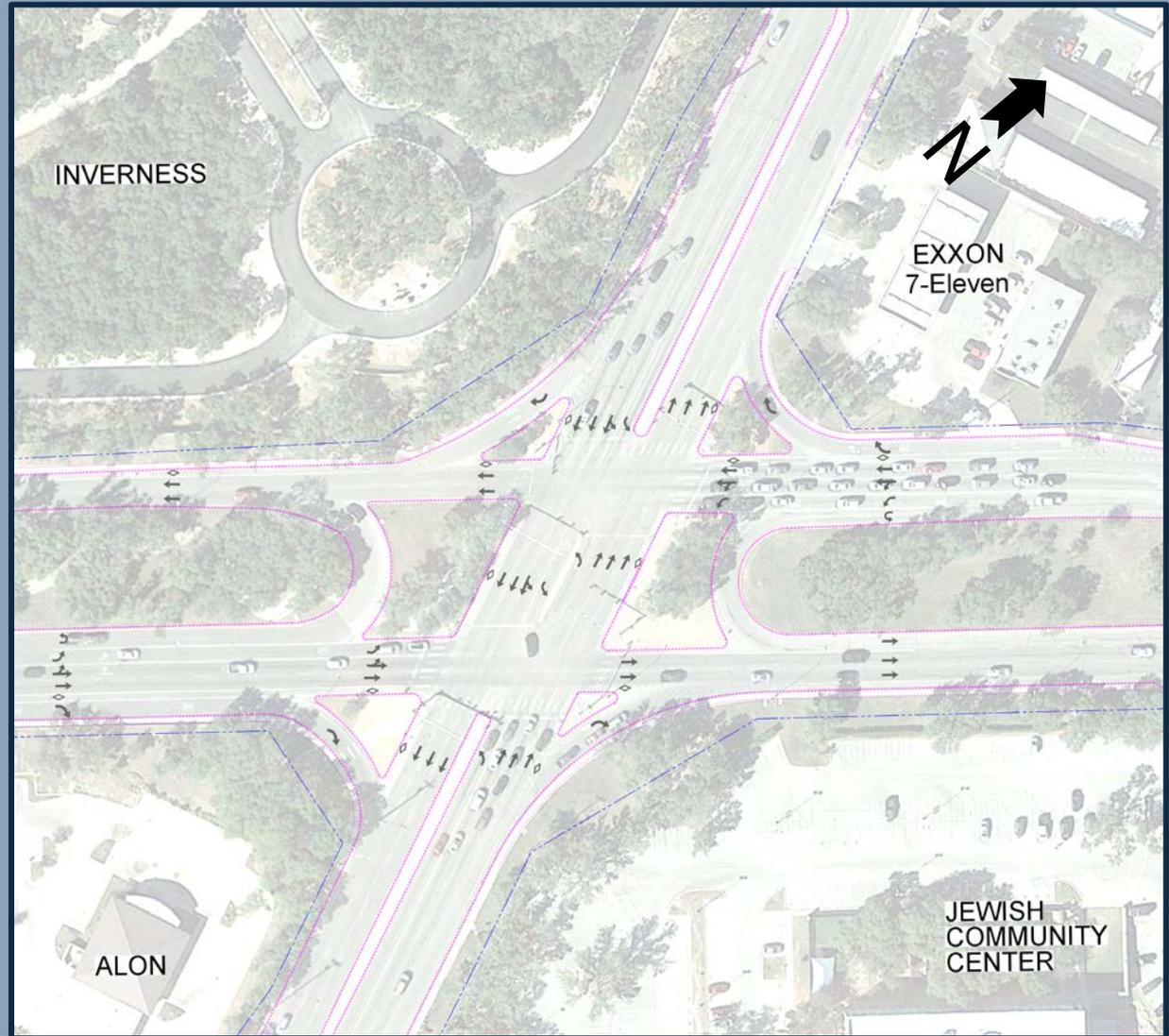
5

# At-Grade Improvements

PROS	CONS
Low construction impacts	Most inefficient operation of all options
Retains some tree canopy	Does not allow for concurrent left turn movements
Maintains property access	Least effective for adding capacity and reducing delay and congestion
Lower construction costs	All movements controlled by signal

# 6 No-Build

- ❑ Keep current intersection configuration
- ❑ No physical improvements
- ❑ Cost: \$5,000



PROS	CONS
Retains median and trees	Traffic congestion not improved
Little to no cost for signal timing	Does nothing to address future growth/increase in traffic
No construction impacts	
Access is not affected	



# Wurzbach Parkway @ NW Military: Performance Measures by Proposed Alternative

# 2017

## Average Delay Experienced by Drivers (in seconds per vehicle)

Options/ Metric	Grade Separated				At-Grade	
	1	2	3	4	5	6
	SPUI With Signals	Modified SPUI	Diamond	Partial Grade- Separation	At-Grade Imp's	Existing
	AM Peak Hour					
Total Interchange Delay	25.6	37.1	46.8	55.3	54.4	182.1
WB Thru Delay	Free Flow	69.8	49.1	74.7	81.9	159.6
EB Thru Delay	Free Flow	36.5	55.7	Free Flow	61.9	187.2
NB NWM Delay	33.4	52.4	44.5	56.1	62.9	138.5
SB NWM Delay	10.0	34.2	44.3	52.8	49.0	59.8
	PM Peak Hour					
Total Interchange Delay	29.1	38.9	81.7	68.7	83.0	311.7
WB Thru Delay	Free Flow	110.0	47.1	117.8	90.6	157.8
EB Thru Delay	Free Flow	43.4	57.6	Free Flow	60.4	358.1
NB NWM Delay	28.5	49.3	50.9	80.0	78.0	477.1
SB NWM Delay	9.3	26.9	42.3	39.7	49.6	51.1

## Level of Service for Each Option

Options/ Metric	Grade Separated				At-Grade	
	1	2	3	4	5	6
	SPUI	Modified SPUI	Diamond	Partial Grade- Separation	At-Grade Imp's	Existing
	AM Peak Hour					
Total Interchange Delay	C	D	D	E	D	F
WB Thru Delay	Free Flow	E	D	E	F	F
EB Thru Delay	Free Flow	D	E	Free Flow	E	F
NB NWM Delay	C	D	D	D	E	F
SB NWM Delay	B	C	D	D	D	E
	PM Peak Hour					
Total Interchange Delay	C	D	F	E	F	F+
WB Thru Delay	Free Flow	F	D	F	F	F
EB Thru Delay	Free Flow	D	E	Free Flow	E	F+
NB NWM Delay	C	D	D	E	E	F+
SB NWM Delay	A	C	D	D	D	D

# Wurzbach Parkway @ NW Military: Performance Measures by Proposed Alternative

# 2030

## Average Delay Experienced by Drivers (in seconds per vehicle)

Options/ Metric	Grade Separated				At-Grade	
	1	2	3	4	5	6
	SPUI With Signals	Modified SPUI	Diamond	Partial Grade- Separation	At-Grade Imp's	No Build
	AM Peak Hour					
Total Interchange Delay	30.5	48.8	97.5	116.7	106.2	353.1
WB Thru Delay	Free Flow	27.3	60.0	135.1	117.3	338.4
EB Thru Delay	Free Flow	42.5	56.7	Free Flow	83.1	360.1
NB NWM Delay	41.2	67.8	47.3	99.0	97.7	307.8
SB NWM Delay	13.5	40.6	58.1	61.6	94.0	174.6
	PM Peak Hour					
Total Interchange Delay	36.9	74.6	144.6	143.1	170.0	533.1
WB Thru Delay	Free Flow	48.2	47.1	38.4	68.8	157.8
EB Thru Delay	Free Flow	51.1	61.8	Free Flow	60.2	596.1
NB NWM Delay	42.7	74.6	68.1	190.7	241.8	767.7
SB NWM Delay	10.5	31.2	49.5	61.6	170.6	197.3

## Level of Service for Each Option

Options/ Metric	Grade Separated				At-Grade	
	1	2	3	4	5	6
	SPUI	Modified SPUI	Diamond	Partial Grade- Separation	At-Grade Imp's	No Build
	AM Peak Hour					
Total Interchange Delay	C	D	F	F	F	F+
WB Thru Delay	Free Flow	C	E	F	F	F+
EB Thru Delay	Free Flow	D	E	Free Flow	F	F+
NB NWM Delay	D	E	D	F	F	F+
SB NWM Delay	B	D	E	E	F	F
	PM Peak Hour					
Total Interchange Delay	C	E	F	F	F	F+
WB Thru Delay	Free Flow	D	D	D	E	F
EB Thru Delay	Free Flow	D	E	Free Flow	E	F+
NB NWM Delay	D	E	E	F	F+	F+
SB NWM Delay	B	C	D	E	F	F

# Wurzbach Parkway @ Lockhill-Selma: Performance Measures by Proposed Option @ NW Military

## 2017 Average Delay, LOS, and Queue Length for the WB Through Movement

NW Military Options/ Metric	Grade Separated				At-Grade	
	1	2	3	4	5	6
	SPUI With Signals	Modified SPUI	Diamond	Partial Grade- Separation	At-Grade Imp's	No Build
	AM Peak Hour					
Total Delay	38.0	40.6	37.9	46.9	34.8	42.4
LOS	D	D	D	D	C	D
WB Thru Queue Length (feet)	538			435		527
	PM Peak Hour					
Total Delay	50.2	53.1	49.2	51.7	53.5	97.3
LOS	D	D	D	D	D	F
WB Thru Queue Length (feet)	387			336		429

- The queue lengths were developed for the worst-case scenarios. For instance, the SPUI W/Signals option represents the worst-case for generating WB queue length of the 3 fully grade separated options, and the partial grade separation is expected to generate longer queue lengths compared with At-Grade Improvements Option.
- The westbound volumes are the peak direction during the AM peak hour.

## 2030 Average Delay, and LOS

NW Military Options/ Metric	Grade Separated				At-Grade	
	1	2	3	4	5	6
	SPUI With Signals	Modified SPUI	Diamond	Partial Grade- Separation	At-Grade Imp's	No Build
	AM Peak Hour					
Total Delay	57.6	56.6	56.8	57.4	56.7	145.5
LOS	E	E	E	E	E	F
	PM Peak Hour					
Total Delay	108.7	100.7	105.8	101.3	103.8	150.3
LOS	F	F	F	F	F	F

# Level-of-Service (LOS) at a Signalized Intersection

A	B	C	D	E	F
<ul style="list-style-type: none"><li>• No delay.</li><li>• Arrive at the signal on green.</li><li>• No waiting cars.</li><li>• Not commonly seen except in very low volume locations or only during off-peak conditions.</li></ul>	<ul style="list-style-type: none"><li>• Little or no delay.</li><li>• May arrive on green.</li><li>• May be a few cars waiting.</li><li>• This LOS is seen in less populated or rural areas.</li></ul>	<ul style="list-style-type: none"><li>• Some delay.</li><li>• Some congestion.</li><li>• Most cars make it through the signal when it turns green.</li><li>• Desirable LOS in urban and suburban areas.</li></ul>	<ul style="list-style-type: none"><li>• Noticeable delay.</li><li>• May wait for more than one cycle.</li><li>• Not all cars make it through when signal turns green</li><li>• Considered a good LOS at intersections in metropolitan suburban and urban areas.</li></ul>	<ul style="list-style-type: none"><li>• Congested conditions.</li><li>• Will wait for more than one cycle.</li><li>• Many cars do not make it through signal.</li><li>• Congestion is becoming more than typically considered acceptable.</li></ul>	<ul style="list-style-type: none"><li>• Very congested</li><li>• May wait for two or more cycles.</li><li>• Many cars do not make it through signal.</li><li>• Indicates intersection is over capacity and cannot handle volumes.</li></ul>