



APPENDIX A

SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA

**APPENDIX A - SUMMARY OF AASHTO CONTROLLING DESIGN CRITERIA
MAIN LINE SUMMARY (DIVIDED)**

PROJECT NUMBER:	M697801X	ROUTE: SR 303L
PROJECT LOCATION:	SR 303L, Lake Pleasant Parkway to I-17 DCR Update (3 GPL's)	BEGINNING MP: 131.90
HIGHWAY SECTION:	SR 303L, Lake Pleasant Parkway to I-17	ENDING MP: 138.64
FUNCTIONAL CLASSIFICATION:	Urban Freeway	

I. TRAFFIC VOLUMES AND FACTORS

Milepost Limits	Latest 2019 AADT	Design Year 2040 AADT	Traffic Factors:			
			2019 Factors		2040 Factors	
Milepost 131.90 to 138.64	26,433	92,300	K % =	13	K % =	13
			D % =	70	D % =	70
			T % =	9.9	T % =	11

II. DESIGN SPEED:

Posted Speed (SR 303L Mainline): 65 mph	AASHTO Design Speed: 50 mph minimum	Average Elevation Is: 1520'	Terrain is: Level
Design Speed (SR 303L Mainline): 65 mph			
New Posted Speed (Frontage Rd): 45 mph	AASHTO Design Speed: 40 mph (urban collector)		
Design Speed (Frontage Rd): 45 mph			
Design Speed (67th Avenue Ramps): 55 mph	AASHTO Design Speed: 35 mph (for 50 mph mainline) (mid-range)		
Design Speed (51st Avenue Ramps): 55 mph			
Design Speed (43rd Avenue Ramps): 50 mph			

III. LANE AND SHOULDER WIDTHS

	EXISTING (Feet)	AASHTO RECOMMENDED MINIMUM (Feet)
LANE WIDTH (ALL):	12'	12'
INSIDE SHOULDER WIDTH (MAINLINE):	12'	4' paved
OUTSIDE SHOULDER WIDTH (MAINLINE):	10'	10'
INSIDE SHOULDER WIDTH (FRONTAGE RD):	2'	*
OUTSIDE SHOULDER WIDTH (FRONTAGE RD):	4'	*
2 LANES+SHOULDERS (FRONTAGE RD):	30'	* 28' combined traveled way and shoulder for two lanes of traffic
INSIDE SHOULDER WIDTH (RAMPS):	2'	**
OUTSIDE SHOULDER WIDTH (RAMPS):	2'	**
2 LANES+SHOULDERS (RAMPS):	28'	** 28' combined traveled way and shoulder for two lanes of traffic

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IV. GRADES

Existing Maximum Grade (SR 303L mainline):	2.7400%	AASHTO Maximum Allowable Grade is: 3% (for 65 mph posted speed)
Existing Maximum Grade (Frontage Rd):	2.6700%	AASHTO Maximum Allowable Grade is: 6% (for 55 mph posted speed)
Existing Maximum Grade (Ramps):	2.9770%	AASHTO Maximum Allowable Grade is: 3% upgrade, 5% downgrade (for 55 mph posted)

V. CROSS SLOPE

Normal Cross Slope (ALL):	2.00%	AASHTO Allowable Range is: 1.5% to 2%
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VI. VERTICAL CLEARANCE

Structure	Milepost	Posted Clearance (ft)	AASHTO Minimum Allowable Clearance (ft)
Lake Pleasant TI UP	131.74	17.67	16.00
Sonoran Desert Dr. TI OP NB	221.94	16.46	14.00
Sonoran Desert Dr. TI OP SB	221.94	15.89	14.00
Dove Valley TI UP	222.97	17.77	16.00

VII. STRUCTURES

Structure	Sta.	Milepost	Existing	Existing	Recommended	Bridge Barrier	Bridge Barrier	Existing	Recommended
			Bridge	Bridge	Bridge	Geometry	Structural	Inventory Rating Structural Capacity	Inventory Rating Structural Capacity
		MP	Length	Width	Width	Adequate	Adequate	(Ton)	(Ton)
Lake Pleasant TI		131.74	325	134	134	1	1	44	36
CAP Siphon NB		132.73	444	70	70	1	1	36	36
CAP Siphon SB		132.73	444	82	82	1	1	36	36
New River NB		133.31	893	58	58	1	1	58	36
New River SB		133.31	890	58	58	1	1	58	36
Channel N1 NB		134.03	78	70	70	1	1	54	36
Channel N1 SB		134.03	78	77	77	1	1	54	36
Deadman Wash NB		135.18	394	70	70	1	1	39	36
Deadman Wash SB		135.18	393	70	70	1	1	39	36
Channel N3 NB		137.14	76	70	70	1	1	53	36
Channel N3 SB		137.14	76	73	73	1	1	53	36
RCBC #3		137.48	83	143	143	1	1	-	-
303L SB over Ramp EN		138.93	112	30	30	1	1	47	36
Sonoran Desert Dr. TI NB		221.94	201	106.9	107	1	1	52	36
Sonoran Desert Dr. TI SB		221.94	201	86	86	1	1	43	36
I-17 SB FR over Ramp EN		222.06	107	44.6	44	1	1	61	36
I-17 SB over Ramp EN		222.07	332	86	86	1	1	64	36
I-17 NB over Ramp EN		222.11	380	86	86	1	1	53	36
Dove Valley Rd SB on Ramp		222.80	355	32	32	1	1	42	36
Dove Valley TI UP		222.97	289	130	130	1	1	40	36

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VIII. VERTICAL ALIGNMENT AND STOPPING SIGHT DISTANCE:

See Attachment No. 1

IX. HORIZONTAL ALIGNMENT, SUPERELEVATION, AND STOPPING SIGHT DISTANCE:

See Attachment No. 2.

X. REMARKS:

Design exceptions are anticipated for the following existing facilities which remain:

- 1) Adverse cross slope of 3% for 67th Avenue Ramp C.
 - 2) Adverse cross slope of 3% for 51st Avenue Ramp D.
 - 3) Superelevation rate for 51st Avenue Ramp D compound curve.
 - 4) Shoulder width for 67th Avenue Ramp C.
 - 5) Superelevation rates for the 303L northbound and southbound frontage roads which do not meet method 5 for the new proposed frontage road speed.
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ATTACHMENT 1 - VERTICAL CURVE INVENTORY

Project Name: SR 303L, Lake Pleasant Parkway to I-17 DCR Update (3 GPL's)
Project Number: M698701X
Roadway Type: Urban Freeway

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
SR 303L mainline											
NB 838+50 RD			1w	1.0000	-0.9780	2000	Crest	1477	655	+100	65
NB 860+00 RD			1w	-0.9780	1.6500	1000	Sag	1724	655	+100	65
NB 877+00 RD			1w	1.6500	-1.0300	1200	Crest	983	656	83	65
NB 1899+65 RD			1w	-1.0300	1.2600	1400	Sag	3339	656	+100	65
NB 1941+00 Orig DCR			1w	1.2600	-1.6600	800	Crest	769	664	71	65
NB 1956+00 RD			1w	-1.6600	2.4400	1000	Sag	956	664	81	65
NB 1972+00 RD			1w	2.4400	-0.9700	1200	Crest	871	655	77	65
NB 1993+75 RD			1w	-0.9700	0.5000	1000	Sag	+9999	655	+100	65
NB 2031+50 PA			1w	0.5000	2.7317	800	Sag	2268	638	+100	65
NB 2041+75 PA			1w	2.7317	-1.8463	1000	Crest	687	666	66	65
NB 2056+00 PA			1w	-1.8463	1.4781	800	Sag	972	666	81	65
NB 2065+60 PA			1w	1.4781	-1.6600	800	Crest	742	664	70	65
NB 2075+94.91 RD			1w	-1.6600	0.6000	800	Sag	2165	664	+100	65
NB 2098+00 PA			1w	0.6000	2.7400	900	Sag	2982	637	+100	65
NB 2107+75 PA			1w	2.7400	-0.7237	900	Crest	749	652	71	65
NB 2128+73.12 DCR			1w	-0.7237	0.5000	800	Sag	+9999	652	+100	65
SB 1838+50 RD			1a	1.0000	-0.9000	2000	Crest	1507	656	+100	65
SB 1861+23.57 RD			1a	-0.9000	1.6800	1000	Sag	1795	664	+100	65
SB 1877+00 RD			1a	1.6800	-1.0300	1200	Crest	978	664	82	65
SB 1899+65 RD			1a	-1.0300	1.2600	1400	Sag	3339	659	+100	65
SB 1941+73.46 Orig DCR			1a	1.2600	-1.6600	800	Crest	769	659	71	65
SB 1956+00 RD			1a	-1.6600	2.4000	1000	Sag	964	674	81	65
SB 1972+00 RD			1a	2.4000	-0.9700	1200	Crest	877	674	76	65
SB 1995+20.92 RD			1a	-0.9700	0.5000	1000	Sag	+9999	650	+100	65

Notes: Traffic Direction:
 1w = One Way Traffic in Station direction
 1a = One Way Traffic against Station direction
 2 = Two Way Traffic

Grades are with respect to Station direction.
 * Indicates design exception required.
 GB indicates grade break. Stopping Sight Distance and Speed not calculated.
 Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

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	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
SB 2031+50 PA			1a	0.5000	2.7317	800	Sag	2268	678	+100	65
SB 2041+75 PA			1a	2.7317	-1.8463	1000	Crest	687	678	65	65
SB 2056+60 PA			1a	-1.8463	1.4609	800	Sag	978	662	82	65
SB 2065+60 PA			1a	1.4609	-1.6600	800	Crest	744	662	70	65
SB 2075+00 RD			1a	-1.6600	0.6000	800	Sag	2165	651	+100	65
SB 2098+00 PA			1a	0.6000	2.7400	900	Sag	2982	678	+100	65
SB 2107+75			1a	2.7400	-0.7237	900	Crest	749	678	69	65
SB 2128+73.12 DCR			1a	-0.7237	0.5000	800	Sag	+9999	650	+100	65
43rd Avenue											
40+35 PA			2	0.4455	2.4048	200	Sag	1892	374	+100	45
44+50 PA			2	2.4048	-1.2800	230	Crest	408	374	48	45
Frontage Roads											
NB FR 11+85 PA			1w	-1.4637	0.6000	200	Sag	1295	368	97	45
NB FR 16+00 RD			1w	0.6000	2.4000	400	Sag	11200	356	+100	45
NB FR 20+50 RD			1w	2.4000	0.3016	400	Crest	714	358	69	45
NB FR 58+00 RD			1w	0.3016	-1.8100	800	Crest	911	370	78	45
NB FR 64+00 RD			1w	-1.8100	0.9967	400	Sag	720	370	68	45
NB FR 73+00 RD			1w	0.9967	0.7310	400	Crest	4261	355	+100	45
SB FR 114+50 PA			1a	-1.5992	2.6700	600	Sag	588	376	60	45
SB FR 120+50 PA			1a	2.6700	-0.6118	400	Crest	529	376	56	45
SB FR 29+00 RD			1a	-0.6118	0.6000	400	Sag	+9999	363	+100	45
SB FR 53+50 RD			1a	0.6000	-0.9909	600	Crest	978	363	83	45
SB FR 64+50 RD			1a	-0.9909	2.1467	400	Sag	596	372	61	45
SB FR 69+00 RD			1a	2.1467	-0.7302	500	Crest	625	372	62	45

Notes:
Traffic Direction:
1w = One Way Traffic in Station direction
1a = One Way Traffic against Station direction
2 = Two Way Traffic

Grades are with respect to Station direction.
* Indicates design exception required.
GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 1 - VERTICAL CURVE INVENTORY

Project Name: SR 303L, Lake Pleasant Parkway to I-17 DCR Update (3 GPL's)
Project Number: M698701X
Roadway Type: Urban Freeway

VPI STATION	MILEPOST		TRAFFIC DIRECTION (1w, 1a or 2)	GRADE IN (%)	GRADE OUT (%)	CURVE LENGTH (ft)	CURVE TYPE	STOPPING SIGHT DISTANCE		SPEED	
	BEGIN	END						AVAILABLE (ft)	AASHTO MINIMUM (ft)	AVAILABLE (mph)	DESIGN (mph)
67th Ramp A 19+00 RD			1a	0.9958	-2.3329	600	Crest	624	501	63	55
67th Ramp A 26+00 RD			1a	-2.3329	1.0781	400	Sag	531	431	57	50
67th Ramp C 15+00 RD			1a	-0.8942	1.4840	600	Sag	1454	251	+100	35
67th Ramp C 25+00 RD			1a	1.4840	1.4928	600	Sag	+9999	505	+100	55
67th Ramp B 23+50 RD			1w	0.9953	-2.1120	600	Crest	647	511	64	55
67th Ramp B 31+00 RD			1w	-2.1120	1.0648	350	Sag	530	254	56	35
67th Ramp D 15+00 RD			1w	-0.9029	0.9445	600	Sag	7744	430	+100	50
67th Ramp D 26+00 RD			1w	0.9445	2.0020	600	Sag	+9999	484	+100	55
51st Ramp A 107+55 PA			1a	0.9024	1.7450	400	Sag	+9999	507	+100	55
51st Ramp A 111+55 PA			1a	1.7450	-2.5281	400	Crest	453	436	51	50
51st Ramp A 116+00 PA			1a	-2.5281	1.6021	200	Sag	258	252	36	35
SB Access Rd 101+70 PA			1a	1.4013	0.4000	200	Crest	1178	251	92	35
SB Access Rd 112+00 PA			1a	-0.4743	0.4011	400	Sag	+9999	426	+100	50
51st Ramp C 214+00 PA			1a	0.4171	2.2050	400	Sag	14712	440	+100	50
51st Ramp C 19+66.15 RD			1a	2.2067	-0.9957	600	Crest	637	440	63	50
51st Ramp B 113+00 PA			1w	1.1996	-1.3418	400	Crest	625	504	63	55
51st Ramp B 118+50 PA			1w	-1.3418	1.5993	200	Sag	415	251	49	35
51st Ramp D 99+25 PA			1w	-1.3925	0.5408	200	Sag	2146	251	+100	35
51st Ramp D 102+25 PA			1w	0.5408	-0.6000	400	Crest	1146	428	91	50
51st Ramp D 112+43.69 PA			1w	-0.6000	2.9770	500	Sag	599	428	62	50
51st Ramp D 21+50 RD			1w	2.9770	-1.9994	625	Crest	521	510	56	55
43rd Ramp A 19+00 RD			1a	0.9958	-0.7567	600	Crest	916	430	79	50
43rd Ramp A 25+00 RD			1a	-0.7567	1.0634	400	Sag	8046	431	+100	50
43rd Ramp B 21+00 RD			1w	0.4965	-0.6817	600	Crest	1216	428	94	50
43rd Ramp B 27+00 PA			1w	-0.6817	1.3817	500	Sag	2284	428	+100	50

Notes:
Traffic Direction:
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GB indicates grade break. Stopping Sight Distance and Speed not calculated.
Calculations are based on AASHTO 2001 and ADOT 2004 Roadway Design Guidelines formulas with adjustments for effective grade.

ATTACHMENT 2 - HORIZONTAL ALIGNMENT

Project Name: SR 303L, Lake Pleasant Parkway to I-17 DCR Update (3 GPL's)
Project Number: M697801X
Roadway Type: Urban Freeway

Note: Stationing is based on ADOT Project H715701C

STOPPING SIGHT DISTANCE:

Curve # or location	PI Station	SDs (ft) (Posted Speed)	Dc	Radius (ft)	M required (ft)	M standard (ft) (face of curb or barrier)	Extra width from M standard	Comment
SR 303L 101 RD	1785+21.39	645	0.5000	11459.16	4.5	18.00	0.0	OK
SR 303L 104 RD	1858+79.01	645	1.5000	3819.72	13.6	18.00	0.0	OK
SR 303L NB 122 RD	858+06.14	645	1.5000	3819.72	13.6	18.00	0.0	OK
SR 303L 107 RD	1896+98.61	645	1.0000	5729.58	9.1	18.00	0.0	OK
SR 303L 110 RD	1963+37.78	645	1.0000	5729.58	9.1	18.00	0.0	OK
SR 303L 113 RD	2054+93.62	645	1.0000	5729.58	9.1	18.00	0.0	OK
NB FR 702 RD	24+59.33	360	0.2500	22918.31	0.7	8.00	0.0	OK
NB FR 705 RD	45+26.52	360	0.5000	11459.16	1.4	8.00	0.0	OK
NB FR 708 RD	61+23.57	360	2.5000	2291.83	7.1	8.00	0.0	OK 45 MPH, with new and existing barrier
NB FR 711 RD	69+81.17	360	3.0000	1909.86	8.5	10.00	0.0	OK 45 MPH, with existing barrier offset
SB FR 400 PA	118+91.42	360	0.5833	9822.13	1.6	10.00	0.0	OK
SB FR 719 RD	45+15.28	360	0.5000	11459.16	1.4	10.00	0.0	OK
SB FR 722 RD	62+07.90	360	3.0000	1909.86	8.5	10.00	0.0	OK 45 MPH w/ new barrier protecting ramp SW
SB FR 725 RD	70+26.03	360	3.0000	1909.86	8.5	10.00	0.0	OK 45 MPH w/ existing barrier
67th Ave Ramp A RD	15+00.96	495	0.8332	6876.49	4.5	8.00	0.0	OK
67th Ave Ramp A RD	23+49.21	495	1.7500	3274.04	9.4	8.00	2.0	OK, no barrier
67th Ave Ramp B RD	12+71.90	495	0.7167	7994.76	3.8	8.00	0.0	OK
67th Ave Ramp C RD	20+93.80	495	1.7500	3274.04	9.4	8.00	2.0	OK, no barrier
67th Ave Ramp D RD	27+91.58	495	1.5000	3819.72	8.0	15.00	0.0	OK, existing barrier for two lanes but now metered on ramp
51st Ave Ramp A PA	106+86.65	495	0.5833	9822.13	3.1	8.00	0.0	OK
51st Ave Ramp B PA	105+84.92	495	0.6667	8594.37	3.6	8.00	0.0	OK
51st Ave Ramp B PA	115+86.63	495	3.0000	1909.86	16.0	8.00	9.0	OK, no barrier
51st Ave Ramp C PA	205+73.31	495	1.4953	3831.72	8.0	8.00	0.0	OK
51st Ave Ramp C PA	222+41.48	495	1.0000	5729.58	5.3	8.00	0.0	OK
51st Ave Ramp D PA	110+03.91	495	1.3333	4297.18	7.1	8.00	0.0	OK
51st Ave Ramp D PA	117+62.85	495	2.0000	2864.79	10.7	8.00	3.0	OK, no barrier
51st Ave Ramp D RD	26+20.85	495	0.5000	11459.16	2.7	8.00	0.0	OK
43rd Ave Ramp A RD	13+50.61	495	0.8333	6875.49	4.5	10.00	0.0	OK
43rd Ave Ramp B RD	13+13.77	495	0.7167	7994.76	3.8	18.00	0.0	OK, exist barrier for two lane ramp now single lane ramp

SUPERELEVATION: Mainline

Curve # or location	PI Station	Design Speed	Dc	Radius (ft)	Existing e (%)	e (%) method 5	f required	f allowed	Method 2 speed	Comment
SR 303L 101 NB RD	1785+21.39	65	0.5000	11459.16	-2.00	NC	0.045	0.11	> 100 mph	OK
SR 303L 101 SB RD	1785+21.39	65	0.5000	11459.16	2.00	NC	0.005	0.11	> 100 mph	OK
SR 303L 104 RD	1858+79.01	65	1.5000	3819.72	4.10	4.10	0.033	0.11	93 mph	OK
SR 303L NB 122 RD	858+06.14	65	1.5000	3819.72	4.10	4.10	0.033	0.11	93 mph	OK
SR 303L 107 RD	1896+98.61	65	1.0000	5729.58	3.00	3.00	0.019	0.11	> 100 mph	OK
SR 303L 110 RD	1963+37.78	65	1.0000	5729.58	3.00	3.00	0.019	0.11	> 100 mph	OK
SR 303L 113 RD	2054+93.62	65	1.0000	5729.58	3.00	3.00	0.019	0.11	> 100 mph	OK

SUPERELEVATION: Frontage Rd, Ramps

Curve # or location	PI Station	Design Speed	Dc	Radius (ft)	Existing e (%)	e (%) method 5	f required	f allowed	Method 2 speed	Comment
NB FR 702 RD	24+59.33	45	0.2500	22918.31	2.00	2.00	-0.014	0.15	> 100 mph	OK
NB FR 705 RD	45+26.52	45	0.5000	11459.16	2.00	2.00	-0.008	0.15	> 100 mph	OK
NB FR 708 RD	61+23.57	45	2.5000	2291.83	4.00	3.50	0.019	0.15	81 mph	super is for 50 mph design speed, interim condition.
NB FR 711 RD	69+81.17	45	2.5000	2291.83	3.90	3.50	0.020	0.15	81 mph	super is for about 50 mph design speed, interim condition.
SB FR 400 PA	118+91.42	45	1.0000	5729.58	2.00	2.00	0.004	0.15	> 100 mph	OK
SB FR 719 RD	45+15.28	45	0.5000	11459.16	2.00	2.00	-0.008	0.15	> 100 mph	OK
SB FR 722 RD	62+07.90	45	3.0000	1909.86	3.90	3.90	0.032	0.15	74 mph	OK
SB FR 725 RD	70+26.03	35	3.0000	1909.86	2.90	2.80	0.014	0.18	77 mph	near intersection, lower design speed used
67th Ave Ramp A RD	15+00.96	55	0.8332	6876.49	2.00	2.00	0.009	0.13	> 100 mph	OK
67th Ave Ramp A RD	23+49.21	55	1.7500	3274.04	3.60	3.60	0.026	0.13	90 mph	OK
67th Ave Ramp B RD	12+71.90	55	0.7167	7994.76	2.00	2.00	0.005	0.13	> 100 mph	OK
67th Ave Ramp C RD	20+93.80	55	1.7500	3274.04	3.60	3.60	0.026	0.13	90 mph	OK
67th Ave Ramp D RD	27+91.58	55	1.5000	3819.72	3.20	3.20	0.021	0.13	96 mph	OK
51st Ave Ramp A PA	106+86.65	55	0.5833	9822.13	2.00	2.00	0.001	0.13	> 100 mph	OK
51st Ave Ramp B PA	105+84.92	55	0.6667	8594.37	2.00	2.00	0.003	0.13	> 100 mph	OK
51st Ave Ramp B PA	115+86.63	50	3.0000	1909.86	4.40	4.40	0.043	0.13	73 mph	OK
51st Ave Ramp C PA	205+73.31	50	1.4953	3831.72	2.80	2.80	0.015	0.13	98 mph	super for 50. Next to access rd.
51st Ave Ramp C PA	222+41.48	55	1.0000	5729.58	2.30	2.30	0.012	0.13	> 100 mph	OK
51st Ave Ramp D PA	110+03.91	55	1.3333	4297.18	4.00	3.00	0.007	0.13	> 100 mph	compound curve, match ahead
51st Ave Ramp D PA	117+62.85	55	2.0000	2864.79	4.00	4.00	0.030	0.13	85 mph	OK
51st Ave Ramp D RD	26+20.85	55	0.5000	11459.16	-3.00	-2.00	0.048	0.13	> 100 mph	Controlled by mainline super at gore. Flat curve, adverse super permitted. Gore transition area.
43rd Ave Ramp A RD	13+50.61	55	0.8333	6875.49	2.00	2.00	0.009	0.13	> 100 mph	OK
43rd Ave Ramp B RD	13+13.77	55	0.7167	7994.76	2.00	2.00	0.005	0.13	> 100 mph	OK