

MEMORANDUM

Exhibit H



To: Michael Renk, Commerce City
From: Eli Farney, PE, PTOE
Date: April 22, 2022
Subject: Reunion Ridge Filings 2 and 3 – 96th & Peoria Traffic Variance

The purpose of this memo is to request a design variance for the intersection of E 96th Avenue & Peoria Street. This intersection does not comply with *Commerce City Construction Standards and Specifications*, which specifies a level of service (LOS) E or lower as unsatisfactory in a traffic study.

The intersection of 96th & Peoria (E4) is expected to operate satisfactorily in the Year 2023 Background AM and PM peak hours. However, the northbound lane (NBLTR) and southbound lane (SBLTR) are expected to operate at LOS E or F in the Year 2023 Opening Day.

According to the *Highway Capacity Manual (HCM) 6th Edition* Synchro reports, the northbound lane is expected to result in 36.1 seconds of delay in the PM peak hour. This result is due to the expected increase in conflicting southbound traffic along Peoria Street with Reunion Ridge and Turnberry developments. However, the 95th percentile queue length is 3 feet, which is not expected to impede upstream driveways of the Rocky Mountain Arsenal National Wildlife Refuge. Therefore, JR recommends the City accept this failing LOS. Furthermore, this movement is not included in site generated traffic for Reunion Ridge Filings 2 and 3.

According to the *Highway Capacity Manual (HCM) 6th Edition* Synchro reports, the southbound lane is expected to result in 48.2 and 69.7 seconds of delay in the AM and PM peak hours, respectively. This result is due to the expected increase in southbound traffic along Peoria Street with Reunion Ridge and Turnberry developments. However, the 95th percentile queue lengths are 93 feet and 90 feet, respectively, which are not expected to impede any upstream driveways of undeveloped land. If a southbound-left turn lane is added in the Synchro model, the left turn lane still fails. Therefore, JR recommends the City accept this failing LOS.

Additionally, on a stop-controlled approach to an arterial, it is fairly common for a minor street movement to fail in the peak hour. Estimated southbound-left volumes are 45 and 30 vehicles in the Year 2023 AM and PM peak hours, respectively. These volumes are too low to warrant a traffic signal per MUTCD Figure 4C-4.

Finally, this failure is expected to be a temporary condition until Reunion Ridge Way is connected to Potomac Street/Potomac Parkway with the development of Reunion Ridge Filing 4 in the next few years. Much of the traffic from Filings 2 and 3 to go southeast are expected to reroute to Potomac Street/Potomac Parkway, rather than Peoria Street/Peoria Parkway.

Therefore, JR recommends approving this variance at the intersection of E 96th Avenue & Peoria Street.

Feel free to contact me at efarney@jrengineering.com or 303-267-6183 if you have any questions or comments.

Attachments:

- TIS Figures 1-3 – Year 2023 Background Traffic, Site Generated Traffic, and Opening Day Traffic
- *HCM 6th Edition* Synchro Reports: Year 2023 Opening Day Traffic AM/PM Peak Hours at E 96th Avenue & Peoria Street



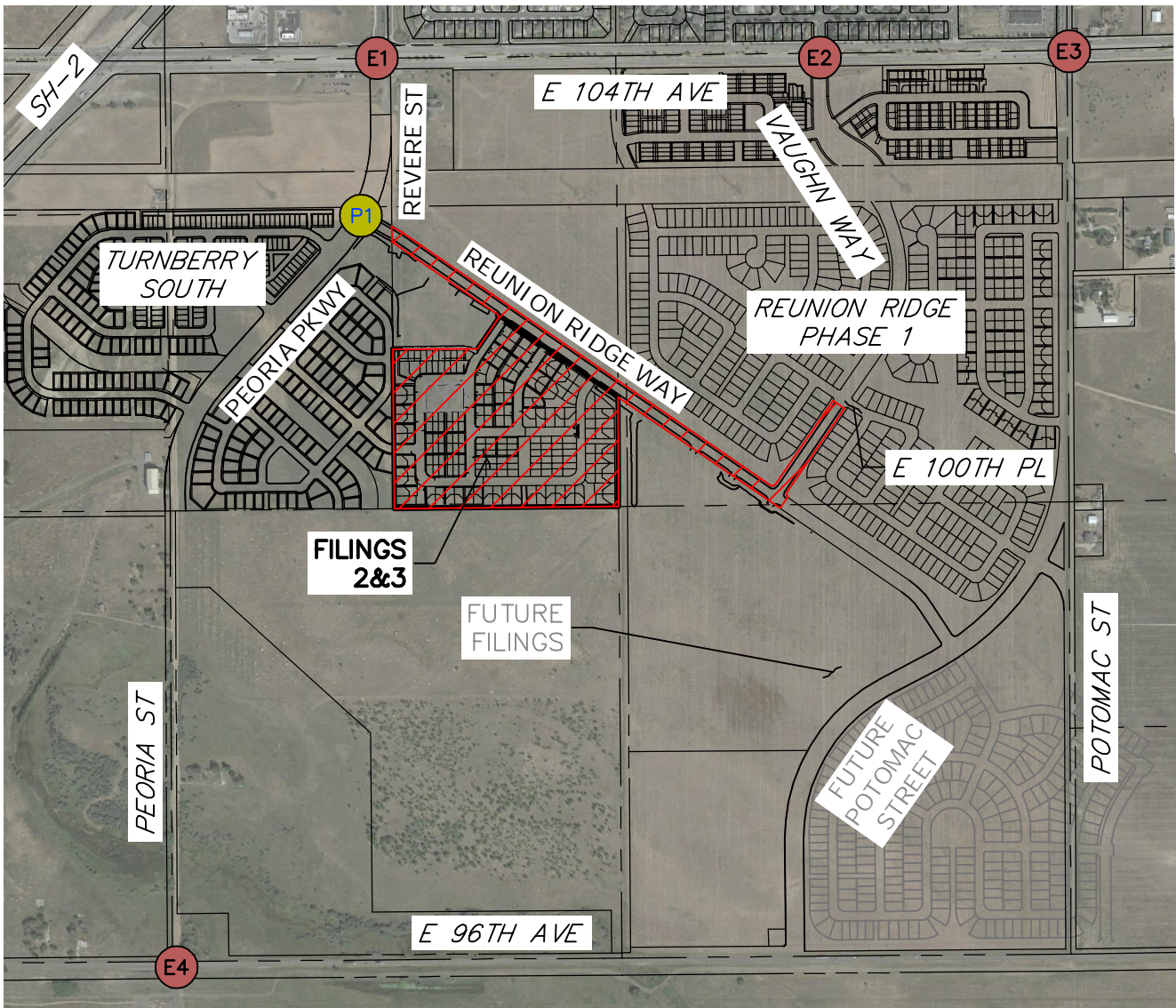
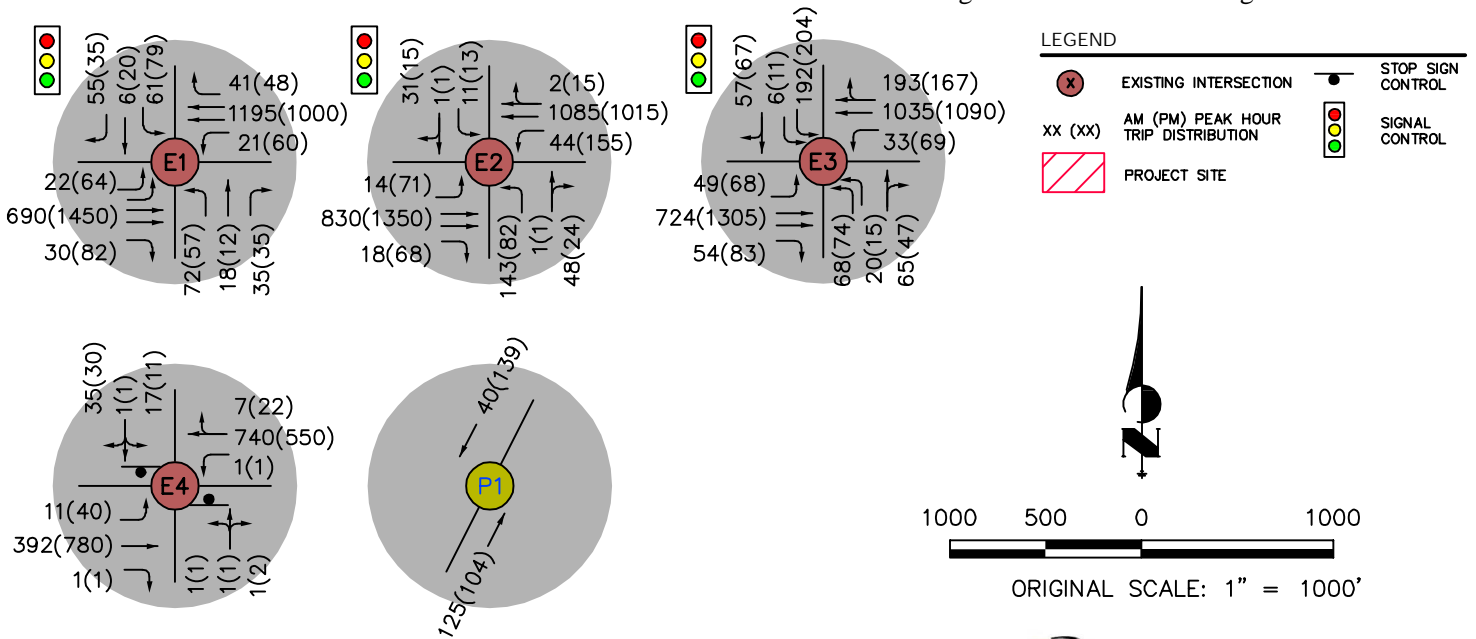


Figure 1 - Year 2023 Background Traffic



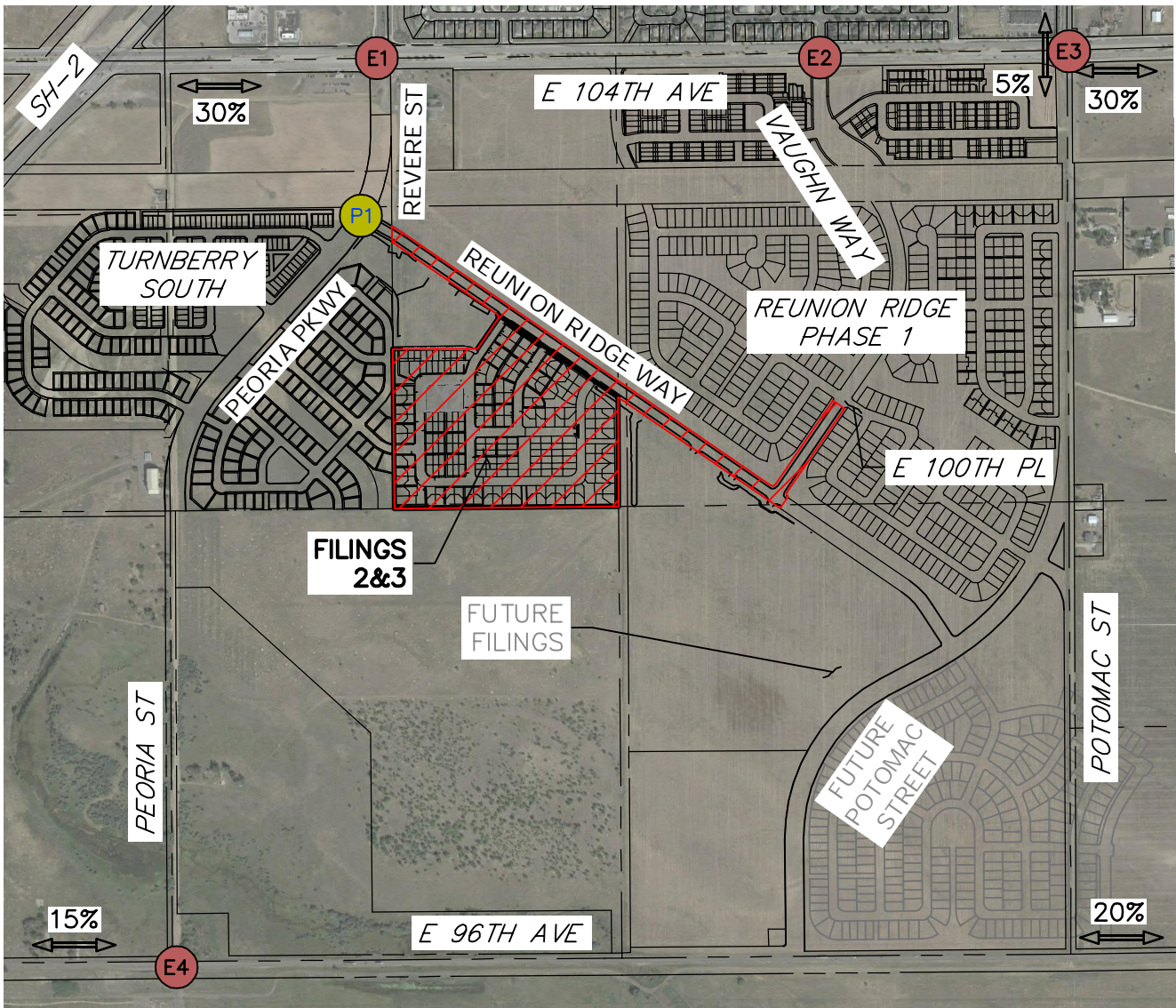
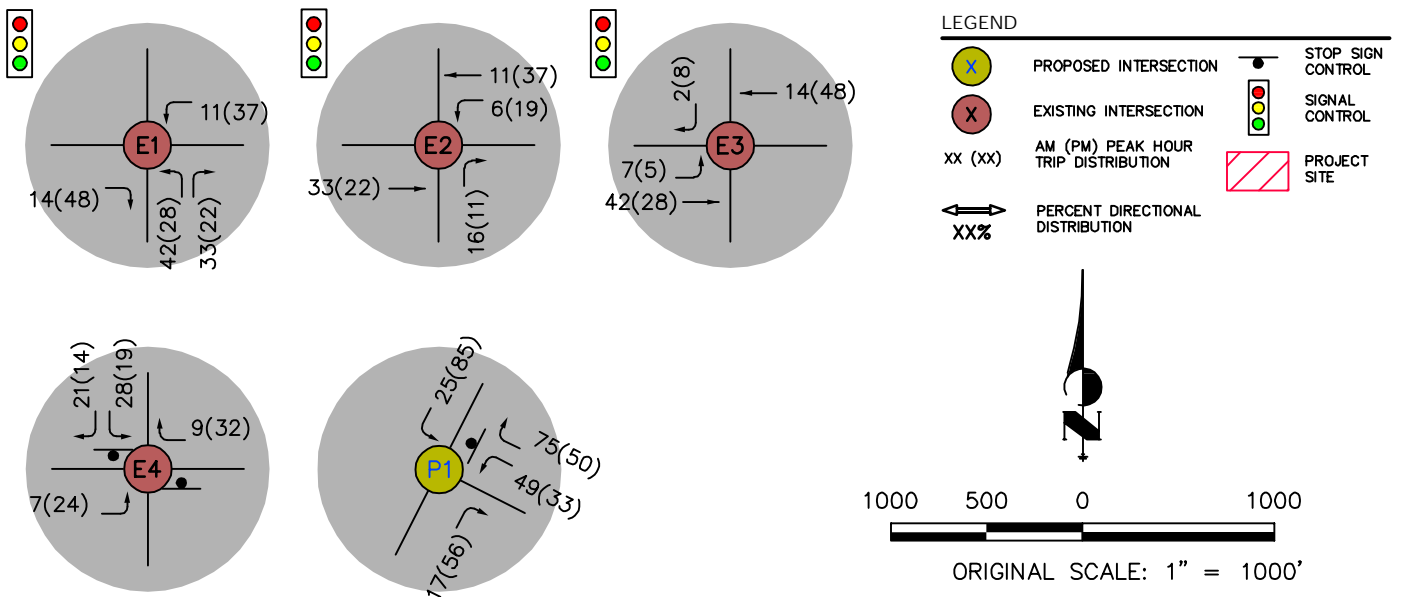


Figure 2 - Assignment of Site Generated Traffic



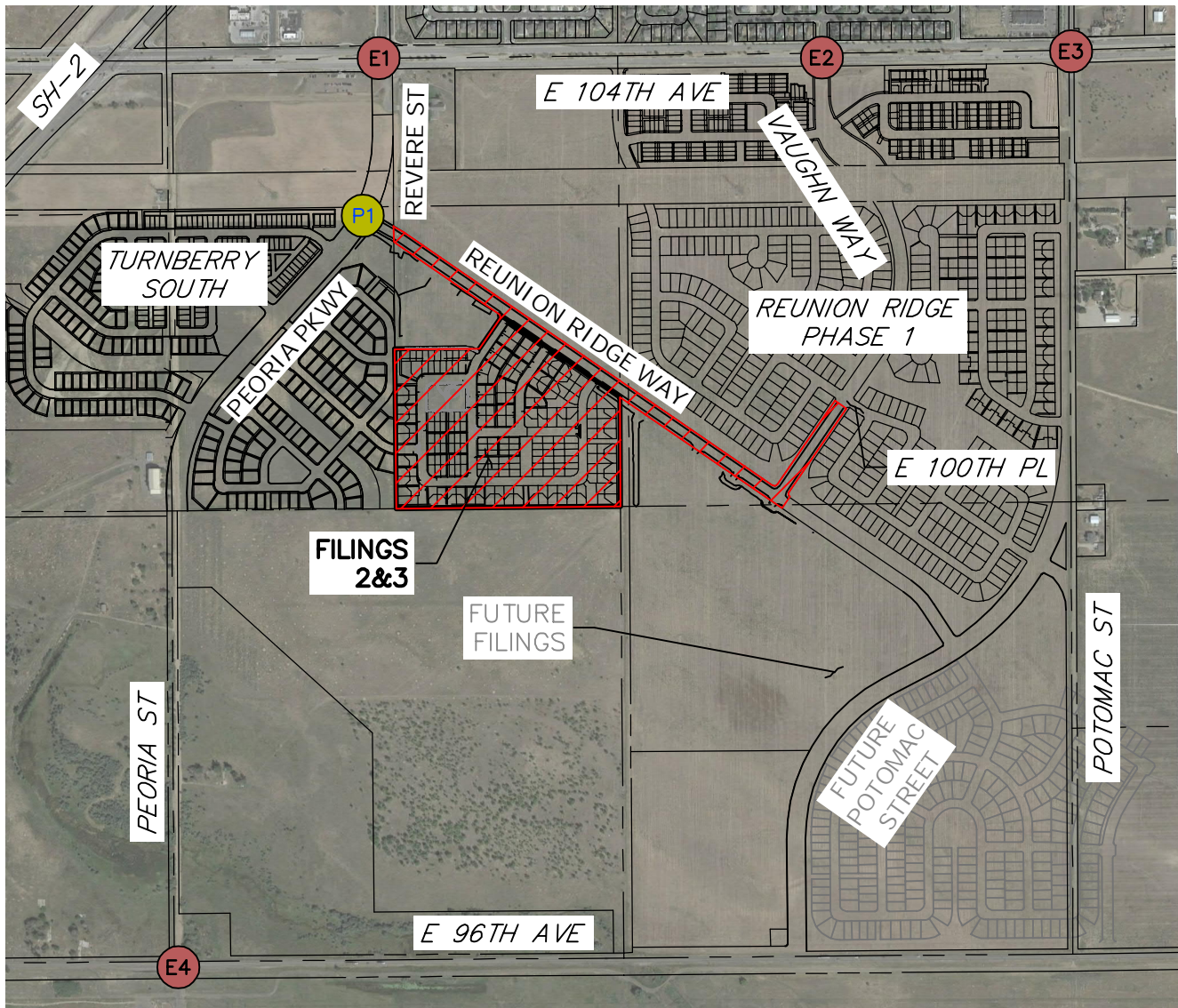
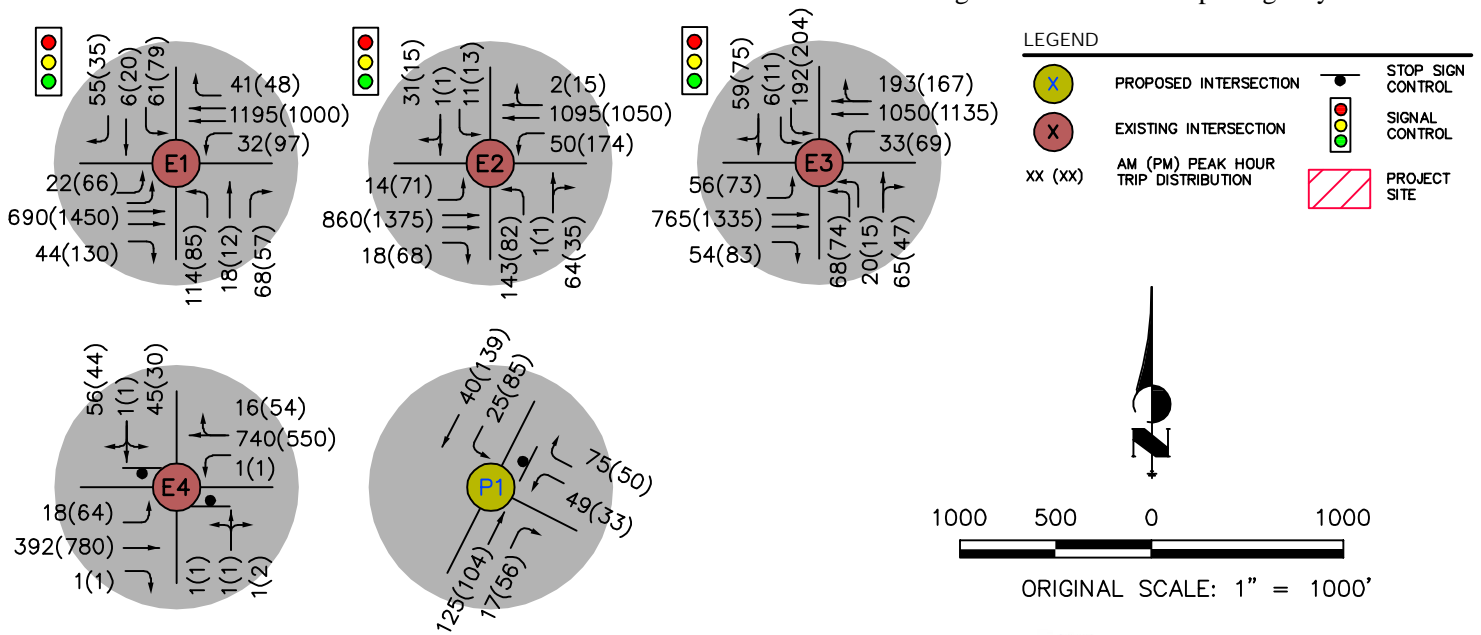


Figure 3 - Year 2023 Opening Day Traffic



Lanes, Volumes, Timings
4: Peoria Street & 96th Ave

JR Engineering
04/20/2022



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	395	1	1	740	16	1	1	1	45	1	56
Future Volume (vph)	18	395	1	1	740	16	1	1	1	45	1	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		0	0		0	0		0
Storage Lanes	1		1	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.996			0.955				0.926
Flt Protected	0.950			0.950				0.984				0.978
Satd. Flow (prot)	1770	1863	1583	1770	1855	0	0	1750	0	0	1687	0
Flt Permitted	0.950			0.950				0.984				0.978
Satd. Flow (perm)	1770	1863	1583	1770	1855	0	0	1750	0	0	1687	0
Link Speed (mph)		45			45			40				40
Link Distance (ft)		563			5275			411				2833
Travel Time (s)		8.5			79.9			7.0				48.3
Peak Hour Factor	0.78	0.90	0.78	0.78	0.92	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	23	439	1	1	804	21	1	1	1	58	1	72
Shared Lane Traffic (%)												
Lane Group Flow (vph)	23	439	1	1	825	0	0	3	0	0	131	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0				0
Link Offset(ft)		0			0			0				0
Crosswalk Width(ft)		16			16			16				16
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop				Stop

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	55.4%
ICU Level of Service	B
Analysis Period (min)	15

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↗			↕			↕	
Traffic Vol, veh/h	18	395	1	1	740	16	1	1	1	45	1	56
Future Vol, veh/h	18	395	1	1	740	16	1	1	1	45	1	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	150	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	90	78	78	92	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	23	439	1	1	804	21	1	1	1	58	1	72





















Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	825	0	0	440	0	0	1338	1312	439	1304	1303	815
Stage 1	-	-	-	-	-	-	485	485	-	817	817	-
Stage 2	-	-	-	-	-	-	853	827	-	487	486	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	805	-	-	1120	-	-	130	159	618	137	161	377
Stage 1	-	-	-	-	-	-	563	552	-	370	390	-
Stage 2	-	-	-	-	-	-	354	386	-	562	551	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	805	-	-	1120	-	-	102	154	618	133	156	377
Mov Cap-2 Maneuver	-	-	-	-	-	-	102	154	-	133	156	-
Stage 1	-	-	-	-	-	-	547	536	-	359	390	-
Stage 2	-	-	-	-	-	-	285	386	-	544	535	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0			27.1			48.2		
HCM LOS							D			E		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	167	805	-	-	1120	-	-	207
HCM Lane V/C Ratio	0.023	0.029	-	-	0.001	-	-	0.632
HCM Control Delay (s)	27.1	9.6	-	-	8.2	-	-	48.2
HCM Lane LOS	D	A	-	-	A	-	-	E
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	3.7

Lanes, Volumes, Timings
4: Peoria Street & 96th Ave

JR Engineering
04/20/2022

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	780	1	1	550	54	1	1	2	30	1	44
Future Volume (vph)	64	780	1	1	550	54	1	1	2	30	1	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		150	150		0	0		0	0		0
Storage Lanes	1		1	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.984			0.919			0.920	
Flt Protected	0.950			0.950				0.990			0.980	
Satd. Flow (prot)	1770	1863	1583	1770	1833	0	0	1695	0	0	1679	0
Flt Permitted	0.950			0.950				0.990			0.980	
Satd. Flow (perm)	1770	1863	1583	1770	1833	0	0	1695	0	0	1679	0
Link Speed (mph)		45			45			40			40	
Link Distance (ft)		563			5275			411			2833	
Travel Time (s)		8.5			79.9			7.0			48.3	
Peak Hour Factor	0.79	0.92	0.78	0.78	0.92	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Adj. Flow (vph)	81	848	1	1	598	69	1	1	3	38	1	56
Shared Lane Traffic (%)												
Lane Group Flow (vph)	81	848	1	1	667	0	0	5	0	0	95	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	61.6%
ICU Level of Service	B
Analysis Period (min)	15

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑	↗	↙	↑	↗		↕			↕	
Traffic Vol, veh/h	64	780	1	1	550	54	1	1	2	30	1	44
Future Vol, veh/h	64	780	1	1	550	54	1	1	2	30	1	44
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	150	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	92	78	78	92	78	78	78	78	78	78	78
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	81	848	1	1	598	69	1	1	3	38	1	56

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	667	0	0	849	0	0	1673	1679	848	1648	1646	633
Stage 1	-	-	-	-	-	-	1010	1010	-	635	635	-
Stage 2	-	-	-	-	-	-	663	669	-	1013	1011	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	923	-	-	789	-	-	76	95	361	79	99	480
Stage 1	-	-	-	-	-	-	289	317	-	467	472	-
Stage 2	-	-	-	-	-	-	450	456	-	288	317	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	923	-	-	789	-	-	62	87	361	72	90	480
Mov Cap-2 Maneuver	-	-	-	-	-	-	62	87	-	72	90	-
Stage 1	-	-	-	-	-	-	264	289	-	426	472	-
Stage 2	-	-	-	-	-	-	396	456	-	260	289	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.8			0			36.1			69.7		
HCM LOS							E			F		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	121	923	-	-	789	-	-	144
HCM Lane V/C Ratio	0.042	0.088	-	-	0.002	-	-	0.668
HCM Control Delay (s)	36.1	9.3	-	-	9.6	-	-	69.7
HCM Lane LOS	E	A	-	-	A	-	-	F
HCM 95th %tile Q(veh)	0.1	0.3	-	-	0	-	-	3.7