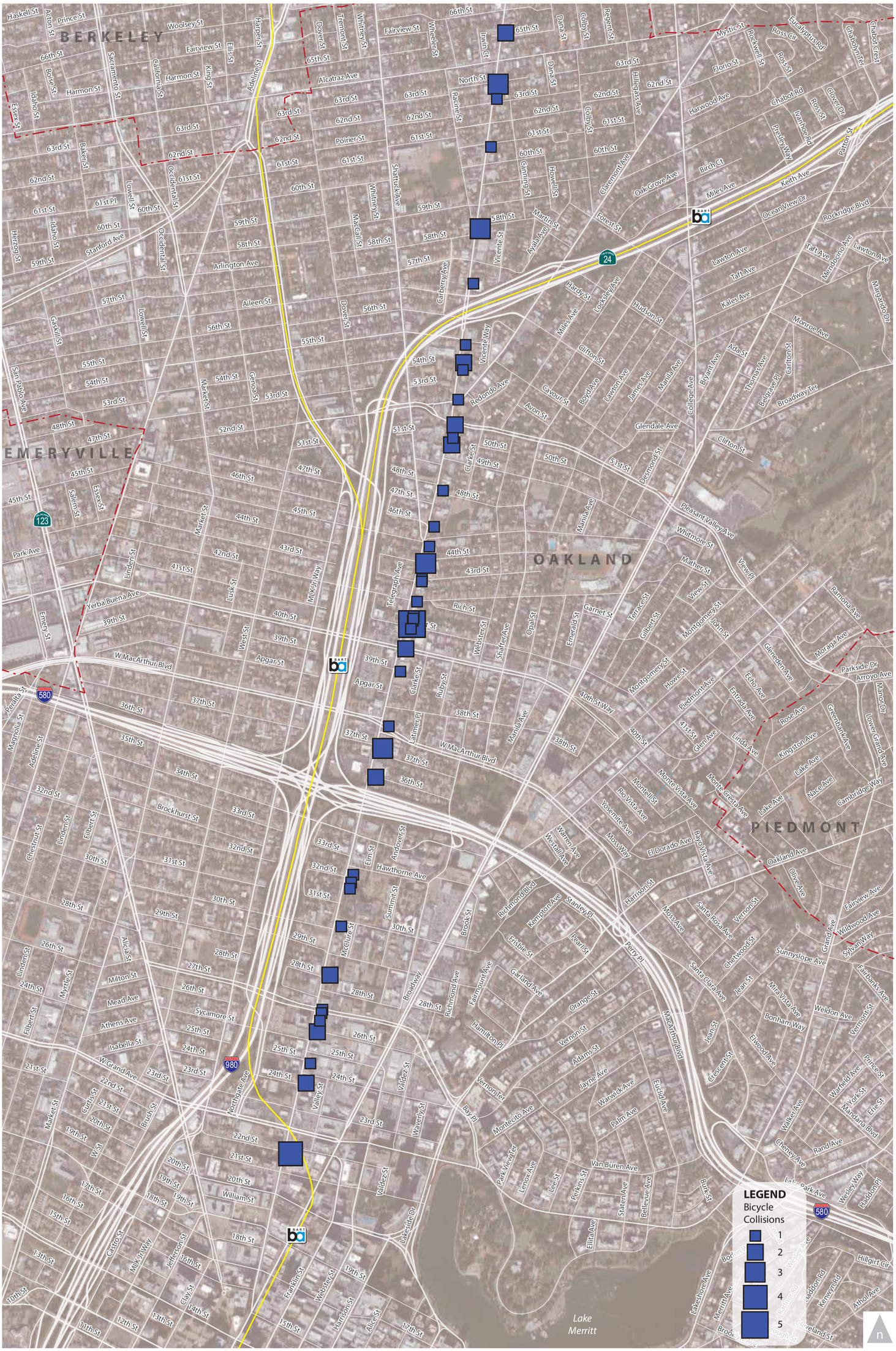


Figure 1

Bicycle Collisions, 2007-2011

WC13-3080

FEHR & PEERS

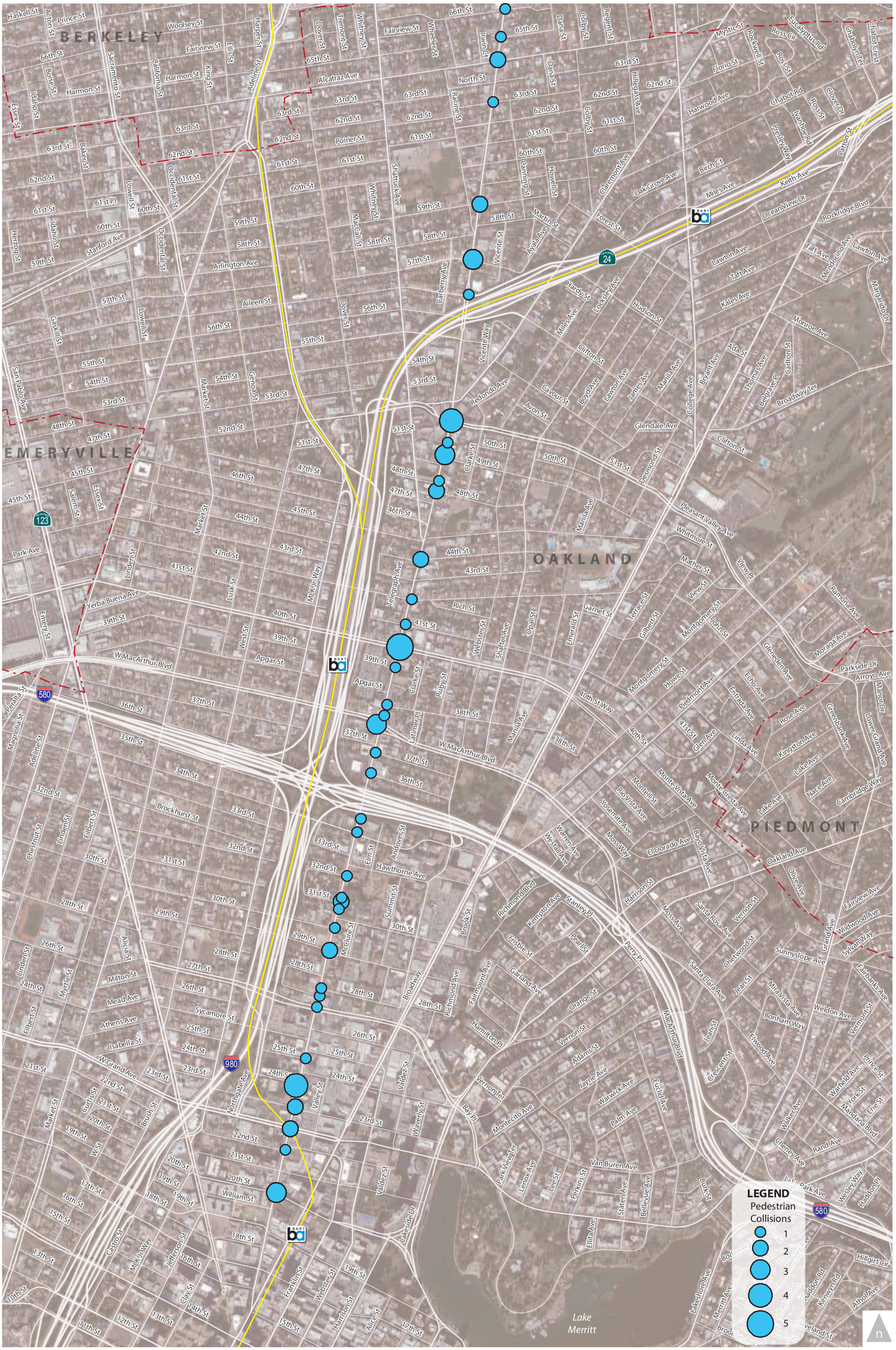


Figure 2

Pedestrian Collisions, 2007-2011

WC13-3080

FEHR & PEERS

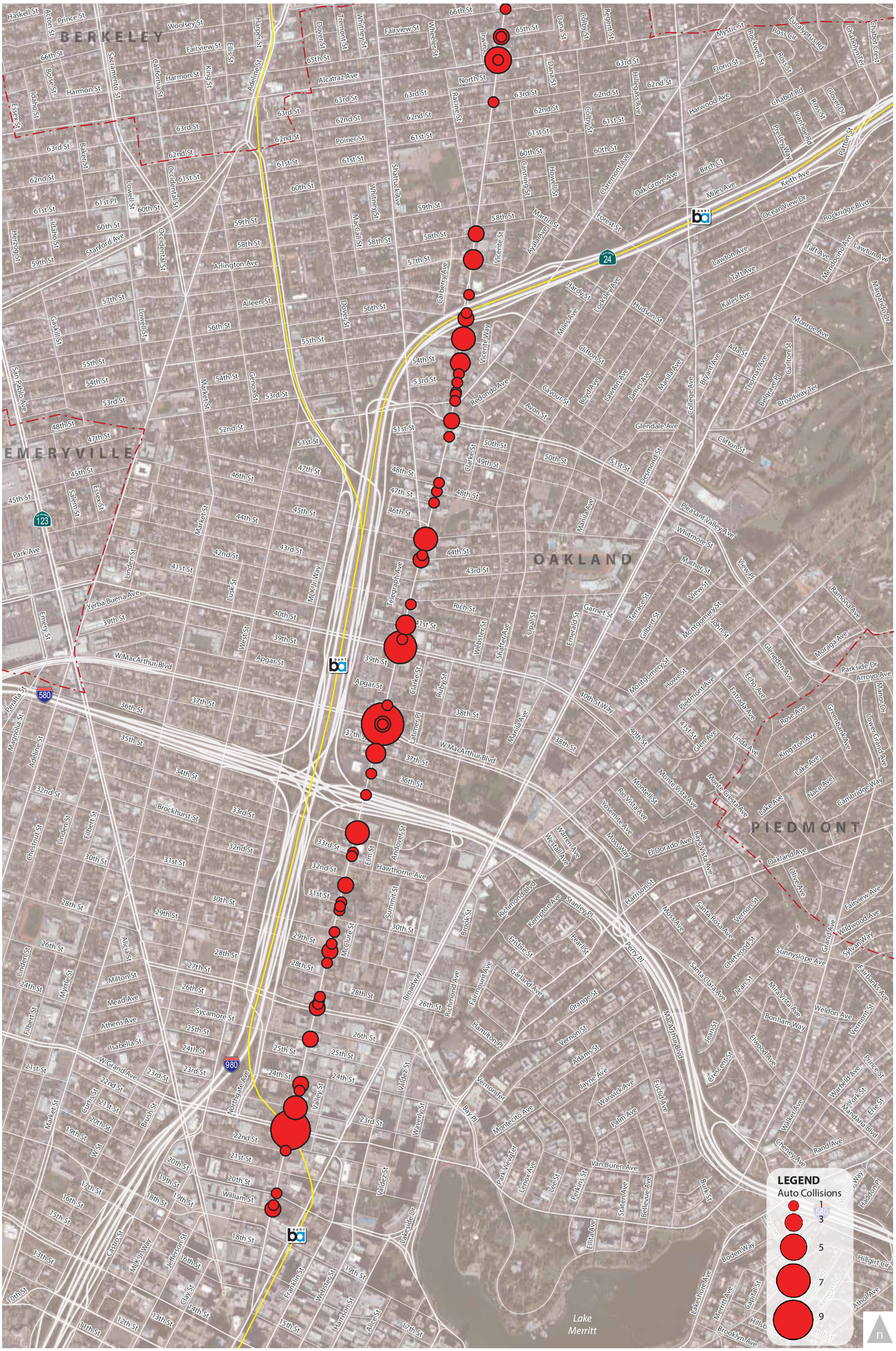


Figure 3

Auto Collisions, 2007-2011

WC13-3080

FEHR & PEERS

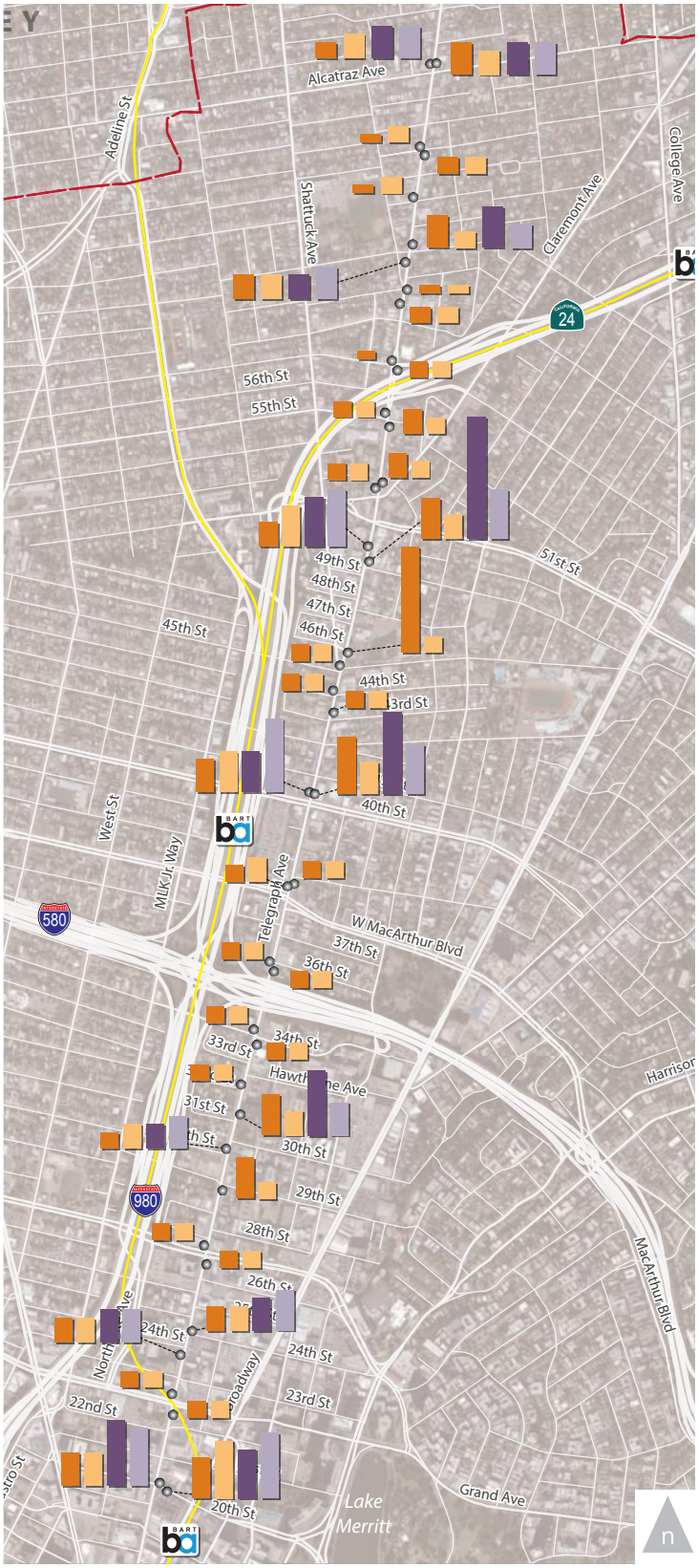


Figure 4

Peak Hour Bus Stop Passenger Activity

WC13-3080_1_BusPAX

FEHR & PEERS

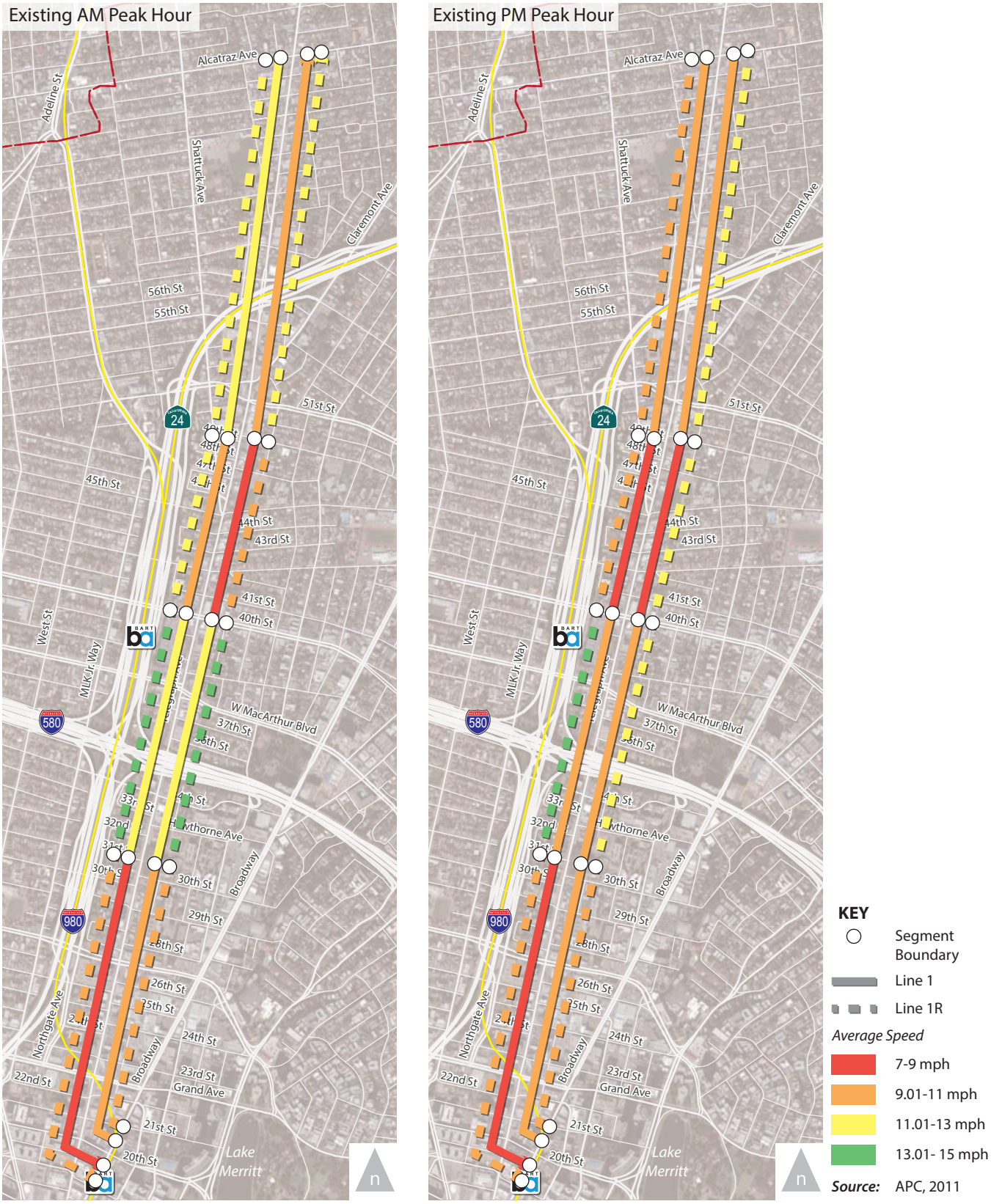


Figure 5

Segment Operating Speed

WC13-3080_2_Speeds

FEHR & PEERS

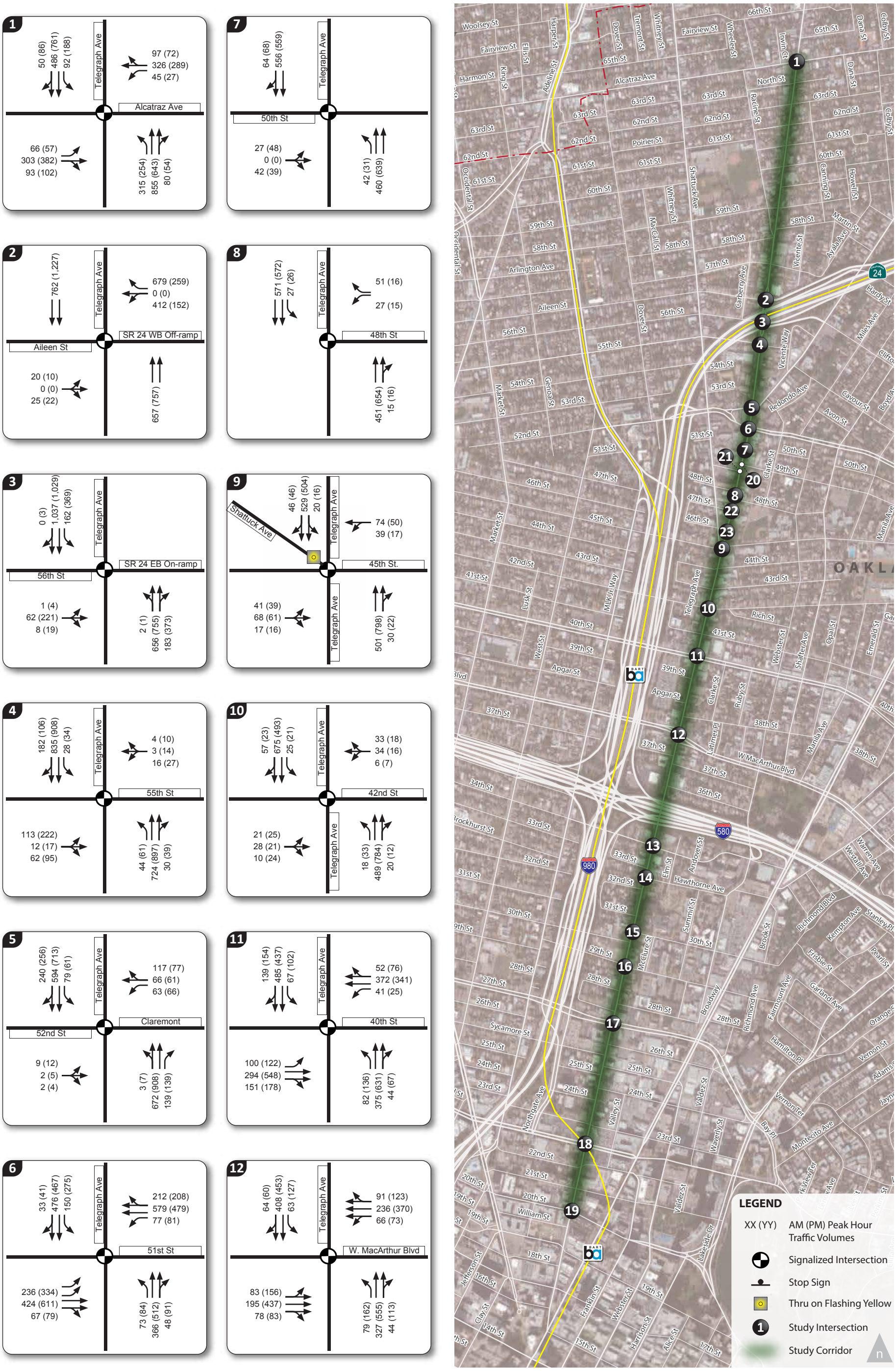


Figure 6A

Existing

Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Control

WC13-3080_Z1A_ExVols

FEHR PEERS

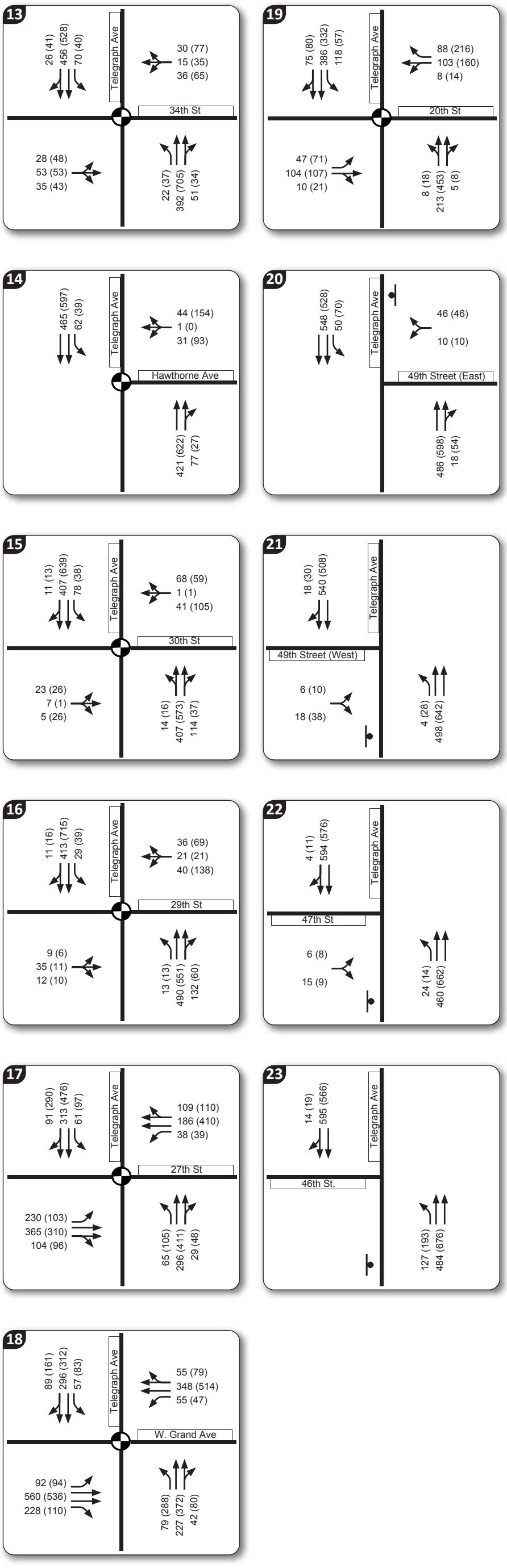


Figure 6B

Existing

Peak Hour Intersection Traffic Volumes, Lane Configurations and Traffic Control

WC13-3080_Z1B_ExVols

FEHR & PEERS

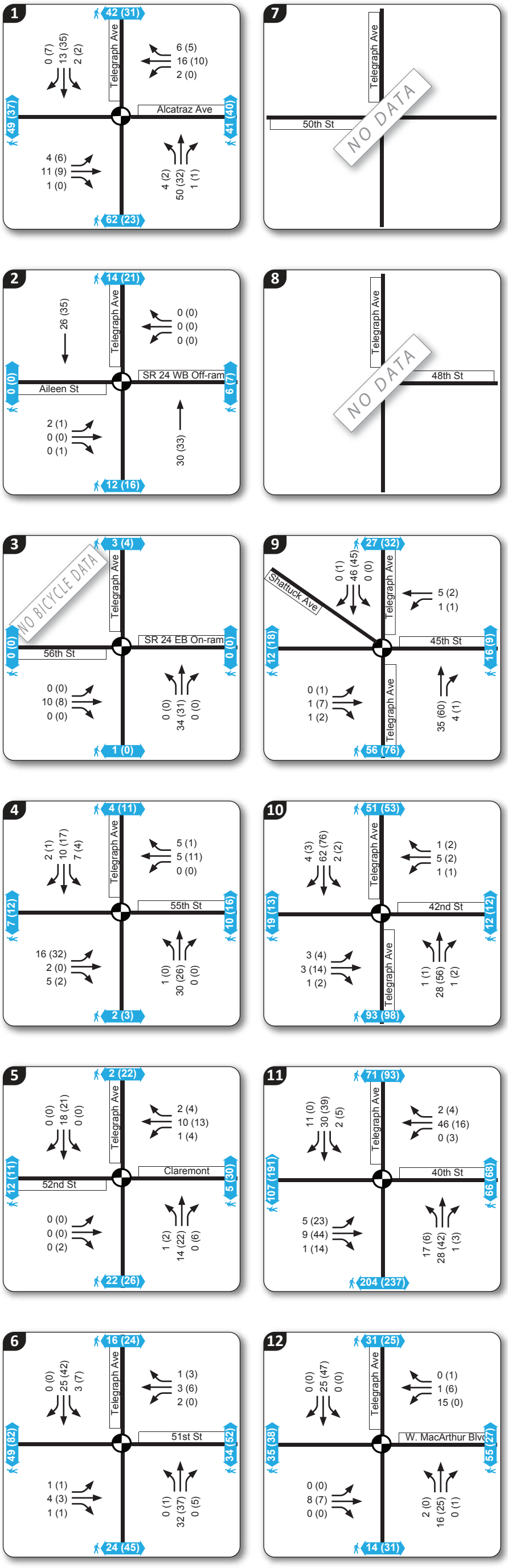


Figure 7A

Existing
Peak Hour Bicycle and Pedestrian Volumes

WC13-3080_2A_ExBikePedVols

FEHR & PEERS

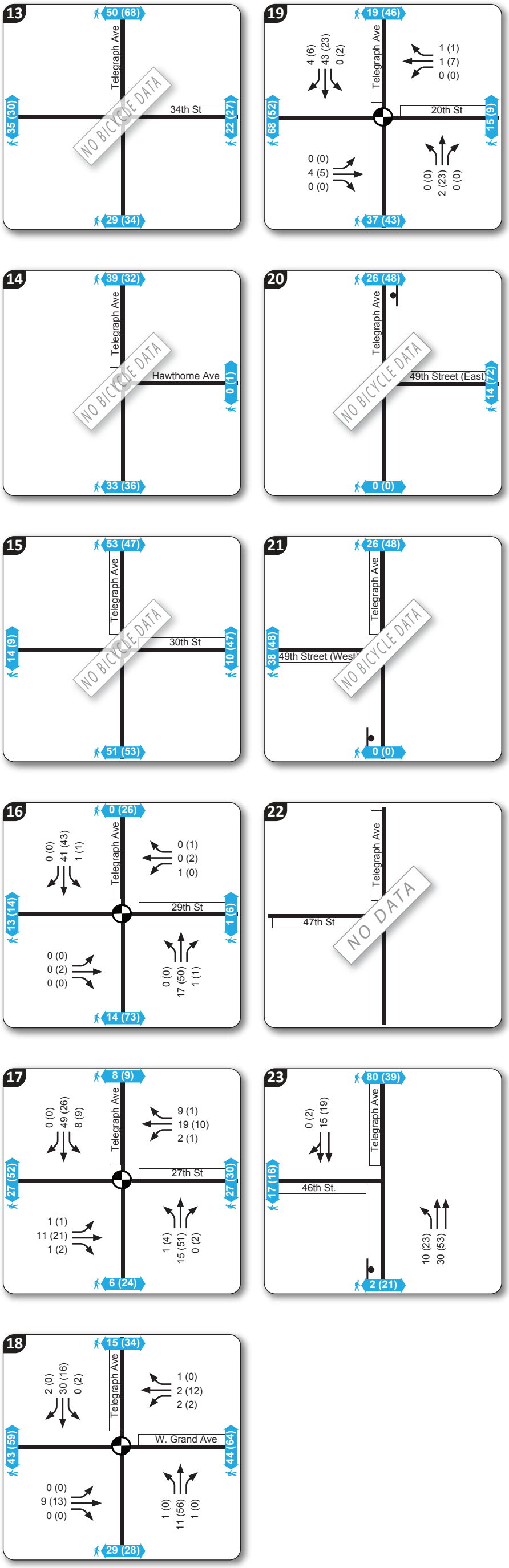


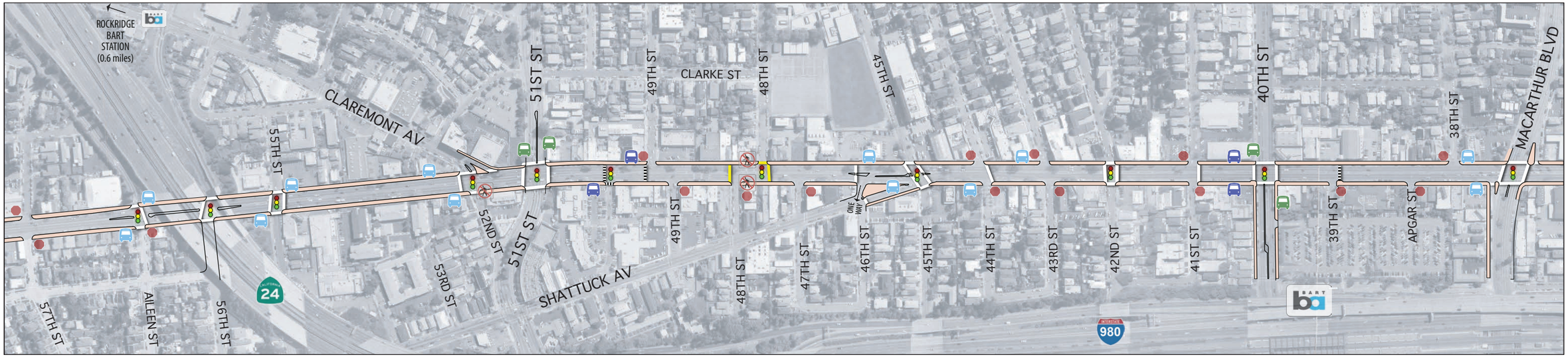
Figure 7B

Existing
Peak Hour Bicycle and Pedestrian Volumes

WC13-3080_2B_ExBikePedVols

FEHR PEERS

Telegraph Avenue Complete Streets Implementation Plan



CITY OF OAKLAND

FEHR & PEERS

cd+a COMMUNITY DESIGN + ARCHITECTURE

0 250 500 1000 1500 Feet

December, 2013

Pedestrian Crossings - Existing Inventory

Source: CD+A, 2013, City of Oakland, 2013, Telegraph Avenue Pedestrian Streetscape Improvements Project, 2005

- Express & Local Bus Stop (On Telegraph Avenue)
- Local Bus Stop (On Telegraph Avenue)
- Bus Stop (On cross street)
- Stop Sign
- Traffic Signal
- Existing Standard Crosswalk
- Existing Ladder Crosswalk
- Pedestrian Crossing not allowed
- Existing Sidewalks

Figure 8A

0 250 500 1000 1500 Feet

December, 2013

Bus Stop Locations (Extension)

Source: CD+A, 2013, City of Oakland, 2013, Telegraph Avenue Pedestrian Streetscape Improvements Project, 2005

CITY OF OAKLAND

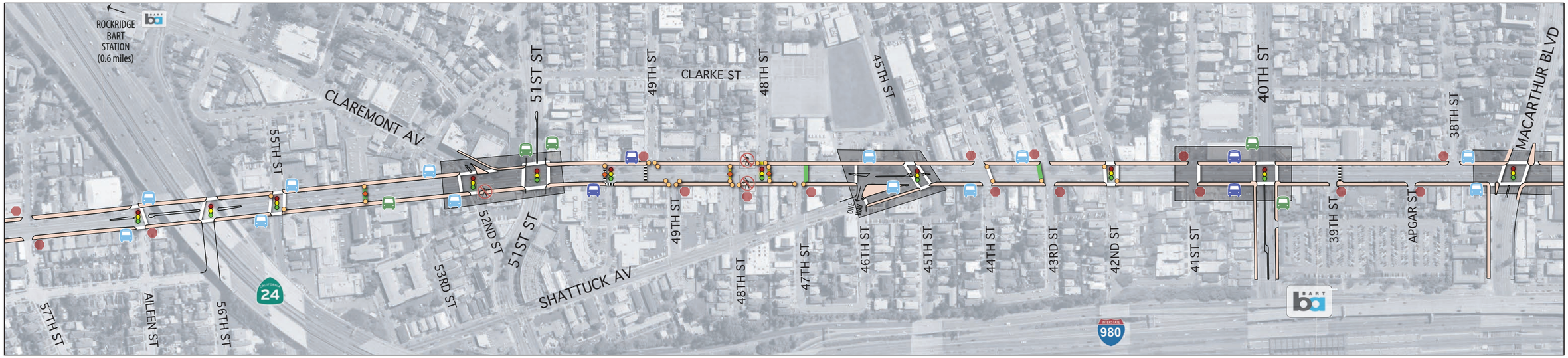
FEHR & PEERS

cd+a COMMUNITY DESIGN + ARCHITECTURE

- Express & Local Bus Stop
- Local Bus Stop
- Stop Sign
- Traffic Signal
- Existing Standard Crosswalk
- Existing Sidewalks
- Pedestrian generating / attracting uses

Figure 8B

Telegraph Avenue Complete Streets Implementation Plan



CITY OF OAKLAND

FEHR & PEERS

cd+a COMMUNITY DESIGN + ARCHITECTURE

0 250 500 1000 1500 Feet

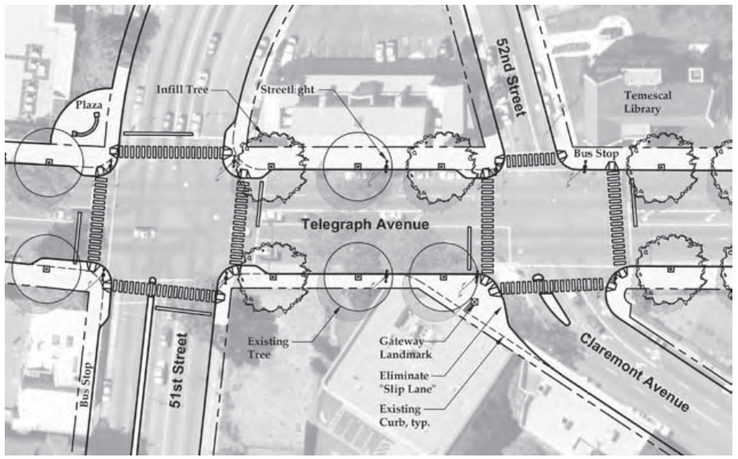
December, 2013

Pedestrian Crossings - Previously Proposed Improvements

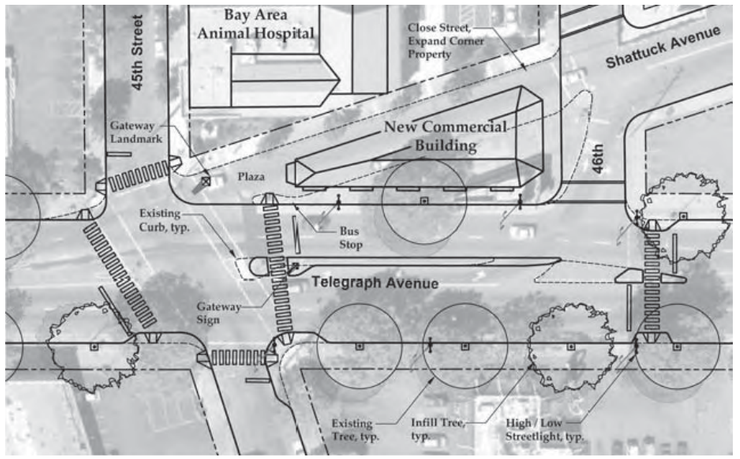
Source: CD+A, 2013, City of Oakland, 2013, Telegraph Avenue Pedestrian Streetscape Improvements Project, 2005

- Express & Local Bus Stop (On Telegraph Avenue)
- Local Bus Stop (On Telegraph Avenue)
- Bus Stop (On cross street)
- Stop Sign
- Traffic Signal
- Existing Standard Crosswalk
- Existing Ladder Crosswalk
- Pedestrian Crossing not allowed
- Existing Sidewalks
- Previously Proposed New Crosswalks
  Previously identified by the 2005 Telegraph Avenue Pedestrian Streetscape Improvements Project
- Previously Proposed Special Intersection Crossing Treatment Areas
  These locations previously identified by the 2005 Telegraph Avenue Pedestrian Streetscape Improvements Project
- Previously Proposed Bulbout Locations
  These locations previously identified by the 2005 Telegraph Avenue Pedestrian Streetscape Improvements Project
- Previously Proposed Midblock Crossing Refuge Locations
  These locations previously identified by the 2005 Telegraph Avenue Pedestrian Streetscape Improvements Project

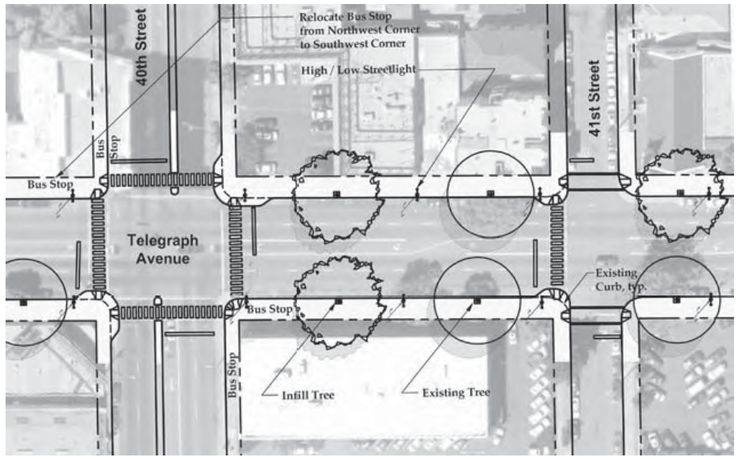
Figure 9A



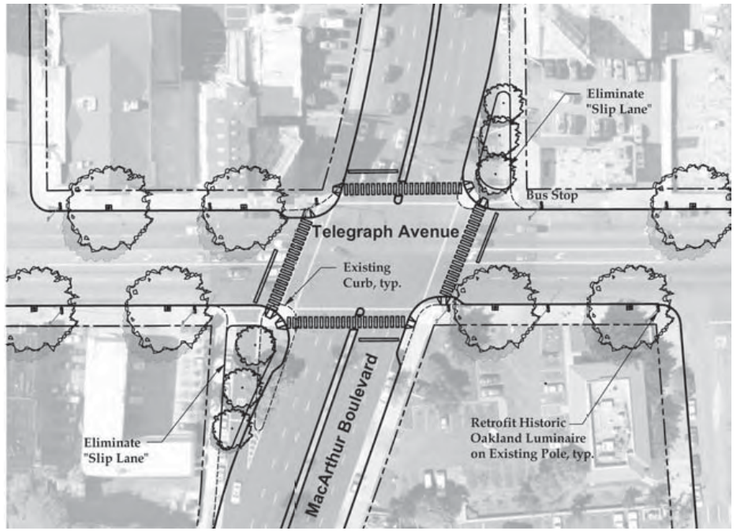
51st Street and Claremont Avenue/52nd Street



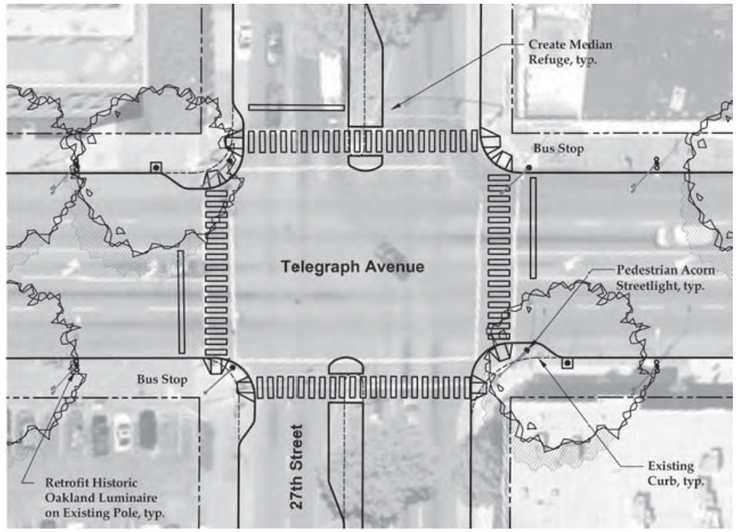
Shattuck Avenue/45th and 46th Streets (Option "B")



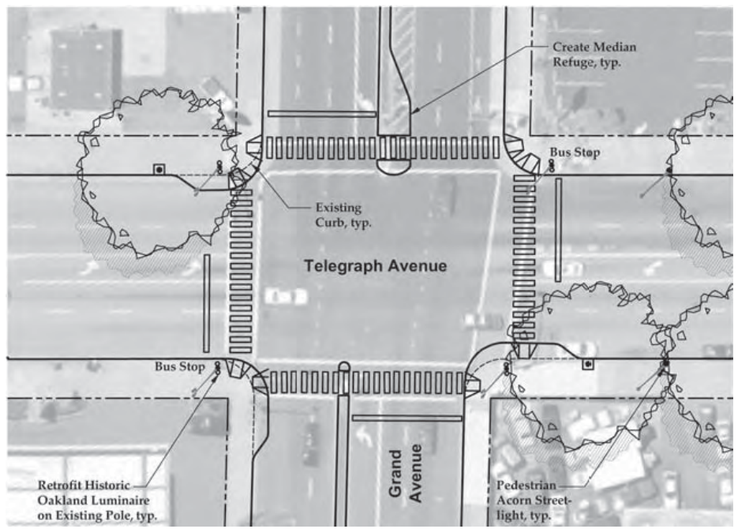
40th and 41st Streets



MacArthur Boulevard



27th Street

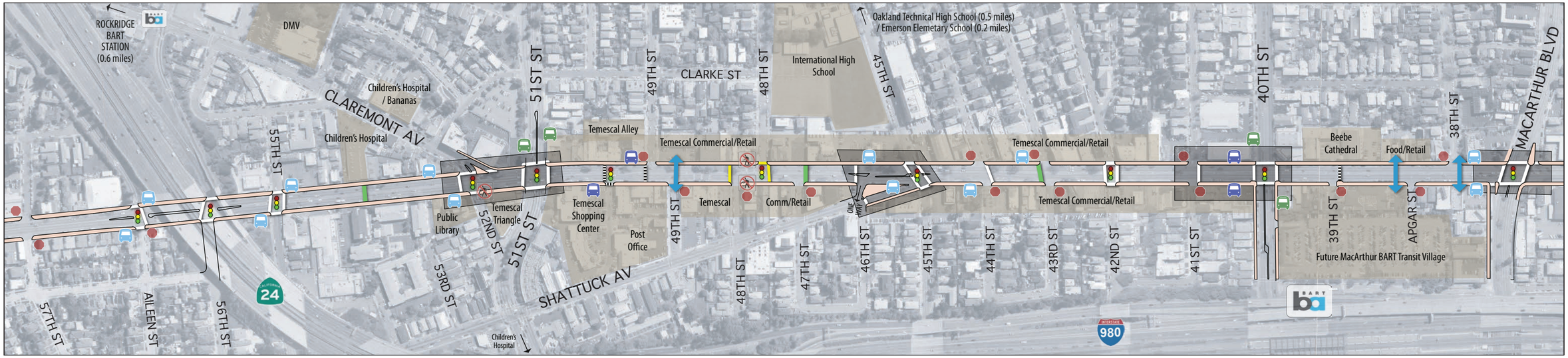


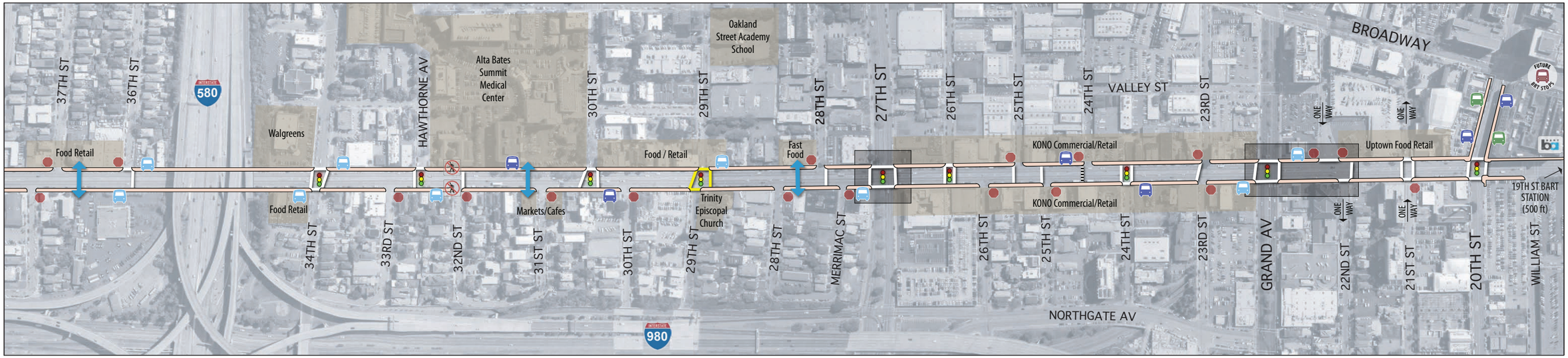
Grand Avenue

Figure 9B: Previously Identified Special Intersection Design Improvements

Note: These drawings and the concepts they represent are from the 2005 *Telegraph Avenue Pedestrian Streetscape Improvement Project*

Telegraph Avenue Complete Streets Implementation Plan





CITY OF OAKLAND

FEHR PEERS

COMMUNITY DESIGN + ARCHITECTURE

0 250 500 1000 1500 Feet

December, 2013

Pedestrian Crossings: Existing Conditions and Analysis

Source: CD+A, 2013, City of Oakland, 2013, Telegraph Avenue Pedestrian Streetscape Improvements Project, 2005

- Express & Local Bus Stop (On Telegraph Avenue)
- Local Bus Stop (On Telegraph Avenue)
- Bus Stop (On cross street)
- Stop Sign
- Traffic Signal
- Existing Standard Crosswalk
- Existing Ladder Crosswalk
- Pedestrian Crossing not allowed
- Existing Sidewalks
- Previously Proposed New Crosswalks
  Previously identified by the 2005 Telegraph Avenue Pedestrian Streetscape Improvements Project
- Previously Proposed Special Intersection Crossing Treatment Areas
  These locations previously identified by the 2005 Telegraph Avenue Pedestrian Streetscape Improvements Project
- Pedestrian generating / attracting uses
- Pedestrian Desire Lines
  Locations identified by CD+A where land uses and transit stops encourage pedestrian crossing or jaywalking mid-block

Figure 10A

December, 2013

Bus Stop Locations (Extension)

Source: CD+A, 2013, City of Oakland, 2013, Telegraph Avenue Pedestrian Streetscape Improvements Project, 2005

CITY OF OAKLAND

FEHR & PEERS

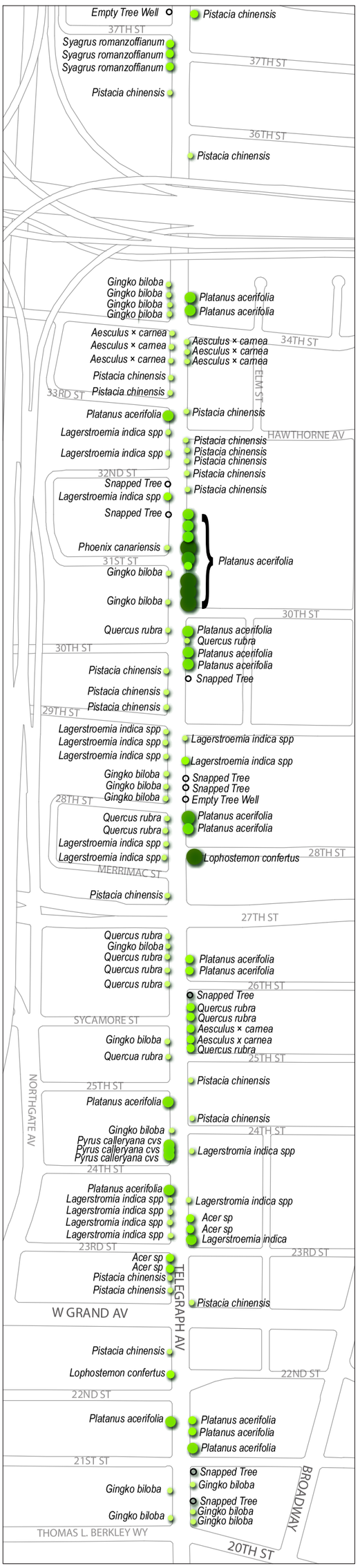
cd+a COMMUNITY DESIGN + ARCHITECTURE

- Express & Local Bus Stop
- Local Bus Stop
- Stop Sign
- Traffic Signal
- Existing Standard Crosswalk
- Existing Sidewalks
- Pedestrian generating / attracting uses

Figure 10B

Figure 11A

Telegraph Avenue Complete Streets Implementation Plan



Telegraph Avenue Existing Street Tree Species Map

LEGEND

- Largest Street Tree
- Large Street Tree
- Medium Street Tree
- Small Street Tree
- New Street Tree
- No Tree/Empty Tree Well

SPECIES KEY (by prevalence)	# present
Platanus acerfolia > London Plane	75
Pistacia chinensis > Chinese Pistache	62
Liquidambar styraciflua > Amer. Sweetgum	27
Lagerstroemia indica spp > Crape myrtle	19
Gingko biloba > Gingko	17
Quercus rubra > Red Oak	13
Aesculus × carnea > Red Horse Chestnut	8
Acer sp > Maple	6
Pyrus calleryana cvs > Flowering Pear	4
Syagrus romanzoffianum > King Palm	3
Lophostemon confertus > Brisbane Box	2
Phoenix canariensis > Canary Island Palm	1

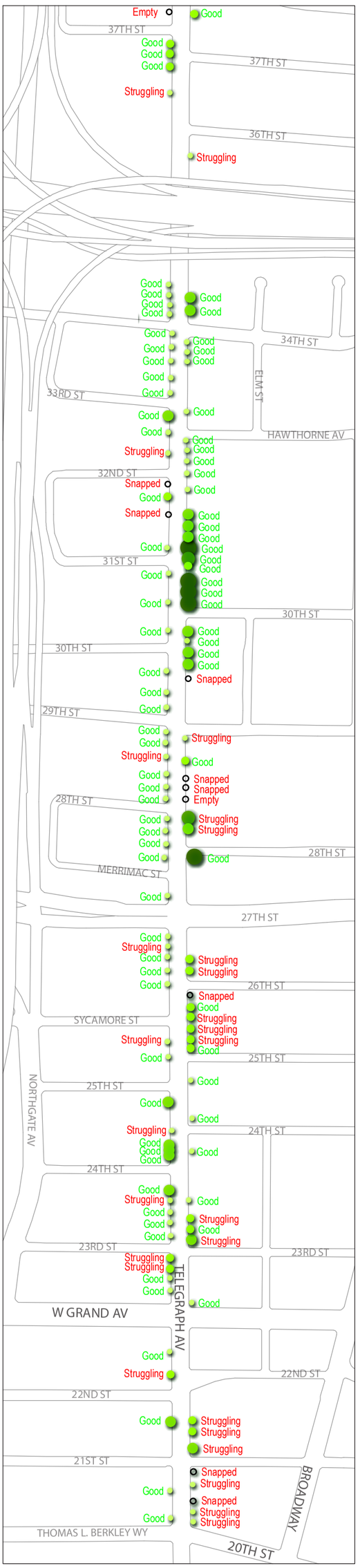
0 200 400 800 Feet

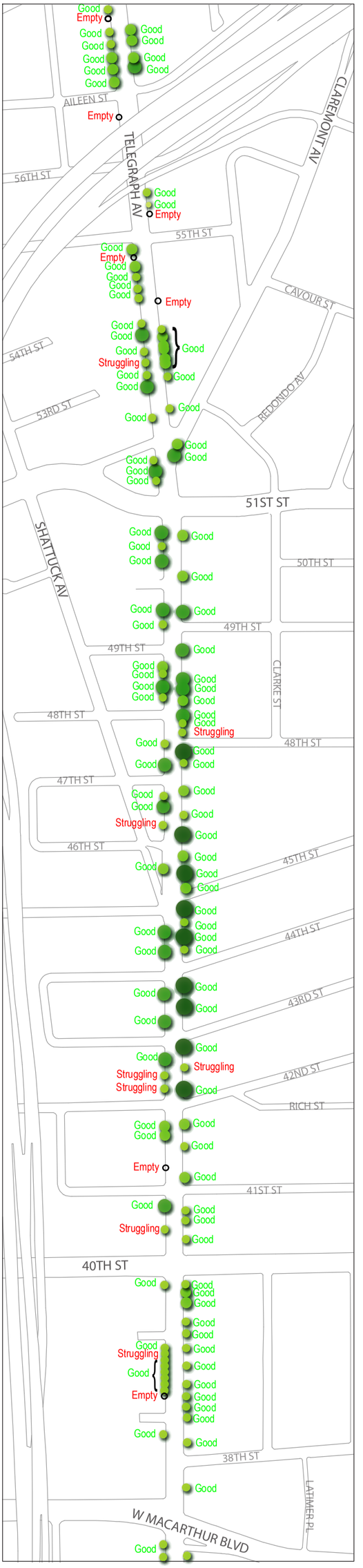
Source: CD+A, 2013, City of Oakland, 2013

COMMUNITY DESIGN + ARCHITECTURE

Figure 11B

Telegraph Avenue Complete Streets Implementation Plan





Telegraph Avenue Existing Street Tree Conditions Map

LEGEND

- Largest Street Tree
- Large Street Tree
- Medium Street Tree
- Small Street Tree
- New Street Tree
- No Tree/Empty Tree Well

Condition Summary	#	%
Good Condition	199	79
Struggling Condition	35	14
Empty Tree Well	9	4
Snapped	8	3

0 200 400 800 Feet

Source: CD+A, 2013, City of Oakland, 2013

COMMUNITY DESIGN + ARCHITECTURE

Appendix A

Bus Stop Passenger Data

Northbound Passenger Activity

		Line 1						Line 1R					
		AM			PM			AM			PM		
ID	Name	On	Off	Total	On	Off	Total	On	Off	Total	On	Off	Total
1031030	20th	2	2	4	2	2	4	3	5	8	4	3	7
1020450	Grand	1	1	2	1	1	2	0	0	0	0	0	0
1030870	24th	2	1	3	1	2	3	2	2	4	2	3	5
1020050	27th	1	1	2	1	1	2	0	0	0	0	0	0
1020060	29th	1	4	5	1	1	2	0	0	0	0	0	0
1020080	31st	3	2	5	2	1	3	3	5	8	2	2	4
1020100	34th	1	1	2	1	1	2	0	0	0	0	0	0
1020120	36th	1	1	2	1	1	2	0	0	0	0	0	0
1020140	MacArthur	1	1	2	1	1	2	0	0	0	0	0	0
1020160	40th	5	2	7	2	2	4	6	4	10	3	3	6
1020190	43rd	1	1	2	1	1	2	0	0	0	0	0	0
1020220	45th	1	12	13	1	1	2	0	0	0	0	0	0
1020240	49th	3	2	5	1	2	3	4	11	15	2	4	6
1020420	52nd	1	2	3	1	1	2	0	0	0	0	0	0
1020270	55th	2	1	3	1	1	2	0	0	0	0	0	0
1020370	Aileen	1	1	2	1	1	2	0	0	0	0	0	0
1020300	58th	0	1	1	0	1	1	0	0	0	0	0	0
1030980	59th	3	1	4	1	1	2	3	2	5	1	2	3
1020320	62nd	1	1	2	1	1	2	0	0	0	0	0	0
1030550	Alcatraz	3	1	4	1	2	3	3	1	4	1	3	4

Southbound Passenger Activity

		Line 1						Line 1R					
		AM			PM			AM			PM		
ID	Name	On	Off	Total	On	Off	Total	On	Off	Total	On	Off	Total
1020380	Alcatraz	1	1	2	1	2	3	3	1	4	2	2	4
1020330	62nd	1	0	1	1	1	2	0	0	0	0	0	0
1020310	60th	0	1	1	1	1	2	0	0	0	0	0	0
1030840	59th	2	1	3	2	1	3	2	1	3	2	2	4
1020290	58th	1	1	2	1	1	2	0	0	0	0	0	0
1020360	Aileen	1	0	1	0	0	0	0	0	0	0	0	0
1020280	55th	1	1	2	1	1	2	0	0	0	0	0	0
1020260	52nd	1	1	2	1	1	2	0	0	0	0	0	0
1020250	49th	2	1	3	3	2	5	4	2	6	4	3	7
1020210	45th	1	1	2	1	1	2	0	0	0	0	0	0
1020200	44th	1	1	2	1	1	2	0	0	0	0	0	0
1020150	40th	2	2	4	3	2	5	3	2	5	5	4	9
1020460	MacArthur	1	1	2	2	1	3	0	0	0	0	0	0
1020130	36th	1	1	2	1	1	2	0	0	0	0	0	0
1020110	34th	1	1	2	1	1	2	0	0	0	0	0	0
1020090	32nd	1	1	2	1	1	2	0	0	0	0	0	0
1020070	30th	1	1	2	2	1	3	2	1	3	2	2	4
1020040	27th	1	1	2	1	1	2	0	0	0	0	0	0
1020020	24th	2	1	3	2	1	3	3	1	4	2	2	4
1020440	Grand	1	1	2	1	1	2	0	0	0	0	0	0
1031060	20th	2	3	5	4	3	7	3	3	6	5	3	8

Northbound Dwell Time

ID	Name	Line 1				Line 1R			
		AM		PM		AM		PM	
		Average	St. Dev	Average	St. Dev	Average	St. Dev	Average	St. Dev
1031030	20th	15.6	11.0	17.1	14.9	25.7	21.6	22.9	13.6
1020450	Grand	2.8	5.5	3.0	8.0				
1030870	24th	13.1	14.6	11.3	13.1	13.8	10.6	19.7	23.4
1020050	27th	7.2	9.8	7.9	20.8				
1020060	29th	12.2	10.5	8.7	12.1				
1020080	31st	16.0	14.0	9.8	24.0	19.4	12.7	18.1	29.0
1020100	34th	5.2	6.6	3.4	5.2				
1020120	36th	0.9	1.8	1.4	3.2				
1020140	MacArthur	5.5	6.6	6.3	11.4				
1020160	40th	27.0	21.9	19.3	25.8	31.5	23.8	19.7	15.6
1020190	43rd	2.8	4.9	0.8	2.1				
1020220	45th	17.2	14.2	4.5	12.0				
1020240	49th	13.5	8.9	11.7	14.0	22.1	10.0	16.2	14.8
1020420	52nd	7.5	6.8	4.8	7.1				
1020280	55th	7.9	6.9	2.8	7.1				
1020360	Aileen	2.5	4.9	2.7	8.1				
1020300	58th	2.7	4.5	1.7	5.6				
1030980	59th	12.9	13.1	10.4	25.8	13.1	11.3	7.9	8
1020320	62nd	3.6	6.4	1.6	3.8				
1030550	Alcatraz	13.4	12.8	10.1	13.2	12.2	8.1	8.2	5.7

Southbound Dwell Time

		Line 1				Line 1R			
		AM		PM		AM		PM	
ID	Name	Average	St. Dev	Average	St. Dev	Average	St. Dev	Average	St. Dev
1020380	Alcatraz	15.1	22.9	13.9	21.1	11.1	10	11.9	13.4
1020330	62nd	1.4	3.3	4.0	4.9				
1020310	60th	0.3	1.3	4.4	5.9				
1030840	59th	11.4	8.4	7.1	7.6	7.6	6.5	8.4	8.8
1020290	58th	1.3	6.0	0.9	2.5				
1020370	Aileen	2.2	6.1	17.1	14.9				
1020270	55th	3.4	6.3	3.0	8.0				
1020260	52nd	3.9	11.9	11.3	13.1				
1020250	49th	15.3	15.3	7.9	20.8	20.5	13.7	22.0	16.8
1020210	45th	7.2	8.4	8.7	12.1				
1020200	44th	1.3	2.8	9.8	24.0				
1020150	40th	23.8	24.1	3.4	5.2	21.7	11.5	28.9	26.9
1020460	MacArthur	8.3	8.8	1.4	3.2				
1020130	36th	3.6	4.7	6.3	11.4				
1020110	34th	9.0	23.7	19.3	25.8				
1020090	32nd	1.5	3.7	0.8	2.1				
1020070	30th	11.5	14.1	4.5	12.0	12.3	7.5	10.7	7.3
1020040	27th	15.8	41.6	11.7	14.0				
1020020	24th	22.1	31.5	4.8	7.1	20.6	24.8	18.1	29.5
1020440	Grand	4.0	4.8	2.8	7.1				
1031060	20th	32.3	40.3	2.7	8.1	19.8	12.6	31.4	35.3

Appendix B

TCQSM Speed and Capacity Model Input Sheets

Step 1: Capacity Calculations

Line 1 AM Peak Hour

									unsignalized		unsignalized						unsignalized			unsignalized		
	Northbound/Westbound Stops	20th	Grand	24th	27th	29th	30th	34th	36th	Macarthur	40th	43rd	45th	50th	52nd	55th	Aileen	58th	59th		62nd	Alcatraz
Inputs		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**		**19**	**20**
c_v	Coefficient of variation of dwell times	0.71	1.93	1.12	1.37	0.86	0.88	1.25	2.12	1.18	0.81	1.76	0.83	0.66	0.90	0.88	1.94	1.69	1.02		1.78	0.96
	Failure rate	15.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%		2.5%	2.5%
t_d	Average dwell time (s) (see Step 0 to calculate, or use default)	15.57	2.82	13.06	7.20	12.23	16.00	5.23	0.86	5.54	27.03	2.80	17.20	13.46	7.53	7.89	2.54	2.69	12.86		3.57	13.37
g/C	Green time ratio	0.36	0.61	0.35	0.35	0.62	0.64	0.63	1.00	0.31	0.37	1.00	0.50	0.37	0.29	0.59	0.48	1.00	0.32		1.00	0.32
C	Traffic signal cycle length (s)	60	60	85	85	85	85	85	85	85	85	85	85	45	90	90	90	60	90		60	90
	Stop type (on-line/off-line)	On-line	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-	Off-line Metro non-		Off-line Metro non-	Off-line Metro non-
	Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD	CBD		CBD	CBD
	Stop location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Near-side	Influenced	Near-side	Near-side	Far-side	Near-side	Near-side	Far-side	Far-side	Far-side	Far-side	Near-side	Far-side	Near-side	Near-side	Near-side	Far-side		Near-side	Far-side
	Bus stop distance to upstream signal (ft)			200																		
v	Curb lane traffic volume (veh/h)	88	135	163	163	311	249	222	200	251	264	200	306	230	450	377	329	200	250		200	509
v_{rt}	Right-turning volume (veh/h)	88	42	29	29	132	114	51	200	44	44	200	30	0	139	30	0	20	80		20	80
v_{ped}	Conflicting pedestrian volume (ped/h)	60	44	27	27	6	10	22	200	27	66	200	0	0	9	16	0	20	41		20	41
	Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random
N_{la}	Number of physical loading areas	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1
	Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear
	Bus lane type	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2	2
Calculations																						
Z	Standard normal variable corresponding to failure rate	1.04	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96		1.96	1.96
$c_{re,1}$	Case 1 re-entry movement capacity (veh/h)	957	892	855	855	685	752	783	809	750	735	809	690	774	555	620	667	809	751		809	507
$d_{re,1}$	Case 1 re-entry delay (s)	38.6	23.6	18.9	18.9	8.3	11.2	13.0	14.8	11.1	10.4	14.8	8.5	12.4	4.7	6.3	7.7	14.8	11.2		14.8	3.8
d_{qs}	Case 2 queue service delay (s)	2.2	1.9	5.5	5.5	6.7	4.9	4.4	0.0	9.5	9.2	0.0	8.7	4.2	21.3	9.8	10.5	0.0	9.9		0.0	24.1
$c_{re,2}$	Case 2 re-entry movement capacity (veh/h)	1041	965	1002	1002	818	860	886	809	972	943	809	868	961	898	782	862	809	968		809	856
d_{gt}	Case 2 gap-in-traffic delay (s)	0.2	0.4	0.3	0.3	1.1	0.9	0.8	1.2	0.4	0.5	1.2	0.9	0.4	0.7	1.3	0.9	1.2	0.4		1.2	0.9
$d_{re,2ns}$	Case 2 re-entry delay for near-side stops (s)	2.4	2.3	5.8	5.8	7.9	5.8	5.2	1.2	9.9	9.7	1.2	9.6	4.6	22.0	11.1	11.4	1.2	10.3		1.2	25.0
$d_{re,2fs}$	Case 2 re-entry delay for far-side stops (s)	0.2	0.5	0.6	0.6	1.6	1.1	1.0	1.2	1.4	1.5	1.2	1.7	0.8	5.6	2.2	2.0	1.2	1.5		1.2	7.1
$d_{re,3}$	Case 3 re-entry delay (s)	0.2	0.5	3.4	0.6	1.6	1.1	1.0	1.2	1.4	1.5	1.2	1.7	0.8	5.6	2.2	2.0	1.2	1.5		1.2	7.1
t_c	Clearance time (s)	10.0	12.3	13.4	15.8	17.9	11.1	15.2	11.2	11.4	11.5	11.2	11.7	14.6	15.6	21.1	21.4	11.2	11.5		11.2	17.1
t_{om}	Operating margin (s)	11.5	10.7	28.6	19.3	20.6	27.5	12.9	3.6	12.9	42.9	9.6	27.8	17.5	13.2	13.5	9.7	8.9	25.7		12.5	25.1
B_l	Loading area design capacity (bus/h)	48	89	27	33	48	47	72	231	43	21	153	37	36	34	54	54	158	28		132	25
N_{el}	Number of effective loading areas	1.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.85	1.00	1.00	1.00	1.00	1.00	1.85	1.00	1.00		1.00	1.00
f_l	Bus stop location factor	0.7	0.7	0.7	0.7	0.7	0.5	0.7	0.7	0.5	0.5	0.5	0.5	0.7	0.5	0.7	0.7	0.7	0.5		0.7	0.5
c_{th}	Through movement capacity (veh/h)	585	1098	630	630	1116	1152	1134	1800	558	666	1800	900	666	522	1062	864	1800	576		1800	576
c_{rt}	Right turn capacity (veh/h)	506	952	551	551	986	1016	994	1436	488	571	1436	798	590	460	934	766	1579	500		1579	500
c_{cl}	Curb lane capacity (veh/h)	506	1052	616	616	1061	1090	1102	1436	546	650	1436	890	666	503	1052	864	1778	552		1778	564
f_{tb}	Traffic blockage adjustment factor	0.88	0.91	0.81	0.81	0.79	0.89	0.86	0.90	0.77	0.80	0.93	0.83	0.76	0.55	0.75	0.73	0.92	0.77		0.92	0.55
Output																						
B_s	***Bus stop capacity (bus/h)***	***73***	***80***	***22***	***27***	***38***	***100***	***62***	***208***	***33***	***30***	***141***	***30***	***27***	***18***	***40***	***72***	***145***	***21***		***121***	***13***
	Bus stop maximum capacity (bus/h)	86	112	36	41	54	66	85	245	48	54	193	49	39	25	52	90	196	36		174	21
B	***Bus facility capacity (bus/h)***	***13***	25																			

Capacity at unsignalized intersections does not affect operating speed thus data for unsignalized intersections are assumed.

Line 1 AM Peak Hour

Southbound/Eastbound Stops

				unsignalized	unsignalized		unsignalized	unsignalized					unsignalized			unsignalized		unsignalized					
		Alcatraz	62nd	60th	59th	57th	Aileen	55th	52nd	50th	45th	44th	40th	Macarthur	36th	34th	32nd	30th	27th	24th	Grand	20th
Inputs		**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
c_v	Coefficient of variation of dwell times	1.51	2.35	4.80	0.74	4.80	2.73	1.84	3.09	1.00	1.18	2.22	1.01	1.07	1.30	2.63	2.42	1.23	2.62	1.43	1.19	1.25
	Failure rate	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	15.0%
t_d	Average dwell time (s) (see Step 0 to calculate, or use default)	15.10	1.39	0.26	11.40	1.25	2.22	3.44	3.86	15.34	7.17	1.28	23.81	8.26	3.63	9.00	1.53	11.48	15.85	22.12	4.01	32.25
g/C	Green time ratio	0.30	1.00	1.00	0.30	1.00	0.48	0.59	0.46	0.37	0.50	1.00	0.37	0.31	1.00	0.63	1.00	0.64	0.35	0.35	0.43	0.49
C	Traffic signal cycle length (s)	90	60	60	90	60	90	90	90	45	85	85	85	85	85	85	85	85	85	85	60	60
	Stop type (on-line/off-line)	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	On-line
	Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro CBD
	Location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Far-side	Near-side	Far-side	Near-side	Far-side
	Bus stop distance to upstream signal (ft)																					
v	Curb lane traffic volume (veh/h)	268	200	200	250	200	381	509	417	310	298	200	312	236	200	241	200	226	202	228	193	227
v_{rt}	Right-turning volume (veh/h)	50	20	20	50	20	0	182	240	64	46	200	139	64	200	26	200	11	91	20	89	75
v_{ped}	Conflicting pedestrian volume (ped/h)	49	20	20	50	20	0	12	7	0	18	200	107	38	200	35	200	14	27	27	43	36
	Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random
N_{la}	Number of physical loading areas	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear
	Bus lane type	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Calculations																						
Z	Standard normal variable corresponding to failure rate	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.04
$c_{re,1}$	Case 1 re-entry movement capacity (veh/h)	731	809	809	751	809	616	507	583	686	698	809	684	767	809	761	809	778	807	776	818	777
$d_{re,1}$	Case 1 re-entry delay (s)	10.2	14.8	14.8	11.2	14.8	6.2	3.8	5.4	8.4	8.8	14.8	8.3	12.0	14.8	11.7	14.8	12.7	14.6	12.6	15.4	12.6
d_{qs}	Case 2 queue service delay (s)	11.0	0.0	0.0	10.2	0.0	12.6	14.5	14.7	5.9	8.4	0.0	11.2	8.9	0.0	4.9	0.0	4.4	7.0	8.0	4.1	5.0
$c_{re,2}$	Case 2 re-entry movement capacity (veh/h)	968	809	809	976	809	830	696	819	920	874	809	919	978	809	870	809	879	982	969	964	924
d_{gt}	Case 2 gap-in-traffic delay (s)	0.4	1.2	1.2	0.4	1.2	1.0	1.9	1.1	0.6	0.8	1.2	0.6	0.4	1.2	0.8	1.2	0.8	0.4	0.4	0.4	0.6
$d_{re,2ns}$	Case 2 re-entry delay for near-side stops (s)	11.4	1.2	1.2	10.6	1.2	13.6	16.4	15.8	6.5	9.3	1.2	11.9	9.2	1.2	5.7	1.2	5.2	7.4	8.4	4.5	5.6
$d_{re,2fs}$	Case 2 re-entry delay for far-side stops (s)	1.7	1.2	1.2	1.5	1.2	2.6	3.9	3.3	1.3	1.6	1.2	2.0	1.3	1.2	1.1	1.2	1.0	0.9	1.1	0.7	1.0
$d_{re,3}$	Case 3 re-entry delay (s)	1.7	1.2	1.2	1.5	1.2	2.6	3.9	3.3	1.3	1.6	1.2	2.0	1.3	1.2	1.1	1.2	1.0	0.9	1.1	0.7	1.0
t_c	Clearance time (s)	21.4	11.2	11.2	20.6	11.2	23.6	26.4	25.8	16.5	19.3	11.2	21.9	19.2	11.2	15.7	11.2	11.0	17.4	11.1	14.5	10.0
t_{om}	Operating margin (s)	44.8	6.4	2.5	16.4	11.8	11.9	12.4	23.4	30.0	16.6	5.6	47.3	17.3	9.2	46.4	7.3	27.7	81.5	61.8	9.3	41.8
B_l	Loading area capacity (bus/h)	15	190	260	27	149	47	52	33	26	46	200	17	29	150	33	181	50	12	16	60	26
N_{el}	Number of effective loading areas	1	1	1	1	1	1	1	1	1	1.85	1	1	1	1	1	1.85	1	1	1	1	1
f_l	Bus stop location factor	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.5	0.7	0.5	0.7	0.5
c_{th}	Through movement capacity (veh/h)	540	1800	1800	540	1800	864	1062	828	666	900	1800	666	558	1800	1134	1800	1152	630	630	774	796
c_{rt}	Right turn capacity (veh/h)	467	1579	1579	467	1579	766	935	731	590	790	1436	559	485	1436	987	1436	1014	551	551	671	698
c_{cl}	Curb lane capacity (veh/h)	526	1778	1778	525	1778	864	1017	772	650	883	1436	618	538	1436	1118	1436	1145	594	623	727	764
f_{tb}	Traffic blockage adjustment factor	0.64	0.92	0.92	0.67	0.92	0.69	0.65	0.62	0.67	0.76	0.90	0.65	0.69	0.90	0.85	0.90	0.90	0.76	0.82	0.81	0.85
Output																						
B_s	***Bus stop capacity (bus/h)***	***9***	***175***	***239***	***17***	***137***	***32***	***33***	***20***	***26***	***85***	***200***	***17***	***29***	***150***	***33***	***334***	***50***	***12***	***16***	***60***	***26***
	Bus stop maximum capacity (bus/h)	16	224	270	24	201	41	42	28	27	89	226	18	27	180	51	395	74	18	25	64	28
B	***Bus facility capacity (bus/h)***	***9***	16																			

Capacity at unsignalized intersections does not affect operating speed thus data for unsignalized intersections are assumed.

Line 1 AM Peak Hour

Step 3: Speed Calculations

		NORTHBOUND				SOUTHBOUND			
Inputs		20th to 31st	31st to 40th	40th to 49th	49th to Alcatraz	Alcatraz to 50th	50th to 49th	40th to 30th	30th to 20th
	Skip-stop operation? (If "Yes", complete Step 2 first)	No	No	No	No	No	No	No	No
	Scheduled buses per hour	10	10	10	10	10	10	10	10
	Average stop spacing (stops/mi)	6.6	6	6.4	7	8	6.4	6	6.6
	Running way type	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic
	Traffic signal pattern	Typical	Typical	Typical	Typical	Typical	Typical	Typical	Typical
d_1	Distance for one-block stop pattern (feet)								
d_2	Distance for multiple block stop pattern (feet)								
v_{max}	Bus running speed on facility (mi/h)	25	25	25	25	25	25	25	25
a	Average bus acceleration rate to running speed (ft/s^2)	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
d	Average bus deceleration rate from running speed (ft/s^2)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Calculations									
t_{dt}	Average dwell time (s)	11.1	10.9	15.1	8.0	6.0	11.9	9.6	17.1
t_{acc}	Acceleration time (s/stop)	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
t_{dec}	Deceleration time (s/stop)	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
L_{ad}	Distance traveled at less than running speed (ft/stop)	367.4	367.4	367.4	367.4	367.4	367.4	367.4	367.4
	Acceleration/deceleration distance per mile (ft/mi)	2425.1	2204.6	2351.6	2572.0	2939.5	2351.6	2204.6	2425.1
L_{rs}	Distance traveled at running speed per mile (ft/mi)	2854.9	3075.4	2928.4	2708.0	2340.5	2928.4	3075.4	2854.9
t_{rs}	Time spent at running speed per mile (s/mi)	77.7	83.7	79.7	73.7	63.7	79.7	83.7	77.7
t_u	Unimpeded bus running time (min/mi)	4.72	4.49	5.07	4.49	4.53	4.73	4.36	5.38
t_l	Base bus running time losses (min/mi)	1.50	1.00	1.50	1.50	1.00	1.00	1.00	1.50
t_r	Base bus running time rate (min/mi)	6.22	5.49	6.57	5.99	5.53	5.73	5.36	6.88
f_s	Stop pattern adjustment factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
v_b/B_{max}	Bus volume to maximum capacity ratio	0.28	0.21	0.26	0.48	0.63	0.56	0.56	0.56
f_{bb}	Bus-bus interference factor	1.00	1.00	1.00	1.00	0.93	0.95	0.95	0.95
Outputs									
S_t	***Average Travel Speed (mi/h)***	***9.6***	***10.9***	***9.1***	***10.0***	***10.1***	***10.0***	***10.7***	***8.3***

1 PM Peak Hour

ıbound/Westbound Stops	20th	Grand	24th	27th	29th	30th	34th	36th	Macarthur	40th	43rd	45th	50th	52nd	55th	Aileen	58th	59th		62nd	Alcatraz
	unsignalized									unsignalized							unsignalized			unsignalized	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**		**19**	**20**
Coefficient of variation of dwell times	0.87	2.71	1.17	2.63	1.39	2.46	1.56	2.27	1.82	1.34	2.64	2.65	1.20	1.48	2.56	3.04	3.26	2.47		2.36	1.31
Failure rate	15.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%		2.5%	2.5%
Average dwell time (s) (see Step 0 to calculate, or use default)	17.10	2.96	11.25	7.89	8.74	9.77	3.36	1.43	6.29	19.32	0.78	4.55	11.74	4.77	2.75	2.67	1.73	10.43		1.62	10.10
Green time ratio	0.36	0.51	0.42	0.42	0.57	0.64	0.63	1.00	0.48	0.34	1.00	0.47	0.43	0.38	0.56	0.64	1.00	0.33		1.00	0.33
Traffic signal cycle length (s)	60	85	85	85	85	85	85	85	85	80	85	80	50	100	100	100	60	95		60	95
Stop type (on-line/off-line)	On-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line		Off-line	Off-line
Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD		Metro non-CBD	Metro non-CBD
Stop location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Near-side	Influenced	Near-side	Near-side	Far-side	Near-side	Near-side	Far-side	Far-side	Far-side	Far-side	Near-side	Far-side	Near-side	Near-side	Near-side	Far-side		Near-side	Far-side
Bus stop distance to upstream signal (ft)			200																		
Curb lane traffic volume (veh/h)	216	226	230	230	306	329	370	200	417	415	200	435	320	531	468	379	200	250		200	386
Right-turning volume (veh/h)	216	80	20	48	60	37	34	200	113	67	200	22	0	139	39	0	20	54		20	54
Conflicting pedestrian volume (ped/h)	60	64	30	30	6	47	27	200	27	68	200	0	0	9	16	0	20	40		20	40
Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random		Random	Random
Number of physical loading areas	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1		1	1
Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear		Linear	Linear
Bus lane type	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		2	2
ations																					
Standard normal variable corresponding to failure rate	1.04	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96		1.96	1.96
Case 1 re-entry movement capacity (veh/h)	790	778	774	774	690	667	626	809	583	585	809	568	676	491	540	618	809	751		809	612
Case 1 re-entry delay (s)	13.5	12.7	12.4	12.4	8.5	7.7	6.5	14.8	5.4	5.4	14.8	5.0	8.0	3.5	4.4	6.2	14.8	11.2		14.8	6.1
Case 2 queue service delay (s)	5.9	6.0	7.3	7.3	7.5	6.8	8.2	0.0	13.4	15.7	0.0	13.5	6.2	26.2	15.6	9.6	0.0	10.3		0.0	17.5
Case 2 re-entry movement capacity (veh/h)	972	920	945	945	841	796	770	809	811	882	809	805	889	810	740	759	809	965		809	904
Case 2 gap-in-traffic delay (s)	0.4	0.6	0.5	0.5	1.0	1.2	1.4	1.2	1.1	0.8	1.2	1.2	0.8	1.1	1.6	1.4	1.2	0.4		1.2	0.7
Case 2 re-entry delay for near-side stops (s)	6.3	6.6	7.8	7.8	8.5	8.0	9.5	1.2	14.6	16.5	1.2	14.7	6.9	27.3	17.2	11.0	1.2	10.7		1.2	18.2
Case 2 re-entry delay for far-side stops (s)	1.0	1.0	1.1	1.1	1.6	1.7	2.0	1.2	3.1	3.7	1.2	3.3	1.4	7.7	3.8	2.2	1.2	1.5		1.2	3.8
Case 3 re-entry delay (s)	1.0	1.0	2.8	1.1	1.6	1.7	2.0	1.2	3.1	3.7	1.2	3.3	1.4	7.7	3.8	2.2	1.2	1.5		1.2	3.8
Clearance time (s)	10.0	16.6	12.8	17.8	18.5	11.7	19.5	11.2	13.1	13.7	11.2	13.3	16.9	17.7	27.2	21.0	11.2	11.5		11.2	13.8
Operating margin (s)	15.5	15.7	25.7	40.7	23.8	47.1	10.3	6.3	22.4	50.6	4.0	23.6	27.5	13.9	13.8	15.9	11.1	50.5		7.5	26.0
Loading area design capacity (bus/h)	41	54	35	24	44	35	71	190	45	17	225	43	31	40	47	60	150	18		178	27
Number of effective loading areas	1.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00
Bus stop location factor	0.7	0.7	0.7	0.7	0.7	0.5	0.7	0.7	0.5	0.5	0.5	0.5	0.7	0.5	0.7	0.7	0.7	0.5		0.7	0.5
Through movement capacity (veh/h)	582	911	752	752	1027	1154	1133	1800	858	619	1800	844	774	675	999	1152	1800	594		1800	587
Right turn capacity (veh/h)	504	781	656	656	907	999	990	1436	750	530	1436	748	686	595	878	1021	1579	516		1579	510
Curb lane capacity (veh/h)	504	865	743	732	1004	1137	1120	1436	828	604	1436	839	774	654	989	1152	1778	577		1778	577
Traffic blockage adjustment factor	0.70	0.82	0.78	0.78	0.79	0.86	0.77	0.90	0.75	0.66	0.93	0.74	0.71	0.59	0.67	0.77	0.92	0.78		0.92	0.67
t																					
Bus stop capacity (bus/h)	***50***	***43***	***27***	***18***	***34***	***100***	***54***	***171***	***33***	***21***	***209***	***32***	***22***	***24***	***31***	***45***	***138***	***14***		***163***	***18***
Bus stop maximum capacity (bus/h)	60	63	44	33	51	57	69	220	53	39	251	53	34	33	39	62	198	28		215	30

Capacity at unsignalized intersections does not affect operating speed thus data for unsignalized intersections are assumed.

1 PM Peak Hour		unsignalized	unsignalized		unsignalized						unsignalized			unsignalized		unsignalized					
nbound/Eastbound Stops	Alcatraz	62nd	60th	59th	57th	Aileen	55th	52nd	50th	45th	44th	40th	Macarthur	36th	34th	32nd	30th	27th	24th	Grand	20th
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Coefficient of variation of dwell times	1.52	1.22	1.32	1.07	2.65	5.10	1.69	2.07	1.27	1.67	1.19	0.85	1.01	1.75	1.75	1.80	1.52	1.11	1.14	2.28	0.98
Failure rate	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	15.0%
Average dwell time (s) (see Step 0 to calculate, or use default)	13.92	4.02	4.44	7.05	0.95	0.28	4.25	8.14	28.28	4.04	3.49	31.77	9.48	5.10	12.99	2.70	15.46	18.94	12.39	5.05	34.10
Green time ratio	0.33	1.00	1.00	0.33	1.00	0.64	0.56	0.56	0.43	0.47	1.00	0.34	0.48	1.00	0.63	1.00	0.64	0.42	0.42	0.30	0.49
Traffic signal cycle length (s)	95	60	60	95	60	100	100	100	50	80	85	80	85	85	85	85	85	85	85	85	60
Stop type (on-line/off-line)	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro CBD
Location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Near-side	Far-side	Near-side	Far-side	Near-side	Far-side
Bus stop distance to upstream signal (ft)																					
Curb lane traffic volume (veh/h)	424	200	200	250	200	614	507	485	314	283	200	296	257	200	285	200	385	383	210	237	172
Right-turning volume (veh/h)	86	20	20	86	20	0	106	256	68	46	200	154	60	200	41	200	13	290	20	161	80
Conflicting pedestrian volume (ped/h)	37	20	20	37	20	0	12	7	0	18	200	191	38	200	30	200	9	52	52	59	36
Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random	Random
Number of physical loading areas	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear	Linear
Bus lane type	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
ations																					
Standard normal variable corresponding to failure rate	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.04
Case 1 re-entry movement capacity (veh/h)	577	809	809	751	809	432	509	526	682	714	809	701	743	809	712	809	612	614	797	766	844
Case 1 re-entry delay (s)	5.2	14.8	14.8	11.2	14.8	2.6	3.8	4.1	8.2	9.5	14.8	8.9	10.8	14.8	9.4	14.8	6.1	6.1	13.9	12.0	17.8
Case 2 queue service delay (s)	19.7	0.0	0.0	10.3	0.0	18.6	17.4	16.4	6.0	7.9	0.0	10.3	7.4	0.0	5.9	0.0	8.3	13.4	6.5	9.0	3.6
Case 2 re-entry movement capacity (veh/h)	888	809	809	965	809	605	716	729	892	895	809	937	909	809	835	809	754	859	957	981	962
Case 2 gap-in-traffic delay (s)	0.8	1.2	1.2	0.4	1.2	2.7	1.7	1.6	0.7	0.7	1.2	0.5	0.7	1.2	1.0	1.2	1.5	0.9	0.5	0.4	0.4
Case 2 re-entry delay for near-side stops (s)	20.5	1.2	1.2	10.7	1.2	21.3	19.2	18.1	6.8	8.7	1.2	10.9	8.1	1.2	6.9	1.2	9.8	14.3	7.0	9.4	4.1
Case 2 re-entry delay for far-side stops (s)	4.7	1.2	1.2	1.5	1.2	5.6	4.5	4.1	1.4	1.4	1.2	1.8	1.3	1.2	1.4	1.2	2.1	2.9	0.9	1.3	0.6
Case 3 re-entry delay (s)	4.7	1.2	1.2	1.5	1.2	5.6	4.5	4.1	1.4	1.4	1.2	1.8	1.3	1.2	1.4	1.2	2.1	2.9	0.9	1.3	0.6
Clearance time (s)	30.5	11.2	11.2	20.7	11.2	31.3	29.2	28.1	16.8	18.7	11.2	20.9	18.1	11.2	16.9	11.2	12.1	24.3	10.9	19.4	10.6
Operating margin (s)	41.4	9.6	11.5	14.8	4.9	2.8	14.1	33.1	70.5	13.2	8.1	52.6	18.8	17.5	44.5	9.5	45.9	41.3	27.7	22.6	34.5
Loading area capacity (bus/h)	15	145	133	31	212	67	44	30	16	50	158	15	41	107	33	154	34	20	34	25	29
Number of effective loading areas	1	1	1	1	1	1	1	1	1	1.85	1	1	1	1	1	1	1	1	1	1	1
Bus stop location factor	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.5	0.7	0.5	0.7	0.5
Through movement capacity (veh/h)	587	1800	1800	594	1800	1152	999	999	774	844	1800	619	858	1800	1133	1800	1154	752	752	540	799
Right turn capacity (veh/h)	511	1579	1579	517	1579	1021	880	882	686	741	1436	496	746	1436	989	1436	1018	649	649	464	700
Curb lane capacity (veh/h)	572	1778	1778	567	1778	1152	974	937	755	827	1436	555	831	1436	1112	1436	1150	674	742	489	753
Traffic blockage adjustment factor	0.48	0.92	0.92	0.69	0.92	0.63	0.64	0.64	0.71	0.76	0.90	0.63	0.78	0.90	0.82	0.90	0.83	0.60	0.86	0.66	0.89
t																					
Bus stop capacity (bus/h)	***7***	***133***	***122***	***21***	***194***	***42***	***27***	***19***	***16***	***92***	***158***	***15***	***41***	***107***	***33***	***154***	***34***	***20***	***34***	***25***	***29***
Bus stop maximum capacity (bus/h)	11	179	169	29	240	44	34	28	20	94	186	15	46	145	45	189	50	19	50	24	31
Bus facility capacity (bus/h)	***7***	11																			

Capacity at unsignalized intersections does not affect operating speed thus data for unsignalized intersections are assumed.

Line 1 PM Peak Hour

Step 3: Speed Calculations

Inputs		NORTHBOUND				SOUTHBOUND			
		20th to 31st	31st to 40th	40th to 49th	49th to Alcatraz	Alcatraz to 50th	50th to 49th	40th to 30th	30th to 20th
	Skip-stop operation? (If "Yes", complete Step 2 first)	No	No	No	No	No	No	No	No
	Scheduled buses per hour	10	10	10	10	10	10	10	10
	Average stop spacing (stops/mi)	6.6	6	6.4	7	8	6.4	6	6.6
	Running way type	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic
	Traffic signal pattern	Typical	Typical	Typical	Typical	Typical	Typical	Typical	Typical
d_1	Distance for one-block stop pattern (feet)								
d_2	Distance for multiple block stop pattern (feet)								
v_{max}	Bus running speed on facility (mi/h)	25	25	25	25	25	25	25	25
a	Average bus acceleration rate to running speed (ft/s^2)	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
d	Average bus deceleration rate from running speed (ft/s^2)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Calculations									
t_{dt}	Average dwell time (s)	9.6	8.0	9.1	5.7	7.9	16.9	12.9	17.2
t_{acc}	Acceleration time (s/stop)	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
t_{dec}	Deceleration time (s/stop)	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
L_{ad}	Distance traveled at less than running speed (ft/stop)	367.4	367.4	367.4	367.4	367.4	367.4	367.4	367.4
	Acceleration/deceleration distance per mile (ft/mi)	2425.1	2204.6	2351.6	2572.0	2939.5	2351.6	2204.6	2425.1
L_{rs}	Distance traveled at running speed per mile (ft/mi)	2854.9	3075.4	2928.4	2708.0	2340.5	2928.4	3075.4	2854.9
t_{rs}	Time spent at running speed per mile (s/mi)	77.7	83.7	79.7	73.7	63.7	79.7	83.7	77.7
t_u	Unimpeded bus running time (min/mi)	4.55	4.20	4.43	4.23	4.78	5.26	4.69	5.39
t_l	Base bus running time losses (min/mi)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
t_r	Base bus running time rate (min/mi)	6.05	5.70	5.93	5.73	6.28	6.76	6.19	6.89
f_s	Stop pattern adjustment factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
v_b/B_{max}	Bus volume to maximum capacity ratio	0.30	0.26	0.29	0.36	0.50	0.67	0.67	0.53
f_{bb}	Bus-bus interference factor	1.00	1.00	1.00	1.00	0.97	0.91	0.91	0.96
Outputs									
S_t	**Average Travel Speed (mi/h)**	**9.9**	**10.5**	**10.1**	***10.5***	***9.3***	***8.0***	***8.8***	***8.4***

Step 1: Capacity Calculations

Line 1R AM Peak Hour

Northbound/Westbound Stops		20th	24th	31st	40th	50th	59th	Alcatraz
Inputs		**1**	**2**	**3**	**4**	**5**	**6**	**7**
c_v	Coefficient of variation of dwell times	0.84	0.76	0.66	0.75	0.45	0.86	0.66
	Failure rate	15.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
t_d	Average dwell time (s) (see Step 0 to calculate, or use default)	25.69	13.80	19.37	31.55	22.13	13.10	12.20
g/C	Green time ratio	0.36	0.35	0.64	0.37	0.37	0.32	0.32
C	Traffic signal cycle length (s)	60	85	85	85	45	90	90
	Stop type (on-line/off-line)	On-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
	Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD
	Stop location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Influenced	Far-side	Far-side	Near-side	Far-side	Far-side
	Bus stop distance to upstream signal (ft)		200					
v	Curb lane traffic volume (veh/h)	88	163	249	264	230	250	509
v_{rt}	Right-turning volume (veh/h)	88	29	114	44	0	80	80
v_{ped}	Conflicting pedestrian volume (ped/h)	60	27	10	66	0	41	41
	Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random
N_{la}	Number of physical loading areas	2	1	1	2	1	1	1
	Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear
	Bus lane type	2	2	2	2	2	2	2
Calculations								
Z	Standard normal variable corresponding to failure rate	1.04	1.96	1.96	1.96	1.96	1.96	1.96
$c_{re,1}$	Case 1 re-entry movement capacity (veh/h)	957	855	752	735	774	751	507
$d_{re,1}$	Case 1 re-entry delay (s)	38.6	18.9	11.2	10.4	12.4	11.2	3.8
d_{qs}	Case 2 queue service delay (s)	2.2	5.5	4.9	9.2	4.2	9.9	24.1
$c_{re,2}$	Case 2 re-entry movement capacity (veh/h)	1041	1002	860	943	961	968	856
d_{gt}	Case 2 gap-in-traffic delay (s)	0.2	0.3	0.9	0.5	0.4	0.4	0.9
$d_{re,2ns}$	Case 2 re-entry delay for near-side stops (s)	2.4	5.8	5.8	9.7	4.6	10.3	25.0
$d_{re,2fs}$	Case 2 re-entry delay for far-side stops (s)	0.2	0.6	1.1	1.5	0.8	1.5	7.1
$d_{re,3}$	Case 3 re-entry delay (s)	0.2	3.4	1.1	1.5	0.8	1.5	7.1
t_c	Clearance time (s)	10.0	13.4	11.1	11.5	14.6	11.5	17.1
t_{om}	Operating margin (s)	22.4	20.7	24.9	46.6	19.7	22.1	15.8
B_l	Loading area design capacity (bus/h)	31	32	48	19	31	31	31
N_{el}	Number of effective loading areas	1.75	1.00	1.00	1.85	1.00	1.00	1.00
f_l	Bus stop location factor	0.7	0.7	0.5	0.5	0.7	0.5	0.5
c_{th}	Through movement capacity (veh/h)	585	630	1152	666	666	576	576
c_{rt}	Right turn capacity (veh/h)	506	551	1016	571	590	500	500
c_{cl}	Curb lane capacity (veh/h)	506	616	1090	650	666	552	564
f_{tb}	Traffic blockage adjustment factor	0.88	0.81	0.89	0.80	0.76	0.77	0.55
Output								
B_s	***Bus stop capacity (bus/h)***	***47***	***26***	***42***	***28***	***23***	***23***	***17***
	Bus stop maximum capacity (bus/h)	58	40	63	50	34	38	23
B	***Bus facility capacity (bus/h)***	***17***	23					

Line 1R AM Peak Hour

Southbound/Eastbound Stops		Alcatraz	59th	50th	40th	31st	24th	20th
Inputs		**1**	**2**	**1**	**2**	**3**	**4**	**5**
c_v	Coefficient of variation of dwell times	0.89	0.85	0.67	0.53	0.61	1.20	0.63
	Failure rate	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	15.0%
t_d	Average dwell time (s) (see Step 0 to calculate, or use default)	11.10	7.60	20.50	21.74	12.33	20.58	19.83
g/C	Green time ratio	0.30	0.30	0.37	0.37	0.64	0.35	0.49
C	Traffic signal cycle length (s)	90	90	45	85	85	85	60
	Stop type (on-line/off-line)	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	On-line
	Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro CBD
	Location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Far-side	Near-side	Near-side	Near-side	Far-side	Far-side
	Bus stop distance to upstream signal (ft)							
v	Curb lane traffic volume (veh/h)	268	200	310	312	226	228	227
v_{rt}	Right-turning volume (veh/h)	50	50	64	139	11	20	75
v_{ped}	Conflicting pedestrian volume (ped/h)	49	49	0	107	14	27	36
	Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random
N_{la}	Number of physical loading areas	1	1	1	1	1	1	2
	Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear
	Bus lane type	2	2	2	2	2	2	2
Calculations								
Z	Standard normal variable corresponding to failure rate	1.96	1.96	1.96	1.96	1.96	1.96	1.04
$c_{re,1}$	Case 1 re-entry movement capacity (veh/h)	731	809	686	684	778	776	777
$d_{re,1}$	Case 1 re-entry delay (s)	10.2	14.8	8.4	8.3	12.7	12.6	12.7
d_{qs}	Case 2 queue service delay (s)	11.0	7.9	5.9	11.2	4.4	8.0	5.0
$c_{re,2}$	Case 2 re-entry movement capacity (veh/h)	968	998	920	919	879	969	924
d_{gt}	Case 2 gap-in-traffic delay (s)	0.4	0.3	0.6	0.6	0.8	0.4	0.6
$d_{re,2ns}$	Case 2 re-entry delay for near-side stops (s)	11.4	8.2	6.5	11.9	5.2	8.4	5.6
$d_{re,2fs}$	Case 2 re-entry delay for far-side stops (s)	1.7	1.0	1.3	2.0	1.0	1.1	1.0
$d_{re,3}$	Case 3 re-entry delay (s)	1.7	1.0	1.3	2.0	1.0	1.1	1.0
t_c	Clearance time (s)	21.4	11.0	16.5	21.9	15.2	11.1	10.0
t_{om}	Operating margin (s)	19.4	12.7	26.8	22.5	14.7	48.5	13.0
B_l	Loading area capacity (bus/h)	24	42	26	25	61	19	54
N_{el}	Number of effective loading areas	1	1	1	1	1	1	1.75
f_l	Bus stop location factor	0.7	0.5	0.7	0.7	0.7	0.5	0.5
c_{th}	Through movement capacity (veh/h)	540	540	666	666	1152	630	796
c_{rt}	Right turn capacity (veh/h)	467	467	590	559	1014	551	698
c_{cl}	Curb lane capacity (veh/h)	526	522	650	618	1145	623	764
f_{tb}	Traffic blockage adjustment factor	0.64	0.81	0.67	0.65	0.86	0.82	0.85
Output								
B_s	***Bus stop capacity (bus/h)***	***15***	***33***	***17***	***16***	***52***	***15***	***80***
	Bus stop maximum capacity (bus/h)	22	49	26	22	70	29	93
B	***Bus facility capacity (bus/h)***	***15***	22					

Line 1R AM Peak Hour

Step 3: Speed Calculations

Inputs		NORTHBOUND 20th-31st	31st-40th	40th-49th	49th-Alcatraz	SOUTHBOUND Alcatraz-50th	50th-49th	40th-31st	31st-20th
	Skip-stop operation? (If "Yes", complete Step 2 first)	No	No	No	No	No	No	No	No
	Scheduled buses per hour	10	10	10	10	10	10	10	10
	Average stop spacing (stops/mi)	2.64	1.53	2.13	2	2.07	2.13	1.53	2.64
	Running way type	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic
	Traffic signal pattern	Typical	Typical	Typical	Typical	Typical	Typical	Typical	Typical
d_1	Distance for one-block stop pattern (feet)								
d_2	Distance for multiple block stop pattern (feet)								
v_{max}	Bus running speed on facility (mi/h)	25	25	25	25	25	25	25	25
a	Average bus acceleration rate to running speed (ft/s^2)	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
d	Average bus deceleration rate from running speed (ft/s^2)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Calculations									
t_{dt}	Average dwell time (s)	19.6	25.5	26.8	15.8	13.1	21.1	17.0	17.6
t_{acc}	Acceleration time (s/stop)	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
t_{dec}	Deceleration time (s/stop)	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
L_{ad}	Distance traveled at less than running speed (ft/stop)	367.4	367.4	367.4	367.4	367.4	367.4	367.4	367.4
	Acceleration/deceleration distance per mile (ft/mi)	970.0	562.2	782.6	734.9	760.6	782.6	562.2	970.0
L_{rs}	Distance traveled at running speed per mile (ft/mi)	4310.0	4717.8	4497.4	4545.1	4519.4	4497.4	4717.8	4310.0
t_{rs}	Time spent at running speed per mile (s/mi)	117.3	128.4	122.4	123.7	123.0	122.4	128.4	117.3
t_u	Unimpeded bus running time (min/mi)	3.70	3.30	3.70	3.25	3.19	3.50	3.08	3.61
t_l	Base bus running time losses (min/mi)	1.50	1.00	1.50	1.50	1.00	1.00	1.00	1.50
t_r	Base bus running time rate (min/mi)	5.20	4.30	5.20	4.75	4.19	4.50	4.08	5.11
f_s	Stop pattern adjustment factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
v_b/B_{max}	Bus volume to maximum capacity ratio	0.25	0.20	0.29	0.43	0.45	0.45	0.45	0.34
f_{bb}	Bus-bus interference factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Outputs									
S_t	***Average Travel Speed (mi/h)***	***11.5***	***14.0***	***11.5***	***12.6***	***14.3***	***13.3***	***14.7***	***11.7***

Step 1: Capacity Calculations

Line 1R PM Peak Hour

Northbound/Westbound Stops		20th	24th	31st	40th	50th	59th	Alcatraz
Inputs		**1**	**2**	**3**	**4**	**5**	**6**	**7**
c_v	Coefficient of variation of dwell times	0.59	1.19	1.61	0.79	0.92	1.00	0.68
	Failure rate	15.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
t_d	Average dwell time (s) (see Step 0 to calculate, or use default)	22.93	19.69	18.09	19.74	16.20	7.90	8.20
g/C	Green time ratio	0.36	0.42	0.64	0.34	0.43	0.33	0.33
C	Traffic signal cycle length (s)	60	85	85	80	50	95	95
	Stop type (on-line/off-line)	On-line	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line
	Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro CBD	Metro non-CBD	CBD	CBD	CBD	CBD	Metro non-CBD
	Stop location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Influenced	Far-side	Far-side	Near-side	Far-side	Far-side
	Bus stop distance to upstream signal (ft)		200					
v	Curb lane traffic volume (veh/h)	216	230	329	415	320	250	386
v_{rt}	Right-turning volume (veh/h)	216	20	37	67	0	54	54
v_{ped}	Conflicting pedestrian volume (ped/h)	60	30	47	68	0	40	40
	Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random
N_{la}	Number of physical loading areas	2	1	1	2	1	1	1
	Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear
	Bus lane type	2	2	2	2	2	2	2
Calculations								
Z	Standard normal variable corresponding to failure rate	1.04	1.96	1.96	1.96	1.96	1.96	1.96
$c_{re,1}$	Case 1 re-entry movement capacity (veh/h)	790	774	667	585	676	751	612
$d_{re,1}$	Case 1 re-entry delay (s)	13.5	12.4	7.7	5.4	8.0	11.2	6.1
d_{qs}	Case 2 queue service delay (s)	5.9	7.3	6.8	15.7	6.2	10.3	17.5
$c_{re,2}$	Case 2 re-entry movement capacity (veh/h)	972	945	796	882	889	965	904
d_{gt}	Case 2 gap-in-traffic delay (s)	0.4	0.5	1.2	0.8	0.8	0.4	0.7
$d_{re,2ns}$	Case 2 re-entry delay for near-side stops (s)	6.3	7.8	8.0	16.5	6.9	10.7	18.2
$d_{re,2fs}$	Case 2 re-entry delay for far-side stops (s)	1.0	1.1	1.7	3.7	1.4	1.5	3.8
$d_{re,3}$	Case 3 re-entry delay (s)	1.0	2.8	1.7	3.7	1.4	1.5	3.8
t_c	Clearance time (s)	10.0	12.8	11.7	13.7	16.9	11.5	13.8
t_{om}	Operating margin (s)	14.1	45.9	56.9	30.5	29.1	15.5	10.9
B_l	Loading area design capacity (bus/h)	40	22	29	24	29	40	43
N_{el}	Number of effective loading areas	1.75	1.00	1.00	1.85	1.00	1.00	1.00
f_l	Bus stop location factor	0.7	0.7	0.5	0.5	0.7	0.5	0.5
c_{th}	Through movement capacity (veh/h)	582	752	1154	619	774	594	587
c_{rt}	Right turn capacity (veh/h)	504	656	999	530	686	516	510
c_{cl}	Curb lane capacity (veh/h)	504	743	1137	604	774	577	577
f_{tb}	Traffic blockage adjustment factor	0.70	0.78	0.86	0.66	0.71	0.78	0.67
Output								
B_s	***Bus stop capacity (bus/h)***	***48***	***17***	***24***	***29***	***20***	***100***	***28***
	Bus stop maximum capacity (bus/h)	57	31	46	48	32	47	38
B	***Bus facility capacity (bus/h)***	***17***	31					

Line 1R PM Peak Hour

Southbound/Eastbound Stops

		Alcatraz	59th	50th	40th	31st	24th	20th
Inputs		**1**	**2**	**3**	**4**	**5**	**6**	**7**
c_v	Coefficient of variation of dwell times	1.13	1.05	0.77	0.93	0.69	1.63	1.12
	Failure rate	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	15.0%
t_d	Average dwell time (s) (see Step 0 to calculate, or use default)	11.90	8.40	21.97	28.86	10.68	18.10	31.37
g/C	Green time ratio	0.33	0.33	0.43	0.34	0.64	0.42	0.49
C	Traffic signal cycle length (s)	95	95	50	80	85	85	60
	Stop type (on-line/off-line)	Off-line	Off-line	Off-line	Off-line	Off-line	Off-line	On-line
	Area type (metro CBD, metro non-CBD, other CBD, other non-CBD)	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro non-CBD	Metro CBD
	Location (near-side at signal, far-side at signal, influenced by signal, not influenced by signal)	Near-side	Far-side	Near-side	Near-side	Near-side	Far-side	Far-side
	Bus stop distance to upstream signal (ft)							
v	Curb lane traffic volume (veh/h)	424	200	314	296	326	210	172
v_{rt}	Right-turning volume (veh/h)	86	86	68	154	13	20	80
v_{ped}	Conflicting pedestrian volume (ped/h)	37	37	0	191	9	52	36
	Arrival type (random/typical/platooned)	Random	Random	Random	Random	Random	Random	Random
N_{la}	Number of physical loading areas	1	1	1	1	1	1	2
	Loading area design (linear/non-linear)	Linear	Linear	Linear	Linear	Linear	Linear	Linear
	Bus lane type	2	2	2	2	2	2	2
Calculations								
Z	Standard normal variable corresponding to failure rate	1.96	1.96	1.96	1.96	1.96	1.96	1.04
$c_{re,1}$	Case 1 re-entry movement capacity (veh/h)	577	809	682	701	670	797	844
$d_{re,1}$	Case 1 re-entry delay (s)	5.2	14.8	8.2	8.9	7.8	13.9	17.9
d_{qs}	Case 2 queue service delay (s)	19.7	8.0	6.0	10.3	6.7	6.5	3.6
$c_{re,2}$	Case 2 re-entry movement capacity (veh/h)	888	989	892	937	798	957	962
d_{gt}	Case 2 gap-in-traffic delay (s)	0.8	0.3	0.7	0.5	1.2	0.5	0.5
$d_{re,2ns}$	Case 2 re-entry delay for near-side stops (s)	20.5	8.3	6.8	10.9	8.0	7.0	4.1
$d_{re,2fs}$	Case 2 re-entry delay for far-side stops (s)	4.7	1.0	1.4	1.8	1.7	0.9	0.6
$d_{re,3}$	Case 3 re-entry delay (s)	4.7	1.0	1.4	1.8	1.7	0.9	0.6
t_c	Clearance time (s)	30.5	11.0	16.8	20.9	18.0	10.9	10.0
t_{om}	Operating margin (s)	26.4	17.3	33.0	52.7	14.4	57.7	36.6
B_l	Loading area capacity (bus/h)	19	38	26	15	59	20	29
N_{el}	Number of effective loading areas	1	1	1	1	1	1	1.75
f_l	Bus stop location factor	0.7	0.5	0.7	0.7	0.7	0.5	0.5
c_{th}	Through movement capacity (veh/h)	587	594	774	619	1154	752	799
c_{rt}	Right turn capacity (veh/h)	511	517	686	496	1018	649	700
c_{cl}	Curb lane capacity (veh/h)	572	561	755	555	1149	742	753
f_{tb}	Traffic blockage adjustment factor	0.48	0.82	0.71	0.63	0.80	0.86	0.89
Output								
B_s	***Bus stop capacity (bus/h)***	***9***	***31***	***18***	***9***	***47***	***16***	***44***
	Bus stop maximum capacity (bus/h)	13	49	29	15	62	33	55
B	***Bus facility capacity (bus/h)***	***9***	13					

Line 1R PM Peak Hour

Step 3: Speed Calculations

Inputs		NORTHBOUND 20th-31st	31st-40th	40th-49th	49th-Alcatraz	SOUTHBOUND Alcatraz-50th	50th-49th	40th-31st	31st-20th
	Skip-stop operation? (If "Yes", complete Step 2 first)	No	No	No	No	No	No	No	No
	Scheduled buses per hour	10	10	10	10	10	10	10	10
	Average stop spacing (stops/mi)	2.64	1.53	2.13	2	2.07	2.13	1.53	2.64
	Running way type	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic	Mixed traffic
	Traffic signal pattern	Typical	Typical	Typical	Typical	Typical	Typical	Typical	Typical
d_1	Distance for one-block stop pattern (feet)								
d_2	Distance for multiple block stop pattern (feet)								
v_{max}	Bus running speed on facility (mi/h)	25	25	25	25	25	25	25	25
a	Average bus acceleration rate to running speed (ft/s^2)	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
d	Average bus deceleration rate from running speed (ft/s^2)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Calculations									
t_{dt}	Average dwell time (s)	20.2	18.9	18.0	10.8	14.1	25.4	19.8	20.1
t_{acc}	Acceleration time (s/stop)	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
t_{dec}	Deceleration time (s/stop)	9.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2
L_{ad}	Distance traveled at less than running speed (ft/stop)	367.4	367.4	367.4	367.4	367.4	367.4	367.4	367.4
	Acceleration/deceleration distance per mile (ft/mi)	970.0	562.2	782.6	734.9	760.6	782.6	562.2	970.0
L_{rs}	Distance traveled at running speed per mile (ft/mi)	4310.0	4717.8	4497.4	4545.1	4519.4	4497.4	4717.8	4310.0
t_{rs}	Time spent at running speed per mile (s/mi)	117.3	128.4	122.4	123.7	123.0	122.4	128.4	117.3
t_u	Unimpeded bus running time (min/mi)	3.72	3.13	3.39	3.09	3.23	3.65	3.15	3.72
t_l	Base bus running time losses (min/mi)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
t_r	Base bus running time rate (min/mi)	5.22	4.63	4.89	4.59	4.73	5.15	4.65	5.22
f_s	Stop pattern adjustment factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
v_b/B_{max}	Bus volume to maximum capacity ratio	0.32	0.22	0.31	0.31	0.77	0.67	0.67	0.30
f_{bb}	Bus-bus interference factor	1.00	1.00	1.00	1.00	0.83	0.91	0.91	1.00
Outputs									
S_t	***Average Travel Speed (mi/h)***	**11.5**	**13.0**	**12.3**	**13.1**	**10.6**	**10.6**	**11.7**	**11.5**

Appendix C

Crossing Tool

Summary Data

Intersection:	Telegraph/24th	**Date:**	12/13/2013
Scenario:	Existing Conditions	**Analyst:**	CN

Step 1: Identify Crossing Type

Crossing Type	4-lane undivided
Two-stage Crossing Calcs Apply?	No
Note: Two-stage crossing calculation applied at all divided roadways	

Step 2: Determine Critical Headway

		Stage 1	Stage 2
L	Crossing distance (ft)	70	
S_p	Average pedestrian speed (ft/s)	3.5	
t_s	Pedestrian start-up time and end clearance time (s)	3	
t_c	Critical headway for pedestrian crossing	23.0	
Note: Platooning effects ignored. $t_{c,G}$ assumed to equal t_c			

Step 3: Estimate Probability of a Delayed Crossing

	Conflicting Vehicles/hr for each stage	1,109	
C	Number of lanes crossed	4	
v	Vehicular flow rate (veh/s)	0.31	
P_b	Probability of a blocked lane	0.83	
P_d	Probability of a delayed crossing	1.00	

Step 4: Calculate Average Delay to Wait for an Adequate Gap

d_g	Average pedestrian gap delay (s)	3850.5	
d_{gd}	Average gap delay for pedestrians who incur non-zero delay	3853.7	

Step 5: Estimate Delay Reduction due to Yielding Vehicles

M_y	Motorist Yield Rate	22%	
Note: See table to right for default HCM 2010 yield rate data based on national research			
h	Average headway for each through lane	13.0	
n	Average number of crossing events before an adequate gap is available	296	
$P(Y_1)$	Probability that motorists yield to pedestrian on crossing event i	0.01	
$P(Y_2)$		0.01	0.00
:			
:			
$P(Y_n)$		1.89E-04	N/A
Note: Full iterations shown on "crossing event calculation" tab			
d_p	Average pedestrian delay for each stage (s)	869.2	

Step 6: Calculate Average Pedestrian Delay and Determine LOS

d_p	Average pedestrian delay (s)	869.2
	Ped LOS	***F***

XWalk+ Crosswalk Treatment Indentification Tool

FEHR & PEERS

Input instructions (refer to Field Visit Checklist for data collection guidelines):

1. Enter the name of the intersection above the Inputs Table
2. An input value is required for every category except Fields 4, 5, 10, and 11 (which are required only if a median refuge island is present), and Field 26
3. Refer to the Documentation tab for more detailed descriptions of inputs and calculations.
4. There are available defaults for Fields 6, 7, 8, and 13, as listed in the "description" section
5. Select inputs for Fields 14-25 from the drop-down menus
6. Refer to the User's Guide for pedestrian crossing treatment descriptions and additional guidelines

Intersection: 24th Street/Telegraph Avenue

required input
optional/default input (update if location-specific data is available)
required only when a median refuge island is present

INPUTS

FIELD	CATEGORY	INPUT	UNITS	DESCRIPTION/ NOTES
1	Speed Limit	25	mph	Posted or statutory speed limit or the 85th percentile speed on the major street
2	Peak Hour Pedestrian Volume	30	ped/h	Number of pedestirans crossing the major roadway in a peak hour
3	Major Road Peak Hour Volume (Total)	1109	veh/h	Total number of vehicles and bicylists on both approaches during the peak hour
4	Major Road Peak Hour Volume Direction 1		veh/h	Include only if a painted or raised median is present (min of 6 feet wide)
5	Major Road Peak Hour Volume Direction 2		veh/h	Include only if a painted or raised median is present (min of 6 feet wide)
6	Average Pedestrian Walking Speed	3.5	ft/s	Average pedestrian walking speed, default speet = 3.5 feet/second
7	15th Percentile Crossing Speed	3	ft/s	Speed for the slowest 15% of pedestrians; default speed = 3 feet/second
8	Pedestrian start-up time and end clearance time	3	s	The *Highway Capacity Manual* suggests 3 seconds
9	Pedestrian Crossing Distance (curb to curb)	70	ft	Distance between the near and far curbs
10	First Half Crossing Distance		ft	Distance between the near curb and a painted or raised median refuge island
11	Second Half Crossing Distance		ft	Distance between a painted or raised median refuge island and the far curb
12	Number of Lanes (total both directions)	4	Lanes	Number of lanes on major roadway
13	Expected Motorist Compliance	Low		Typical motorist compliance, default = Low
14	Is frequent at-grade transit present?	Yes		Does frequent surface transit run along major or minor road at the intersection?
15	Are bicycle lanes present?	No		
16	Is there heavy bicycle traffic?	Yes		
17	Is there a clear major and minor road?	Yes		Is there a clear differentiation in the traffic volume between the two roads?
18	Is this a midblock location or off-set intersection?	Yes		
19	Is there heavy truck traffic?	No		
20	Does existing infrastructure limit potential treatments?	No		Are there storm drains, poles, or other permanent structures at any corner of the intersection?
21	Is there on-street parking at the location?	Yes		
22	Is the location in a downtown area?	Yes		
23	Is it located within the built-up area of an isolated community?	No		Does the community have a population of less than 10,000?
24	Is a median refuge island present?	No		Does the refuge island have a width of at least 6 feet to accommodate pedestrian queues?
25	Is there sufficient width to accommodate a median?	Yes		At least 4 feet (with lane widths reduced to 10 or 11 feet)
26	Actual Total Pedestrian Delay		s	Optional (if calcuated at the site)

OUTPUTS

Signalized Crossing or Unsignalized Crossing?	**HAWK* Signal**
Pedestrian LOS	**F**
Candidate Pedestrian Treatment Identified	**HAWK* Signal**
Candidate for Median Refuge Island?	**YES**
Candidate for Road Diet?	**YES**
Other Treatments for Consideration**	**NA**
Paired Treatments for Consideration**	**NA**

TREATMENT IDENTIFICATION MATRIX FOR UNCONTROLLED LOCATIONS

PEDESTRIAN LEVEL OF SERVICE	EXPECTED MOTORIST COMPLIANCE		
	LOW (or Speed > 35 MPH)	MODERATE	HIGH
LOS A-D (average delay up to 30 seconds)	**LEVEL 3** 2 Lane Road: In-Pavement Flashers, Overhead Flashing Beacons Multi-Lane Road: RRFB Plus LEVELS 1 and 2	**LEVEL 2** Curb Extentions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge Plus LEVEL 1	**LEVEL 1** High Visibility Crosswalk Markings, Advanced Yield Lines, Advance Signage
LOS E-F (average delay greater than 30 seconds)	**LEVEL 4** HAWK*, RRFB, or Direct Pedestrians to Nearest Safe Crossing Plus LEVELS 1, 2, and 3	**LEVEL 3** 2 Lane Road: In-Pavement Flashers, Overhead Flashing Beacons Multi-Lane Road: RRFB Plus LEVELS 1 and 2	**LEVEL 2** Curb Extentions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge Plus LEVEL 1

* Treatment has provisional approval under the CaMUTCD
* * Note that not all treatments are appropriate for multi-lane roads; refer to suitability notes in treatment fact sheets. Check local codes for each treatment.
** Note that curb extensions should not be used in instances where bicycle lanes are present and no on-street parking is available.

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Summary Data

Intersection:	Telegraph/49th	**Date:**	12/13/2013
Scenario:	Existing Conditions	**Analyst:**	CN

Step 1: Identify Crossing Type

Crossing Type	4-lane undivided
Two-stage Crossing Calcs Apply?	No

Note: Two-stage crossing calculation applied at all divided roadways

Step 2: Determine Critical Headway

		Stage 1	Stage 2
L	Crossing distance (ft)	70	
S_p	Average pedestrian speed (ft/s)	3.5	
t_s	Pedestrian start-up time and end clearance time (s)	3	
t_c	Critical headway for pedestrian crossing	23.0	

Note: Platooning effects ignored. $t_{c,G}$ assumed to equal t_c

Step 3: Estimate Probability of a Delayed Crossing

	Conflicting Vehicles/hr for each stage	1,250	
C	Number of lanes crossed	4	
v	Vehicular flow rate (veh/s)	0.35	
P_b	Probability of a blocked lane	0.86	
P_d	Probability of a delayed crossing	1.00	

Step 4: Calculate Average Delay to Wait for an Adequate Gap

d_g	Average pedestrian gap delay (s)	8440.9	
d_{gd}	Average gap delay for pedestrians who incur non-zero delay	8443.7	

Step 5: Estimate Delay Reduction due to Yielding Vehicles

M_y	Motorist Yield Rate	38%	

Note: See table to right for default HCM 2010 yield rate data based on national research

h	Average headway for each through lane	11.5	
n	Average number of crossing events before an adequate gap is available	732	
$P(Y_1)$	Probability that motorists yield to pedestrian on crossing event i	0.03	
$P(Y_2)$		0.04	0.00
:			
:			
$P(Y_n)$		0.00E+00	N/A

Note: Full iterations shown on "crossing event calculation" tab

d_p	Average pedestrian delay for each stage (s)	256.5	

Step 6: Calculate Average Pedestrian Delay and Determine LOS

d_p	Average pedestrian delay (s)	256.5
	Ped LOS	***F***

XWalk+ Crosswalk Treatment Indentification Tool

FEHR & PEERS

Input instructions (refer to Field Visit Checklist for data collection guidelines):

1. Enter the name of the intersection above the Inputs Table
2. An input value is required for every category except Fields 4, 5, 10, and 11 (which are required only if a median refuge island is present), and Field 26
3. Refer to the Documentation tab for more detailed descriptions of inputs and calculations.
4. There are available defaults for Fields 6, 7, 8, and 13, as listed in the "description" section
5. Select inputs for Fields 14-25 from the drop-down menus
6. Refer to the User's Guide for pedestrian crossing treatment descriptions and additional guidelines

Intersection: 49th Street/Telegraph Avenue

required input
optional/default input (update if location-specific data is available)
required only when a median refuge island is present

INPUTS

FIELD	CATEGORY	INPUT	UNITS	DESCRIPTION/ NOTES
1	Speed Limit	25	mph	Posted or statutory speed limit or the 85th percentile speed on the major street
2	Peak Hour Pedestrian Volume	60	ped/h	Number of pedestirans crossing the major roadway in a peak hour
3	Major Road Peak Hour Volume (Total)	1250	veh/h	Total number of vehicles and bicylists on both approaches during the peak hour
4	Major Road Peak Hour Volume Direction 1		veh/h	Include only if a painted or raised median is present (min of 6 feet wide)
5	Major Road Peak Hour Volume Direction 2		veh/h	Include only if a painted or raised median is present (min of 6 feet wide)
6	Average Pedestrian Walking Speed	3.5	ft/s	Average pedestrian walking speed, default speet = 3.5 feet/second
7	15th Percentile Crossing Speed	3	ft/s	Speed for the slowest 15% of pedestrians; default speed = 3 feet/second
8	Pedestrian start-up time and end clearance time	3	s	The *Highway Capacity Manual* suggests 3 seconds
9	Pedestrian Crossing Distance (curb to curb)	70	ft	Distance between the near and far curbs
10	First Half Crossing Distance		ft	Distance between the near curb and a painted or raised median refuge island
11	Second Half Crossing Distance		ft	Distance between a painted or raised median refuge island and the far curb
12	Number of Lanes (total both directions)	4	Lanes	Number of lanes on major roadway
13	Expected Motorist Compliance	Low		Typical motorist compliance, default = Low
14	Is frequent at-grade transit present?	Yes		Does frequent surface transit run along major or minor road at the intersection?
15	Are bicycle lanes present?	No		
16	Is there heavy bicycle traffic?	Yes		
17	Is there a clear major and minor road?	Yes		Is there a clear differentiation in the traffic volume between the two roads?
18	Is this a midblock location or off-set intersection?	Yes		
19	Is there heavy truck traffic?	No		
20	Does existing infrastructure limit potential treatments?	No		Are there storm drains, poles, or other permanent structures at any corner of the intersection?
21	Is there on-street parking at the location?	Yes		
22	Is the location in a downtown area?	Yes		
23	Is it located within the built-up area of an isolated community?	No		Does the community have a population of less than 10,000?
24	Is a median refuge island present?	No		Does the refuge island have a width of at least 6 feet to accommodate pedestrian queues?
25	Is there sufficient width to accommodate a median?	Yes		At least 4 feet (with lane widths reduced to 10 or 11 feet)
26	Actual Total Pedestrian Delay		s	Optional (if calcuated at the site)

OUTPUTS

Signalized Crossing or Unsignalized Crossing?	**HAWK* Signal**
Pedestrian LOS	**F**
Candidate Pedestrian Treatment Identified	**HAWK* Signal**
Candidate for Median Refuge Island?	**YES**
Candidate for Road Diet?	**YES**
Other Treatments for Consideration**	**NA**
Paired Treatments for Consideration**	**NA**

TREATMENT IDENTIFICATION MATRIX FOR UNCONTROLLED LOCATIONS

PEDESTRIAN LEVEL OF SERVICE	EXPECTED MOTORIST COMPLIANCE		
	LOW (or Speed > 35 MPH)	MODERATE	HIGH
LOS A-D (average delay up to 30 seconds)	**LEVEL 3** 2 Lane Road: In-Pavement Flashers, Overhead Flashing Beacons Multi-Lane Road: RRFB Plus LEVELS 1 and 2	**LEVEL 2** Curb Extentions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge Plus LEVEL 1	**LEVEL 1** High Visibility Crosswalk Markings, Advanced Yield Lines, Advance Signage
LOS E-F (average delay greater than 30 seconds)	**LEVEL 4** HAWK*, RRFB, or Direct Pedestrians to Nearest Safe Crossing Plus LEVELS 1, 2, and 3	**LEVEL 3** 2 Lane Road: In-Pavement Flashers, Overhead Flashing Beacons Multi-Lane Road: RRFB Plus LEVELS 1 and 2	**LEVEL 2** Curb Extentions, Bus Bulb, Reduced Curb Radii, Staggered Pedestrian Refuge Plus LEVEL 1

* Treatment has provisional approval under the CaMUTCD
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