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Springs at Waterview East  
Preliminary Plan  
Traffic Impact and Access Analysis  
PCD File No: SP-17-010  
(LSC #184360)  
June 22, 2018  
(August 24, 2018 Revision)

Traffic Engineer's Statement

This traffic report and supporting information were prepared under my responsible charge and they comport with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.



Developer's Statement

I, the Developer, have read and will comply with all commitments made on my behalf within this report.

A large, stylized blue ink signature of the developer, written over a horizontal line.

8/23/18



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June 22, 2018  
(Rev. August 24, 2018)

Mr. Charles Cothorn, P.E  
Dakota Springs Engineering  
31 North Tejon, Suite 311  
Colorado Springs, CO 80903

RE: The Springs at Waterview East Preliminary Plan  
Traffic Impact and Access Analysis  
El Paso County, Colorado  
LSC #184360

Dear Mr. Cothorn:

In response to your request, LSC Transportation Consultants, Inc. has prepared this traffic impact and access analysis for The Springs at Waterview East Preliminary Plan. As shown in Figure 1, the site is located southeast of the intersection of Powers Boulevard and Bradley Road in El Paso County, Colorado. This parcel was included in the *Waterview Sketch Plan Updated Master Traffic Impact Study* dated January 9, 2018. This report contains the following:

- This August 24, 2018 minor revision contains updated Figures 2, 3, and 4; no other revisions.
- A determination of the existing traffic and roadway conditions in the vicinity of the site including the lane geometries and traffic controls.
- The projected average weekday and peak-hour vehicle-trips to be generated by the Springs at Waterview East development.
- The assignment of the projected trips on the area roadways.
- Projections of the future background and resulting total traffic volumes on the area roadways.
- Level of service analysis at key intersections adjacent to and in the vicinity of the site.
- Recommendations for intersection laneage and traffic control.
- Recommendations for street functional classifications for streets within the Springs at Waterview East.
- The required Countywide Road Impact Fees.

## LAND USE AND ACCESS

### Land Use

Figure 2 shows the currently proposed Springs at Waterview East Preliminary Plan. This area was included in the *Waterview Sketch Plan Updated Master Traffic Impact Study* (Master TIS) dated

January 9, 2018 as Parcels P-17 and P18. A 26-acre parcel located on the northwest area of the site is to be developed for commercial uses. This is consistent with the land use assumed for Parcel P-17 in the Master TIS. The remaining site is planned to be developed with about 714 lots for single-family homes. The Master TIS assumed this area would be developed with about 865 lots for single family homes plus a potential community recreation center and school site.

## **Access**

Access to Bradley Road is proposed via a full-movement intersection 1,030 feet east of Powers Boulevard and an additional right-in/right-out-only access about 1,310 feet east of the full-movement access. These access points are consistent with the access assumed in the Master TIS and deviations to the El Paso County *Engineering Criteria Manual (ECM)* for these access points have been approved. The approved deviation forms have been attached.

Internal access for the proposed land uses within the site are proposed to a north/south Non-Residential Urban Collector ("A" Street) and an east/west Non-Residential Urban Collector ("K" Street west of "A" Street and "C" Street east of "A" Street). Access for the commercial portion of the development is proposed via two full-movement access points to "K" Street west of "A" Street and one full-movement access point east of "A" Street. The location and spacing of the proposed commercial access points are shown in Figure 2.

## **Commercial Access Intersection Sight Distance**

The commercial access for the east-side commercial area would have adequate horizontal intersection sight distance in both directions.

The design of the westernmost commercial site will need to allow for acceptable stopping sight distance and intersection sight distance to the north from the intersection of the Non-Residential Collector and the north/south local street on the west side of the project. This access will be designed with the commercial site plan and final plat for that parcel. The submitted plans should include a sight distance evaluation.

The commercial access in the center of the west-side commercial area would have adequate horizontal intersection sight distance in both directions. With the commercial site plan a "sight distance" easement may be needed along the site frontage to "K" street west of this access due to the horizontal curve to the west. However, the intersection sight distance could be based on a reduced approach vehicle speed due to the curve radius and the proximity of the beginning of the street.

## **Roundabout Design**

The intersection of the two Non-Residential Urban Collector Streets ("A" Street and "K" Street) is planned to be constructed a modern one-lane roundabout. The approximate recommended size for the roundabout's inscribed circle diameter is 150 feet, however the final dimensions and

other roundabout details will be determined with the roundabout design – which will likely be with the first final plat. A roundabout design report will be prepared and submitted at that time. Figure 3 depicts a roundabout concept of approximately the appropriate size to accommodate truck traffic demonstrating that sufficient space is being provided for the roundabout. Minor lot line adjustments may be needed on the corners at the roundabout design stage and platting.

### Currently Approved Deviations

- Full-movement, future public street signalized intersection with Bradley Road approximately 1,030 feet east of Powers Boulevard (DSD File No. SKP 16-002 approved 3/28/2018).
- Right-in/right-out access point to both the westbound and eastbound directions of Bradley Road approximately 2,340 feet east of Powers Boulevard (DSD File No. SKP 16-002 approved 3/28/2018).

### New Deviation Requests

The following new deviation requests are shown on Figure 4.

1. Intersection spacing along a Non-Residential Collector for “A” Street between Bradley Road and the roundabout and for proposed commercial access to “C” street just east of “A” Street.
2. Intersection spacing along an Urban Local Streets “L”, “O”, “U”, “E”, “F”, and “N” to the first local street intersection back from a Collector don't meet criteria - 2.2.5.E On an urban local roadway, the closest intersection to a collector roadway shall be at least 200 feet (centerline to centerline).
3. Centerline radius on “K” street less than the 565-foot minimum for a Non-Residential Collector
4. Reduction in auxiliary lane lengths for the northbound left-turn lane on “A” Street approaching Bradley Road
5. Reduction in auxiliary lane lengths for the eastbound left-turn lane on “C” Street at the proposed commercial access east of the roundabout.

## ROADWAY AND TRAFFIC CONDITIONS

### Area Roadways

Figure 1 shows the roadways in the vicinity of the two sites. The major roadways are identified below, followed by a brief description.

- **Powers Boulevard** (State Highway 21) is classified as a Freeway (FW). Powers Boulevard is one of the region’s main north/south corridors. Powers Boulevard has a center median and a posted speed limit of 60 miles per hour (mph) north of Crestera Parkway. South of this point the posted speed limit is 65 mph. Powers Boulevard is ultimately planned to be converted to a Freeway with grade-separated intersections.



- **Bradley Road** is shown with a Minor Arterial classification east of Grinnell Boulevard on the 2016 update to the DRAFT 2040 El Paso County *Major Transportation Corridors Plan (MTCP)*. Adjacent to the site Bradley Road is a four-lane roadway with a 50-mph posted speed limit and has a raised median, left-turn lanes, and rural paved shoulders.

### Existing Traffic Conditions

Figure 5 shows the existing traffic volumes at the intersection of Powers Boulevard/Bradley Road. The traffic volumes are based on the attached traffic counts conducted by LSC in April 2018. Figure 5 also shows the 2016 Colorado Department of Transportation (CDOT) Average Annual Daily Traffic Volume (AADT) on Powers Boulevard and estimates of the average daily traffic volume on Bradley Road based on the peak-hour traffic counts. Figure 5 also shows the daily traffic volume on Bradley Road shown in the El Paso County *2016 Major Transportation Corridors Plan Update*.

### Existing Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from “A” to “F.” LOS A represents control delay of less than 10 seconds for unsignalized and signalized intersections. LOS F represents control delay of more than 50 seconds for unsignalized intersections and more than 80 seconds for signalized intersections. Table 1 shows the level of service delay ranges.

<b>Table 1</b> <b>Intersection Levels of Service Delay Ranges</b>			
Level of Service	Signalized Intersections		Unsignalized Intersections
	Average Control Delay (seconds per vehicle)	V/C <sup>(1)</sup>	Average Control Delay (seconds per vehicle) <sup>(2)</sup>
A	10.0 sec or less	less than 0.60	10.0 sec or less
B	10.1-20.0 sec	0.60-0.69	10.1-15.0 sec
C	20.1-35.0 sec	0.70-0.79	15.1-25.0 sec
D	35.1-55.0 sec	0.80-0.89	25.1-35.0 sec
E	55.1-80.0 sec	0.90-0.99	35.1-50.0 sec
F	80.1 sec or more	1.00 and greater	50.1 sec or more
<sup>(1)</sup> Source: <i>Transportation Research Circular 212</i> <sup>(2)</sup> For unsignalized intersections if V/C ratio is greater than 1.0 the level of service is LOS F regardless of the projected average control delay per vehicle.			

The signalized intersection of Powers/Bradley has been analyzed to determine the existing levels of service using Synchro. All movements at this intersection are currently operating at LOS C or better during the peak hours.

## **2040 BACKGROUND TRAFFIC**

The background traffic volumes for the year 2040 are shown on Figure 6. The 2040 background traffic volumes were based on the *Waterview Sketch Plan Updated Master Traffic Impact Study* dated January 9, 2018

## **TRIP GENERATION**

The traffic volumes to be generated by the land uses within the currently proposed preliminary plan have been estimated using the nationally published trip generation rates from *Trip Generation, 10th Edition*, by the Institute of Transportation Engineers (ITE). Table 2 shows the average weekday and weekday morning and afternoon peak hour. Table 2 also shows the trip generation estimate for this same area assumed in the Master TIS for comparison.

The total number of vehicle-trips generated by the commercial parcels was reduced to account for the pass-by phenomenon. A pass-by trip is made by a motorist who would already be on the roadway system regardless of the development, but who stops in at the site while passing by. The motorist would then continue on his or her way to a final destination in the original direction. The pass-by percentages for each use were taken from *Trip Generation Handbook, 3rd Edition*, June 2004, by ITE.

The site is projected to generate about 11,660 new external vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. This is about 2,357 fewer trips than was estimated in the Master TIS. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 267 vehicles would enter and 477 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:15 and 6:15 p.m., about 779 vehicles would enter and 624 vehicles would exit the site.

## **TRIP DISTRIBUTION AND ASSIGNMENT**

The directional distribution of the site-generated traffic volumes on the adjacent roadway system is one of the most important factors in determining the traffic impacts of the site. Figure 7 shows the short-term and long-term directional distributions of traffic projected to be generated by the residential uses. The short-term directional distribution estimates were based on the existing area roadway system and the traffic counts. The long-term directional distribution estimates were based on the anticipated regional development and future roadway networks. Figure 8 shows the short-term and long-term directional distribution of the primary commercial generated traffic. Figure 9 shows the directional distribution of the commercial pass-by generated trips. Pass-by trips were assigned based primarily on the existing traffic volumes on the major streets adjacent to the site

When the distribution percentages (from Figures 7 through 9) are applied to the trip generation estimates (from Table 2), the resulting site-generated traffic volumes can be determined. Figures 10 and 11 show the projected short-term and long-term site-generated traffic volume due to the residential portion of the site. Figures 12 and 13 show the projected short-term and long-term site-generated traffic volume due to the commercial portion of the site

## **TOTAL TRAFFIC**

Figure 14 shows the sum of the existing traffic volumes from Figure 5 plus the short-term residential site-generated traffic volumes from Figure 10. These figures represent the short-term impacts following buildout of the residential portion of the site only.

Figure 15 shows the sum of the existing traffic volumes from Figure 5 plus the short-term residential site-generated traffic volumes from Figure 10 plus the short-term commercial generated traffic volumes from Figure 12. These figures represent the short-term impacts following buildout of the entire Springs at Waterview East Preliminary Plan.

Figure 16 shows the sum of the 2040 background traffic volumes from Figure 6 plus the long-term residential site-generated traffic volumes from Figure 11 plus the long-term commercial generated traffic volumes from Figure 13.

## **PROJECTED LEVELS OF SERVICE**

The site access points are key area intersections have been analyzed to determine the projected levels of service for the 2040 background, existing plus residential generated traffic volumes, existing plus buildout site-generated traffic volumes, and 2040 total traffic volumes based on the signalized and unsignalized method of analysis procedures found in Synchro and the *Highway Capacity Manual, 6th Edition* by the Transportation Research Board. Figures 6, 14, 15, and 16 show the level of service analysis results. The level of service reports are attached.

### **Powers/Bradley**

The intersection of Powers/Bradley is currently signalized and is operating at a satisfactory level of service. All movements at this intersection are projected to operate at LOS D or better during the peak hours with the addition of the residential generated traffic. It was assumed that Powers Boulevard would be restriped to provide dual southbound left-turn lanes approaching Bradley Road and Bradley Road would be restriped to provide dual westbound left-turn lanes approaching Powers Boulevard with development of the retail portion of the Springs at Waterview East. Based on the short-term total traffic volumes and the lane geometry shown in Figure 15 all movements at the intersection of Powers/Bradley are projected to operate at LOS D or better with the addition of both the residential and commercial generated trips.

By 2040 it was assumed that the section of Bradley Road between Goldfield Drive and Powers Boulevard would be constructed. It was also assumed that Powers Boulevard would be widened

to provide three through lanes in each direction by 2040. Based on the 2040 total traffic volumes shown and the lane geometry shown in Figure 16, some of the minor movements are projected to operate at LOS E during the peak hours. It is common for left-turn and side-street through movements to have projected delays in the LOS E range as signal coordination timing plans generally give priority to moving through traffic. This often results in higher delay for left-turn and side-street movements and can result in movement/approach delays in the E range even though they are projected to have sufficient capacity for the projected traffic volumes. Note: This intersection is planned to be converted to a grade-separated interchange in the long-term future.

#### **Full-Movement Site Access/Bradley**

The northbound left-turn movement at the full-movement intersection to Bradley Road is projected to operate at LOS F during the peak hours if this intersection is two-way stop-sign controlled. If this intersection is signalized, all movements are projected to operate at LOS D or better during the peak hours based on the existing plus residential generated traffic, existing plus buildout site-generated traffic, and 2040 total traffic volumes.

#### **Right-in/Right-out Site Access/Bradley**

All movements at the proposed right-in/right-out site access to Bradley Road are projected to operate at LOS C or better during the peak hours based on the projected existing plus residential generated traffic, existing plus buildout site-generated traffic, and 2040 total traffic volumes.

#### **“A” Street/“K” Street**

The intersection of the north/south Non-Residential Urban Collector (“A” Street) and the east/west Non-Residential Urban Collector (“K” Street) is proposed to be constructed as a modern one-lane roundabout. All movements at this intersection are projected to operate at LOS A during the peak hours based on the projected existing plus residential generated traffic, existing plus buildout site-generated traffic, and 2040 total traffic volumes.

#### **Commercial Site Access Points**

The commercial site access points to the Urban Non-Residential Collector streets within the Springs at Waterview East Preliminary Plan area are projected to operate at LOS B or better for all movements during the peak hours as stop-sign-controlled intersections.

#### **VEHICLE QUEUING ANALYSIS**

A queuing analysis was performed using Synchro/SimTraffic to determine if the proposed intersection spacing will be sufficient to accommodate the projected queues based on the total traffic volumes. The 2040 total afternoon peak-hour traffic volumes were entered into the Synchro model. The simulation was run five times. The queuing reports are attached.

Figure 3 shows the preliminary lane concept for the street segments north and east of the proposed roundabout. This figure identifies the preliminary stacking lengths for the northbound left-turn lanes on “A” Street approaching Bradley Road and on eastbound “C” Street approaching the retail access.

The projected maximum northbound left-turn queue on “A” Street approaching Bradley Road is 204 feet during the afternoon peak hour.

The projected maximum eastbound left-turn queue on “C” Street approaching the retail access just east of “A” Street is 31 feet during the afternoon peak hour.

### **TRAFFIC SIGNAL WARRANT ANALYSIS**

The full-movement intersection to Bradley Road was analyzed to determine when either an Eight-Hour or a Four-Hour Vehicular Volume Traffic Signal Warrant would be met or be close to being met. The lower threshold volume for an Eight-Hour Vehicular Volume Traffic Signal Warrant for Condition B - Interruption of Continuous Traffic for a major street with two or more lanes and a posted speed limit greater than 40 mph and a minor street approach with one lane is 53 vehicles per hour. This lower threshold is applicable when the major street volumes (northbound and southbound left, through, and right movements) exceeds 630 vehicles per hour. The lower threshold volume for a Four-Hour Vehicular Volume Traffic Signal Warrant for a major street with two or more lanes and a posted speed limit greater than 40 mph and a minor street approach with one lane is 60 vehicles per hour. This lower threshold is applicable when the major street volumes (northbound and southbound left, through, and right movements) exceeds 1,000 vehicles per hour. The existing through volumes on Bradley Road adjacent to the site currently exceeds 1,000 vehicles per hour during both the morning and afternoon peak hours.

Table 2 shows the existing and the projected site-generated traffic volumes. The off-peak through volumes on Bradley Road were estimated based on 24-hour counts conducted by CDOT on Powers Boulevard just south of Bradley Road. The off-peak site-generated volumes were based on the short-term site-generated traffic volumes shown in Figures 10 and 12 and the hourly variation data found in *Trip Generation, 10th Edition* by the Institute of Transportation Engineers (ITE).

Detailed analyses are presented in Table 3. Table 3 shows that a Four-Hour Vehicular Volume Traffic Signal Warrant is projected to be met once about 34 percent of the residential portion of the site is developed (about 242 dwelling units). If the retail portion of the site is developed first an Eight-Hour Vehicular Volume Traffic Signal Warrant is projected to be met once about 23 percent of the commercial area is built out. A traffic signal warrant may be met earlier if the residential and commercial parcels are developed concurrently. The satisfaction of warrants does not indicate that a signal must be installed. The decision to require a signal to be installed at this location rests with the County.

## **TRAFFIC SIGNAL ESCROW PERCENTAGES/AMOUNTS**

Table 4 shows the projected total traffic volumes on the minor approach volumes at the intersection of "A" Street and Bradley Road by development based on the 2040 total traffic volumes (from Figure 16). The minor approach volumes were assumed to include the northbound and southbound left-turn and through movements. As shown in Table 4, the residential portion of the Springs at Waterview East development is projected to contribute about 32.8 percent of the traffic on the northbound and southbound approaches at this intersection. The commercial portion of the Springs at Waterview East development is projected to contribute about 23.2 percent of the traffic on the northbound and southbound approaches at this intersection. Assuming a total signal cost of \$500,000, a fair share contribution towards a future signal at this intersection would be \$163,883.09 for the residential portion (\$230.17 per dwelling unit) and \$114,866.39 for the commercial portion. Table 5 presents a template that should be used with each final plat for keeping track of the running escrow amount. If an IGA is established between the County and the Waterview II Metro District, whereby the district is responsible for signal installation once warranted/directed by the County Public Works Department, escrow of funds may not be necessary. It is our understanding that the intent is to have the district responsible for the collecting fees and mills and the signal installation.

Should a traffic signal be installed prior to the development of the parcel north of Bradley Road the Springs at Waterview East would be responsible for the entire cost of the signal. Table 4 shows the fair share contribution for the commercial and residential portions of The Springs at Waterview assuming no development north of Bradley Road. The developers could potentially then file for cost recovery with the County against that parcel(s) to the north, so they would provide fair share reimbursement for their relative impact on the intersection and benefit from the signal. If an IGA is established between the County and the Waterview II Metro District, whereby the district is responsible for signal installation once warranted/directed by the County Public Works Department, cost recovery may not apply as the property on the north side of Bradley Road would be in the district as well.

## **ROADWAY CLASSIFICATIONS**

Figure 17 shows the recommended street classification for all streets within the Springs at Waterview East Preliminary Plan based on the projected 2040 weekday traffic volumes shown in Figure 16.

## **RECOMMENDED IMPROVEMENTS**

- Table 6 contains a summary of the needed improvements.
- Table 7 contains a summary of the auxiliary turn lanes required at the intersections of Powers/Bradley and "A" Street/Bradley based on the criteria contained in the ECM and the *Colorado State Highway Access Code*. Deviations to the ECM will be submitted for the shortened continuous right-turn acceleration lane on Bradley Road between Powers

Boulevard and "A" Street and for shortened northbound left-turn lanes on "A" Street approaching Bradley Road. Deviation requests will likely be needed for the back-to-back left-turn lanes between Powers Boulevard and Bradley Road and for a continuous westbound right-turn acceleration/deceleration lane between these two intersections with the development of the parcel(s) to the north. Improvements that may be needed to Powers Boulevard/Bradley Road to be in compliance with the ECM include widening to provide dual southbound left-turn lanes.

- Figures 18 and 19 present to-scale conceptual lane exhibits for Bradley Road adjacent to the site. These exhibits have been prepared to depict the recommended short- and long-term auxiliary turn lane and center median configuration at the full-movement access point and between this access and Powers.
- Figure 3 shows the preliminary lane concept for the street segments north and east of the proposed roundabout. This figure identifies the preliminary stacking lengths for the northbound left-turn lanes on "A" Street approaching Bradley Road and on eastbound "C" Street approaching the retail access.
- Based on the criteria contained in the ECM, an eastbound right-turn deceleration lane would be required on Bradley Road approaching the full-movement site access point with the addition of the site-generated traffic due to the residential portion of the Springs at Waterview East. The northbound right-turn lane on Powers at Bradley Road is currently a channelized right-turn lane into an acceleration lane on eastbound Bradley Road. Figure 18 shows no changes to this current configuration except the right-turn acceleration lane would end as an eastbound right-turn lane at the proposed site access instead of the current transition taper.
- Based on the criteria contained in the ECM, an eastbound right-turn deceleration lane would be required on Bradley Road approaching the right-in/right-out site access point with the addition of the site-generated traffic due to the residential portion of the Springs at Waterview East. Although the ECM generally does not require right-turn acceleration lanes on Minor Arterial, LSC recommends a continuous right-turn acceleration/deceleration lane be constructed on Bradley Road between the full-movement and right-in/right-out site access points.
- Based on the criteria contained in the ECM a westbound left-turn lane would be required on Bradley Road approaching the full-movement site access point with the addition of the site-generated traffic due to the residential portion of the Springs at Waterview East. Based on the posted speed limit of 50 miles per hour and the projected 2040 total traffic volumes, this lane should be 495 feet (235 feet of deceleration length plus 260 feet of storage) plus a 200-foot taper.
- **Commercial Site Access Auxiliary Turn Lane Requirements:** Left-turn lanes at the commercial access points will be provided as the Non-Residential Collector cross section includes a

striped, center, two-way left-turn lane (TWLTL). The taper for the eastbound left-turn lane for the east commercial access on "C" Street would be shorter than the ECM standard length. This taper is proposed to be a reverse-curve-type taper of approximately 90 feet. The stacking distance would be included within the standard 155-foot deceleration distance. A deviation is being submitted for this. A right-turn lane will be required at the central/main commercial access west of the roundabout. A right-turn lane will not be required at the commercial access east of the roundabout.


- **County Road Impact Fee Program:** This residential portion of this project will be required to participate in the El Paso County Road Improvement Fee Program. The Springs at Waterview East is likely to join the ten-mil PID, however this has yet to be determined. A final determination will be at the final plat stage the ten-mil PID building permit fee portion associated with this option is \$923 per single-family dwelling unit. Based on 714 lots, the total building permit fee would be \$659,022.
- **Improvements Relative to the current MTCP:** The 2040 MTCP does not call for any improvement projects in the immediate vicinity of the site except for the Bradley Road extension west of Powers Boulevard. Although this project would not be responsible for that improvement, this is addressed in the improvements table. No improvements identified herein would be reimbursable through the MTCP-based Roadway Improvements program.
- **Special Districts:** This project will be part of the Waterview II Metropolitan District

\* \* \* \* \*

Please contact me if you have any questions regarding this report.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By   
Jeffrey C. Hodsdon, P.E., PTOE  
Principal

JCH:KDF:bjwb

Enclosures: Tables 2-7  
Figures 1-19  
Approved Deviation Forms  
Traffic Count Reports  
Level of Service Reports



Table 2  
Trip Generation Estimate  
Springs at Waterview East Preliminary Plan

Land Use Code	Land Use Description	Trip Generation Units	Trip Generation Rates <sup>(1)</sup>						Total Future Trips Generated					Internal Trips	Total External Future Trips Generated					Pass-by Trip Percent <sup>(2)</sup>	Total Future "External" Trips Generated	
			Average Weekday Traffic	Morning		Afternoon		Average Weekday Traffic	Morning		Afternoon		Average Weekday Traffic		Morning		Afternoon		Average Weekday			
				In	Out	In	Out		In	Out	In	Out			In	Out						
Trip Generation Estimate Based on The Currently Proposed Preliminary Plan																						
820	Shopping Center	148	KSF <sup>(3)</sup>	53.03	0.95	0.58	2.36	2.55	7,849	140	86	349	378	2%	7,692	137	84	342	370	34%	5,077	
210	Single-Family Detached Housing	714	DU <sup>(4)</sup>	9.44	0.19	0.56	0.62	0.37	6,740	132	396	445	262	2%	6,583	130	393	437	255	0%	6,583	
									14,589	272	482	794	639		14,275	267	477	779	624		11,660	
Trip Generation Estimate From The <i>Waterview Sketch Plan Updated Master Traffic Impact Study</i> by LSC January 9, 2018																						
820	Shopping Center	148	KSF	59.20	0.83	0.51	2.53	2.85	8,762	123	75	374	422	0%	8,762	123	75	374	422	34%	5,783	
495	Recreational Community Center	33	KSF	33.82	1.35	0.70	1.34	1.40	1,116	45	23	44	46	50%	558	23	11	22	23	0%	558	
210	Single-Family Detached Housing	865	DU	9.52	0.19	0.56	0.63	0.37	8,235	162	487	545	320	<sup>(5)</sup>	7,354	99	403	503	280	0%	7,354	
520	Elementary School	500	Students	1.29	0.25	0.20	0.07	0.08	645	124	101	37	38	50%	322	62	50	19	19	0%	322	
									18,758	453	686	1,000	826		16,996	306	539	918	744		14,017	
Change In Trip Generation Estimate									-4,169	-181	-204	-206	-187		-2,721	-39	-62	-139	-120		-2,357	

Notes:  
(1) Source: based on *Trip Generation* , 10th Edition, 2017 by the Institute of Transportation Engineers (ITE)  
(2) Source: "Trip Generation Handbook - An ITE Proposed Recommended Practice 3rd Edition, September 2017" by ITE  
(3) KSF = 1,000 square feet  
(4) DU = dwelling unit  
(5) Residential were balanced with estimated internal trips to and from the school and recreation center

Source: LSC Transportation Consultants, Inc.

<p style="text-align: center;"> <b>Table 3</b>  <b>Waterview Sketch Plan</b>  <b>Traffic Signal Warrant Analysis of Full-Movement Site Access to Bradley Road</b> </p>
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Period	2 or More Lanes on Major Approach & 1 Lane on Minor Approach																													
	Traffic Volumes														Warrant 1, Eight Hour Vehicular Volume Evaluation								Warrant 2, Four Hour Vehicular Volume Evaluation							
Hour															Warrant Threshold Met?								Existing + 34% Buildout of Residential				Existing + 23% Buildout of Retail			
	Existing <sup>(1)</sup>		Added by 100% Buildout of Residential		Added by 34% Buildout of Residential		Added by 100% Buildout of Retail		Added by 23% Buildout Retail		Existing + 34% Buildout of Residential		Existing + 23% Buildout of Retail		Warrant Thresholds		Existing + 34% Buildout of Residential		Existing + 23% Buildout of Retail		Minor Street Minimum		Met?							
	Major <sup>(2)</sup>	Minor <sup>(3)</sup>	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	A 70%	B 70%	A 70%	B 70%	Minor Street Minimum	Met?	Minor Street Minimum	Met?				
6:00 AM	1002	0	67	147	23	50	16	9	4	2	1025	50	1006	2	420	105	630	53	No	No	No	No	60	No	60	No				
7:00 AM	1237	0	118	260	40	88	90	49	21	11	1277	88	1258	11	420	105	630	53	No	Yes	No	No	60	Yes	60	No				
8:00 AM	1098	0	110	240	37	82	163	89	37	20	1135	82	1135	20	420	105	630	53	No	Yes	No	No	60	Yes	60	No				
9:00 AM	866	0	76	167	26	57	293	159	67	37	892	57	933	37	420	105	630	53	No	Yes	No	No	66	No	63	No				
10:00 AM	884	0	85	186	29	63	456	248	105	57	913	63	989	57	420	105	630	53	No	Yes	No	Yes	64	No	61	No				
11:00 AM	1039	0	92	202	31	69	676	368	155	85	1070	69	1194	85	420	105	630	53	No	Yes	No	Yes	60	Yes	60	Yes				
12:00 Noon	824	0	266	111	90	38	290	287	67	66	914	38	891	66	420	105	630	53	No	No	No	Yes	64	No	66	No				
1:00 PM	789	0	291	121	99	41	270	267	62	61	888	41	851	61	420	105	630	53	No	No	No	Yes	67	No	72	No				
2:00 PM	792	0	320	133	109	45	261	258	60	59	901	45	852	59	420	105	630	53	No	No	No	Yes	65	No	72	No				
3:00 PM	949	0	349	145	119	49	255	253	59	58	1068	49	1008	58	420	105	630	53	No	No	No	Yes	60	No	60	No				
4:00 PM	1165	0	436	181	148	62	267	264	61	61	1313	62	1226	61	420	105	630	53	No	Yes	No	Yes	60	Yes	60	Yes				
5:00 PM	1222	0	426	177	145	60	270	267	62	61	1367	60	1284	61	420	105	630	53	No	Yes	No	Yes	60	No	60	Yes				
6:00 PM	995	0	349	145	119	49	232	230	53	53	1114	49	1048	53	420	105	630	53	No	No	No	No	60	No	60	No				
																			0	7	0	8		4	3					
																			No	No	No	Yes		Yes	No					

Notes:

- (1) Hourly variation based on traffic counts on Powers Boulevard south of Bradley Road
- (2) The major street volumes include all (left/through/right) movements on Bradley Rd
- (3) The minor street volumes includes only the northbound left movement

Source: LSC Transportation Consultants, Inc.

**Table 4**  
**"A" Street and Bradley Road Signal Escrow Analysis**  
**Springs at Waterview East**

Development	Minor Approach Volume <sup>(1)</sup>			Signal Escrow Amounts	
	AM	PM	Fair Share	Escrow of \$500,000	Portion of Total Escrow Per DU <sup>(2)</sup>
<b>Based on Projected 2040 Total Traffic Volumes</b>					
Springs at Waterview East Residential	189	125	32.8%	\$163,883.09	\$230.17
Springs at Waterview East Commercial	46	176	23.2%	\$115,866.39	---
Background	90	332	44.1%	\$220,250.52	---
<b>\$500,000</b>					
<b>Based on 2040 Total Traffic Assuming No Development of the Parcel(s) North of Bradley</b>					
Springs at Waterview East Residential	189	125	58.6%	\$292,910.45	\$411.39
Springs at Waterview East Commercial	46	176	41.4%	\$207,089.55	---
<b>\$500,000</b>					
Notes:					
(1) Minor approach volume includes northbound and southbound left-turn and through movements					
(2) DU = dwelling unit					
Source: LSC Transportation Consultants, Inc.					

<b>Table 5</b> <b>Running Escrow Analysis Template</b> <b>Bradley Road and "A" Street</b> <b>Springs at Waterview East</b>				
Subdivisions Currently Proposed			Signal Escrow Amounts (Portion of Total Escrow of \$279,749.48 <sup>(1)</sup> )	
Subdivision Name	Number of Residential Lots or Acres of Commercial Development	Status	Escrow Per Lot or Acre	Total Escrow
<b>Residential</b>				
Residential Filing 1	100	Example only	\$230.17	\$23,017.29
Future Residential	614	Future	\$230.17	\$141,326.15
<b>Total Residential Escrow</b>				<b>\$164,343.44</b>
<b>Commercial</b>				
Commercial Filing 1	10	Example only	\$4,456.40	\$44,564.00
Future Commercial	16	Future	\$4,456.40	\$71,302.39
<b>Total Commercial Escrow</b>				<b>\$115,866.39</b>
<b>Total Springs at Waterview East Escrow</b>				<b>\$280,209.83</b>
<b>Notes:</b>				
(1) See Table 4				
Source: LSC Transportation Consultants, Inc., May 19, 2018				

Table 6 Improvements Table Springs at Waterview East Preliminary Plan		
Improvement	Timing /"Trigger Point(s)"	Responsibility <sup>(1)</sup>
Access Points to Bradley Road		
Full-movement access to Bradley Road 1,030 feet east of Powers Boulevard	With development of either the residential or commercial portion of the Springs at Waterview East	Applicant
Right-in/right-out access 1,300 feet east of the full-movement access	This access would be constructed with the adjacent portion of the residential subdivision or it may be required to provide a second access if a connection east to Bradley Heights (City development) is not available.	Applicant
Traffic Signal		
Traffic Signal Escrow - Prorated escrow amount with each final plat toward the planned traffic signal at the full-movement access to Bradley Road 1,030 feet east of Powers Boulevard	Not necessary if an IGA between the County and the Waterview 2 Metro District is established and the district becomes responsible for signal installation when warranted/directed by the County PWD. Otherwise, an escrow amount would be payable with each residential and commercial final plat	Waterview II Metropolitan District
Traffic Signal Installation - Installation of the traffic signal at the full-movement access to Bradley Road 1,030 feet east of Powers Boulevard. Any funds held in escrow would be returned to the applicant.	As determined by El Paso County Public Works - typically this is when traffic signal warrants are met, however traffic signal warrants are guidelines and the actual timing of installation is at the discretion of El Paso County Public Works. The estimated timing based on the traffic volumes projected in this report is as follows: With either development of 34% of the residential portion of Springs at Waterview East (242 DUs) or development of about 23% of the commercial portion of Springs at Waterview East. These trigger points/timing estimates and the need for the signal are subject to change and would be evaluated with each final plat application. County public works approval is required for signal installation.	Waterview II Metropolitan District.
Auxiliary Turn Lanes		
Eastbound right-turn deceleration lane on Bradley Road approaching "A Street"- the full-movement site access	With initial development/final plat of either the residential or commercial portion of the Springs at Waterview East. The trigger is a westbound left-turn volume of 25 vehicles per hour.	Applicant
Westbound left-turn lane on Bradley Road approaching the full-movement site access	With initial development/final plat of either the residential or commercial portion of the Springs at Waterview East. The trigger is a westbound left-turn volume of 10 vehicles per hour.	Applicant
Eastbound right-turn acceleration lanes on Bradley Road in the form of continuous accel/decel lanes between "A Street" and the right-in/right-out site access and between the right-in/right-out site access and the city access point to the east.	With the applicable final plat of either the residential or commercial portion of the Springs at Waterview East which results in the turn lane threshold to be exceeded (as determined by final plat traffic reports). The threshold is a northbound right-turn volume of 50 vehicles per hour.	Applicant
Eastbound right-turn deceleration lane on Bradley Road approaching the right-in/right-out access	With development of the residential portion of the Springs at Waterview East (Parcel P-18) <b>OR</b> if the access is required for a secondary access <b>and</b> the right turning volume would exceed 25 vehicles per hour.	Applicant
Westbound left-turn lane on Bradley Road approaching the full-movement site access	With initial development/final plat of either the residential or commercial portion of the Springs at Waterview East. The trigger is a westbound left-turn volume of 10 vehicles per hour.	Applicant
Restripe Bradley Road for dual westbound left-turn lanes approaching Powers Boulevard	With development of the commercial portion of Springs at Waterview East	Applicant
Restripe Powers Boulevard for dual southbound left-turn lanes approaching Bradley Road	With development of the commercial portion of Springs at Waterview East if not completed by other development(s) or CDOT. The timing of this improvement could be evaluated with each final plat.	Likely the commercial portion of Springs at Waterview East if not completed by other development(s) or CDOT.
Street Widening/Construction		
Construct Bradley Road between Goldfield Drive and Powers Boulevard. This would include intersection modifications at the Powers/Bradley intersection associated with conversion of this intersection from a three-leg to a four-leg intersection.	Future with development of the Waterview parcel northwest of Powers/Bradley or by El Paso County/PPRTA <sup>(2)</sup> if that parcel is not developed. The 2040 MTCP shows the roadway segment constructed.	The developer of the Waterview parcel northwest of Powers/Bradley (if this parcel is developed) or El Paso County/PPRTA if that parcel is not developed.
Notes: (1) Preliminary concept of responsibility; the actual construction responsibility would be determined through subdivision applications and cost recovery if applicable agreements. (2) PPRTA = Pikes Peak Rural Transportation Authority.		
Source: LSC Transportation Consultants, Inc. 5/18/2018		

<p align="center">Table 7          Auxiliary Turn Lanes/Speed Change Lanes          Springs at Waterview East</p>	
---	--

		CDOT/ECM Standard (ft)				Existing/Proposed (ft)				Difference From Standard (ft)			
		Taper	Acceleration/ Deceleration	Stacking	Total	Taper	Acceleration/ Deceleration	Stacking	Total	Taper	Acceleration/ Deceleration	Stacking	Total
Intersection		Length	Distance	Distance	Distance	Length	Distance	Distance <sup>(1)</sup>	Distance	Length	Distance	Distance	Distance
Powers Boulevard/Bradley Road (CDOT)													
Southbound Left-Turn Decel. Lane	Single Lane	300	700	670	1670	300	700	0	1000	0	0	-670	-670
	Dual Lanes	600	700	335	1635	600	700	335	1635	0	0	0	0
Northbound Right-Turn Decel. Lane		300	700	---	1000	300	600	---	900	0	-100	---	-100
Northbound Right-Turn Accel. Lane		300	1170	---	1470	300	430	---	730	0	-740	---	-740
Westbound Left-Turn Decel. Lane(s)		200	235	265	700	200	235	390	825	0	0	125	125
Westbound Right-Turn Decel. Lane		200	235	---	435	See Section Below				See Section Below			
Bradley Road													
Westbound Right-Turn Deceleration and Acceleration Lanes													
Westbound Right-Turn Acceleration Lane from "A" Street		180	760	---	1375	200	480	---	915	0	-280	---	-460
Westbound Right-Turn Deceleration Lane approaching Powers Boulevard		200	235	---			235	---			0	---	
Eastbound Right-Turn Deceleration and Acceleration Lanes													
Eastbound Right-Turn Acceleration Lane from Powers Boulevard		200	760	---	1195	200	480	---	915	0	-280	---	-280
Eastbound Right-Turn Deceleration Lane approaching "A" Street			235	---			235	---		0	0	---	
Eastbound Right-Turn Acceleration Lane from "A" Street		200	760	---	1195	200	740	---	1175	0	-20	---	-20
Eastbound Right-Turn Deceleration Lane approaching Right-in/Right-out Access			235	---			235	---		0	0	---	
Left Turn Lane													
Westbound Left-Turn Decel. Lane approaching "A" Street		200	235	260	695	200	235	260	695	0	0	0	0
"A" Street													
Northbound Right-Turn Lane		160	155	---	315	160	155	---	315	0	0	---	0
Northbound Left-Turn Lanes (dual)		160	155	155	470	90		220	310	-70	-90		-160
"C" Street													
Eastbound Left-Turn Lane at the Commercial Access <sup>(2)</sup>		96 <sup>(3)</sup>	155	31	282	90		155	230-240'	-6		-31	-37

Notes:
(1) During off-peak periods, any unused stacking length will function as additional deceleration distance.
(2) The final dimensions of the eastbound left-turn lane on "C" street will be determined with the roundabout design.
(3) Based on a minimum taper ratio of 8:1 allowed for by the ECM for tangent bay tapers in constrained locations.

Source: LSC Transportation Consultants, Inc.

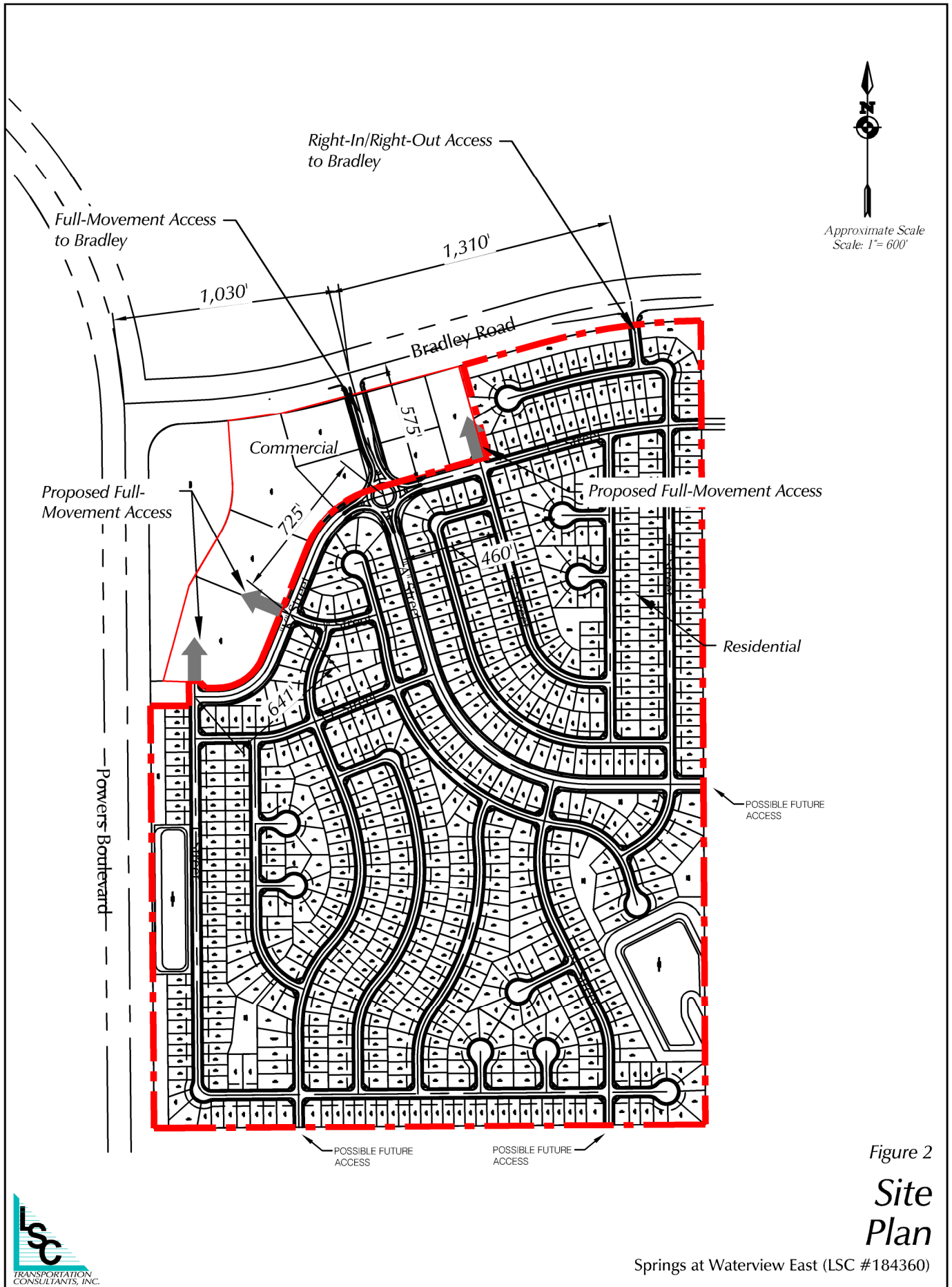




Approximate Scale  
Scale: 1" = 3,000'

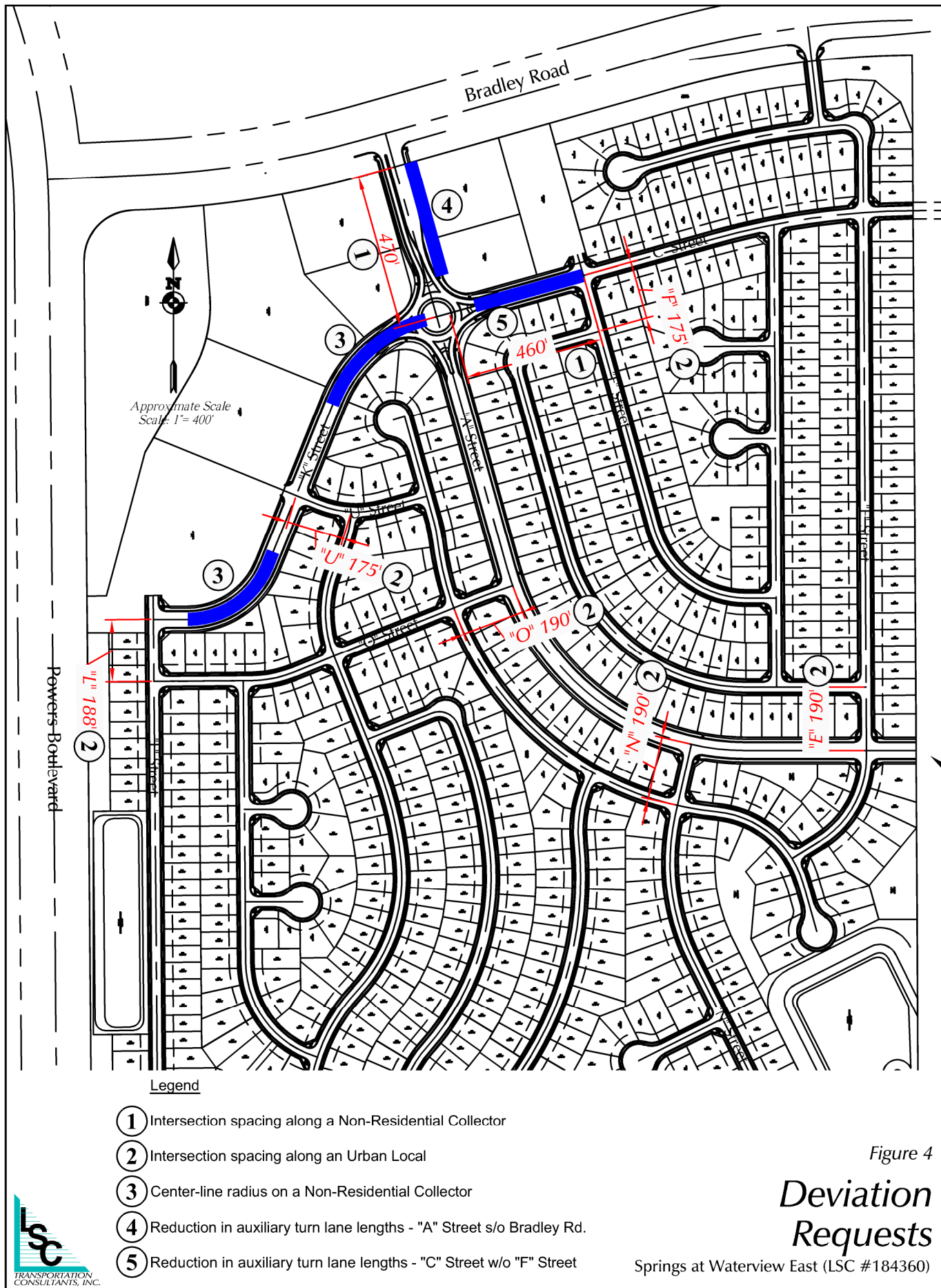
Figure 1  
**Vicinity  
Map**  
Springs at Waterview East (LSC #184360)

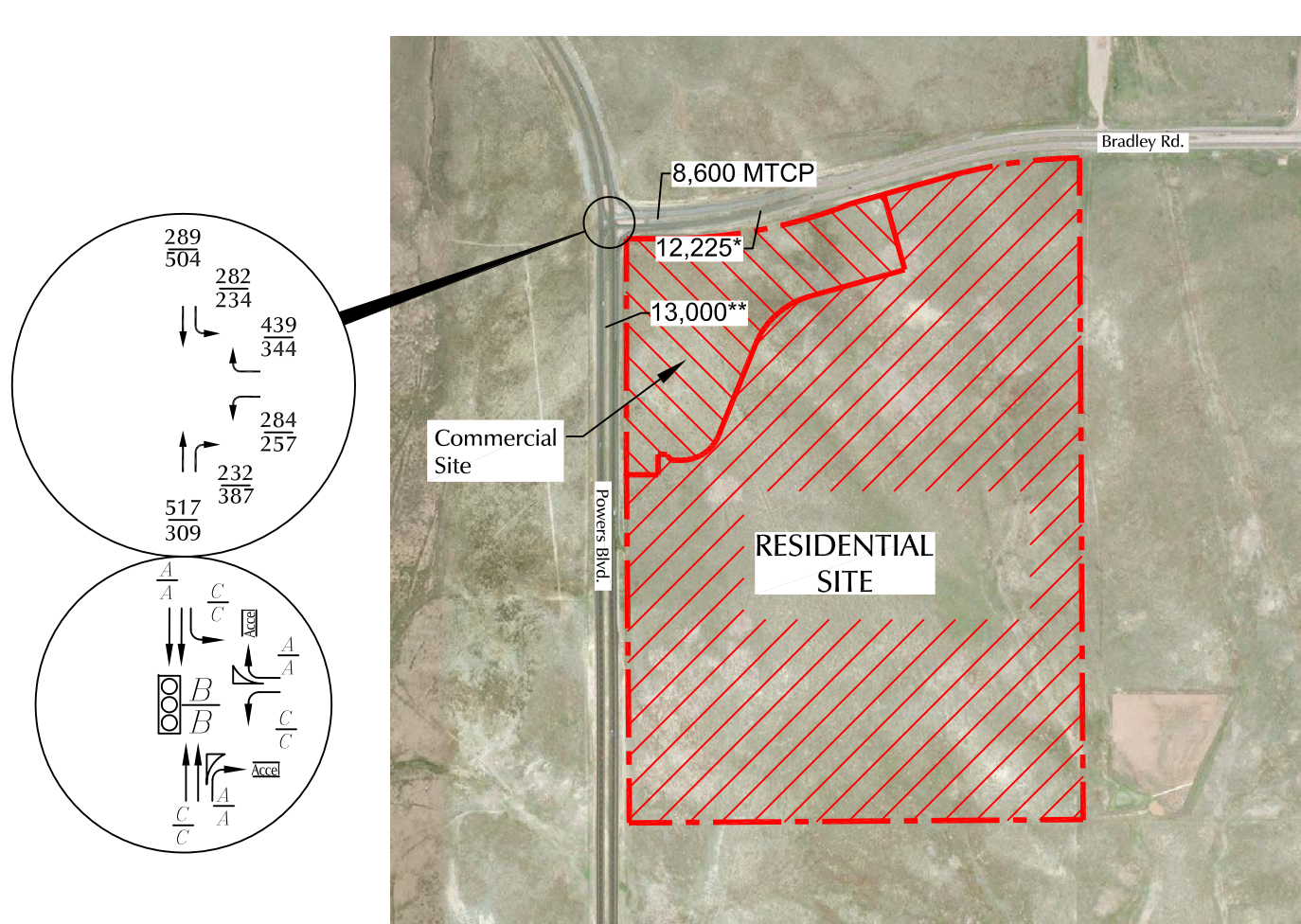












Approximate Scale  
Scale: 1" = 1,000'

#### LEGEND:



= Traffic Signal

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
PM Weekday Peak-Hour Traffic (vehicles per hour) Counts by LSC April 2018

$\frac{A}{B}$  = AM Individual Movement Peak-Hour Level of Service  
PM Individual Movement Peak-Hour Level of Service

$\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service  
PM Entire Intersection Peak-Hour Level of Service

X,XXX= Average Daily Traffic (vehicles per day)

\* Estimate by LSC  
\*\* 2016 AADT CDOT

Figure 5

## Existing Traffic, Lane Geometry, Traffic Control and Level of Service

Springs at Waterview East (LSC #184360)



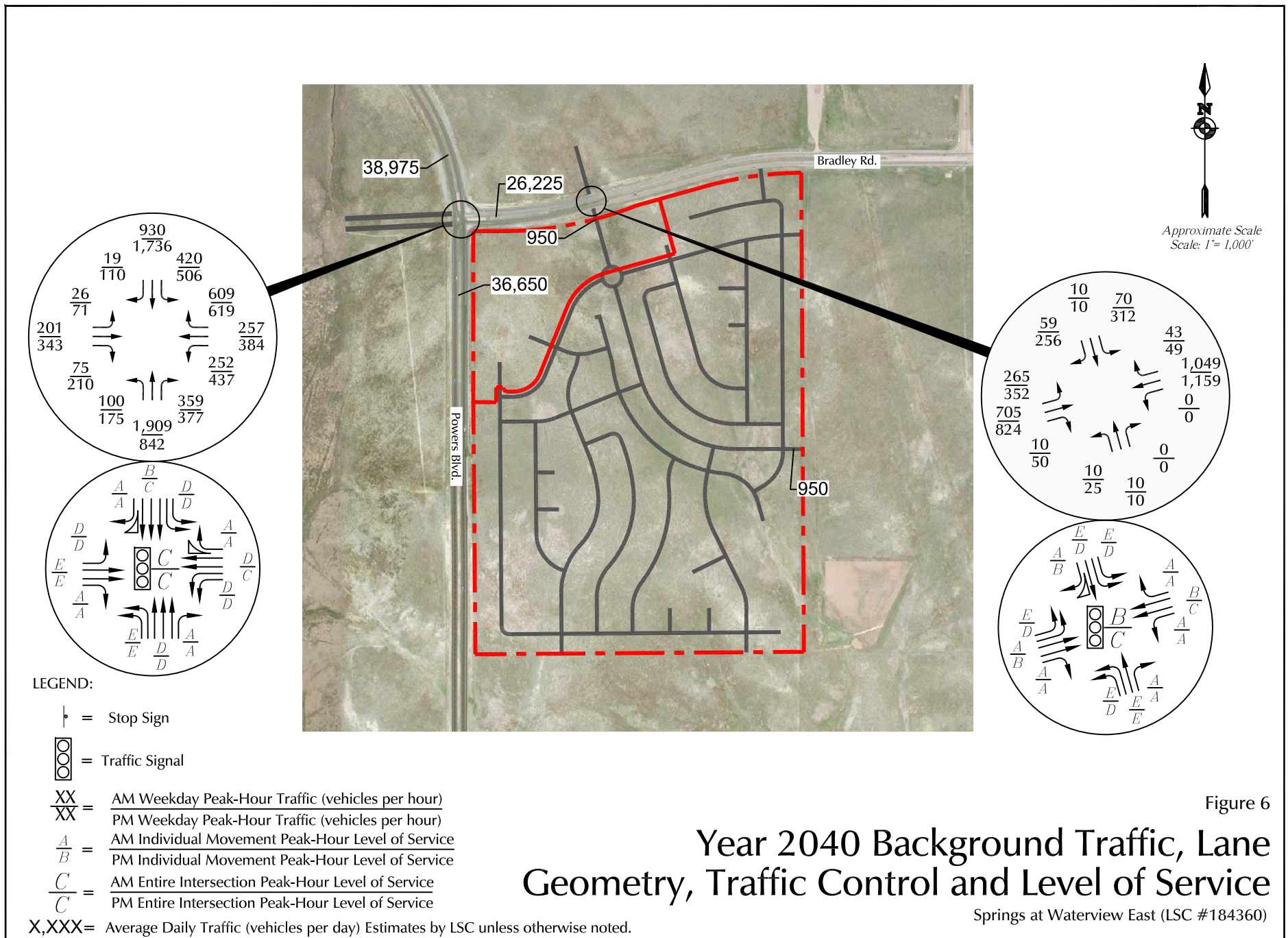
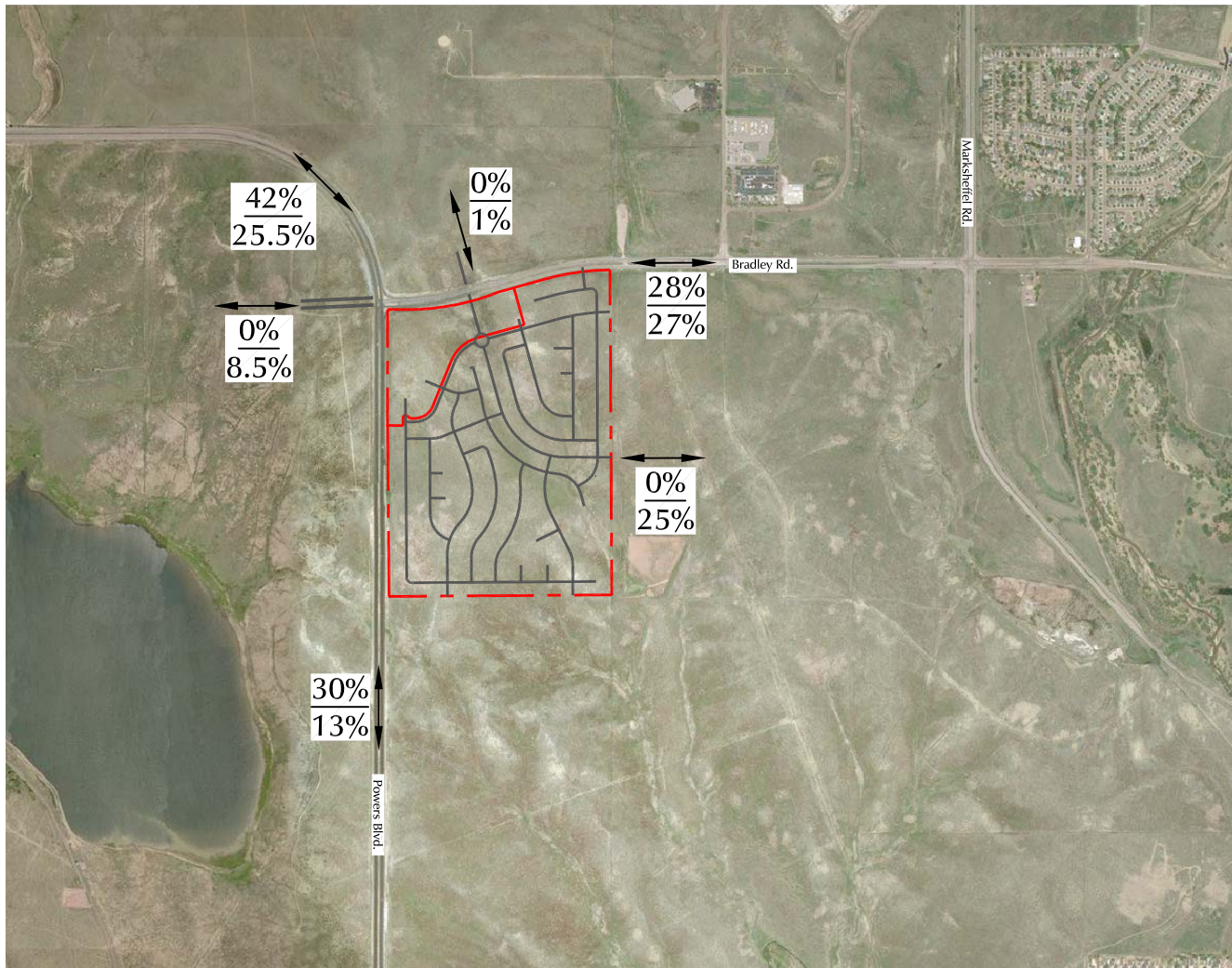


Figure 6  
Year 2040 Background Traffic, Lane  
Geometry, Traffic Control and Level of Service

Springs at Waterview East (LSC #184360)



LEGEND:

$\frac{XX\%}{XX\%}$   
 $\frac{XX\%}{XX\%}$

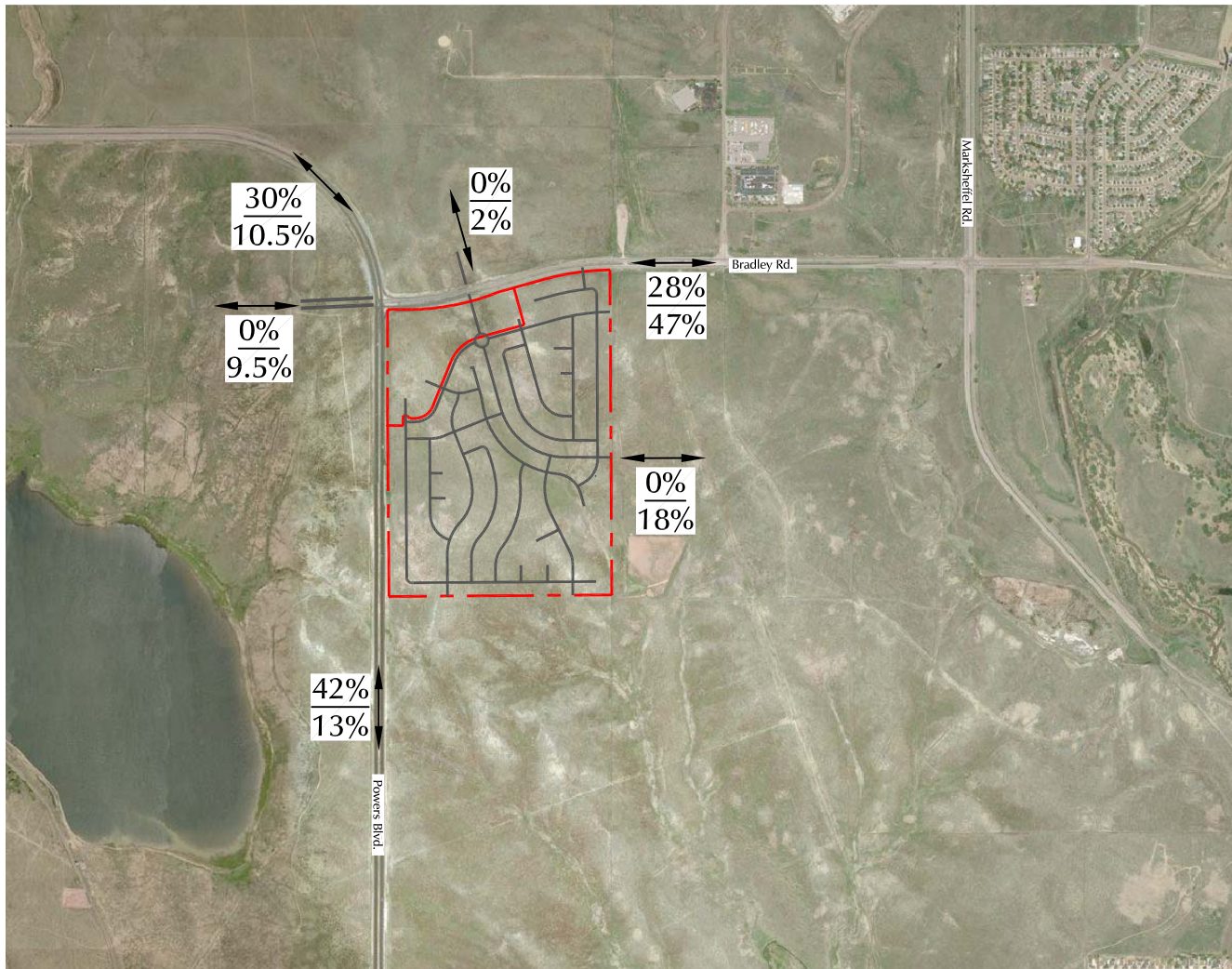
= Short-Term Percent Directional Distribution  
 = Long-Term Percent Directional Distribution

Figure 7

## Directional Distribution of Residential Generated Traffic

Springs at Waterview East (LSC #184360)





Approximate Scale  
Scale: 1" = 2,000'

LEGEND:

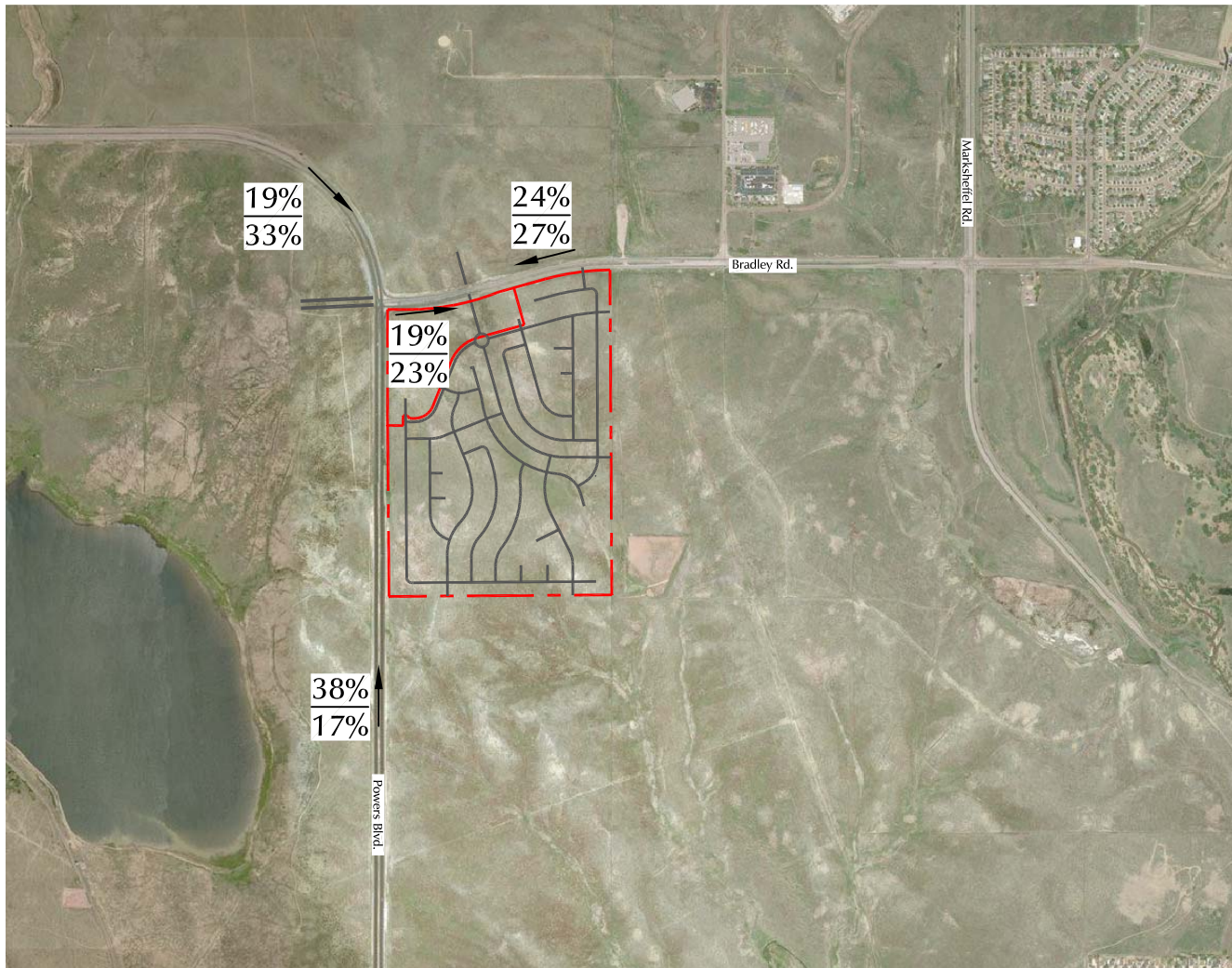
XX%  
XX%

= Short-Term Percent Directional Distribution  
Long-Term Percent Directional Distribution

## Directional Distribution of Primary Commercial Generated Traffic

Springs at Waterview East (LSC #184360)

Figure 8



LEGEND:

$\frac{XX\%}{XX\%}$

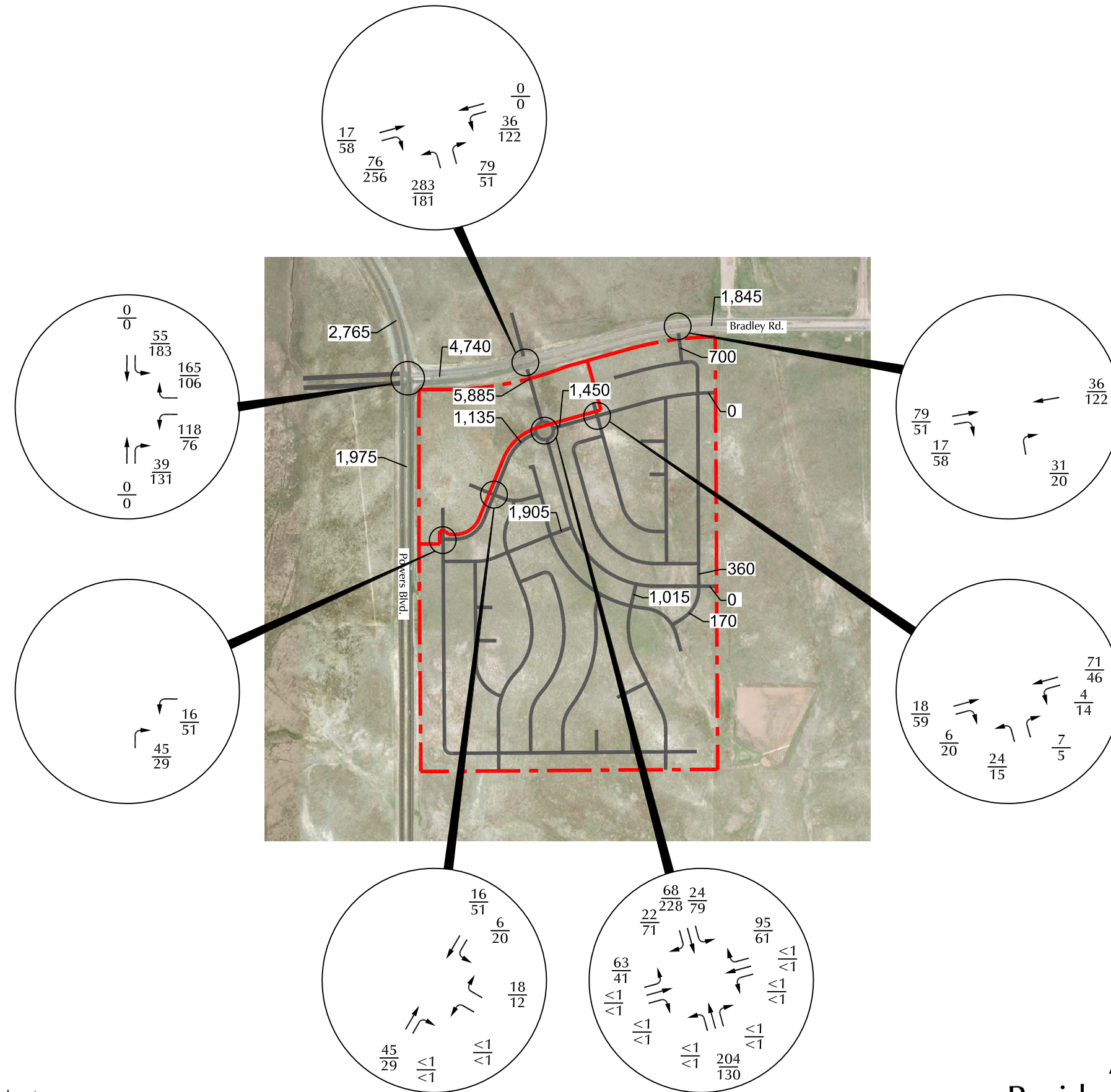
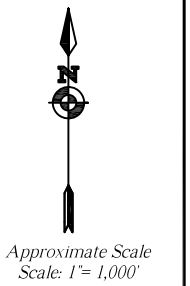
$= \frac{\text{AM Percent Directional Distribution}}{\text{PM Percent Directional Distribution}}$

## Directional Distribution of Passby Commercial Generated Traffic

Springs at Waterview East (LSC #184360)

Figure 9

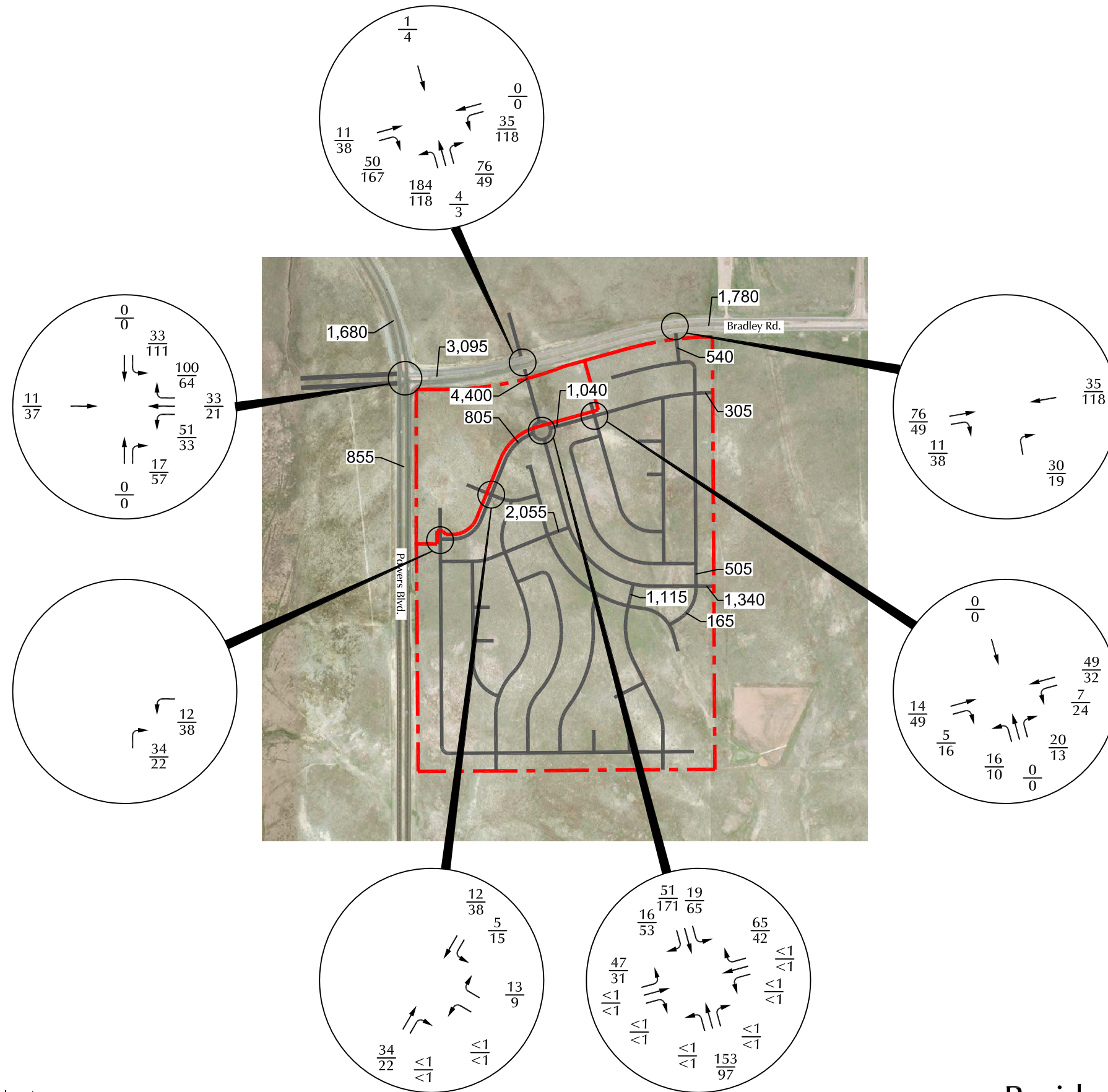
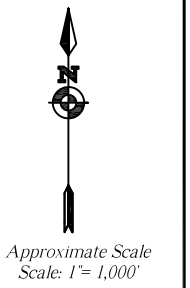




LEGEND:  
 $\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)  
X,XXX= Average Daily Traffic (vehicles per day)

Figure 10  
**Assignment of Short-Term  
Residential Site-Generated Traffic**  
Springs at Waterview East (LSC #184360)



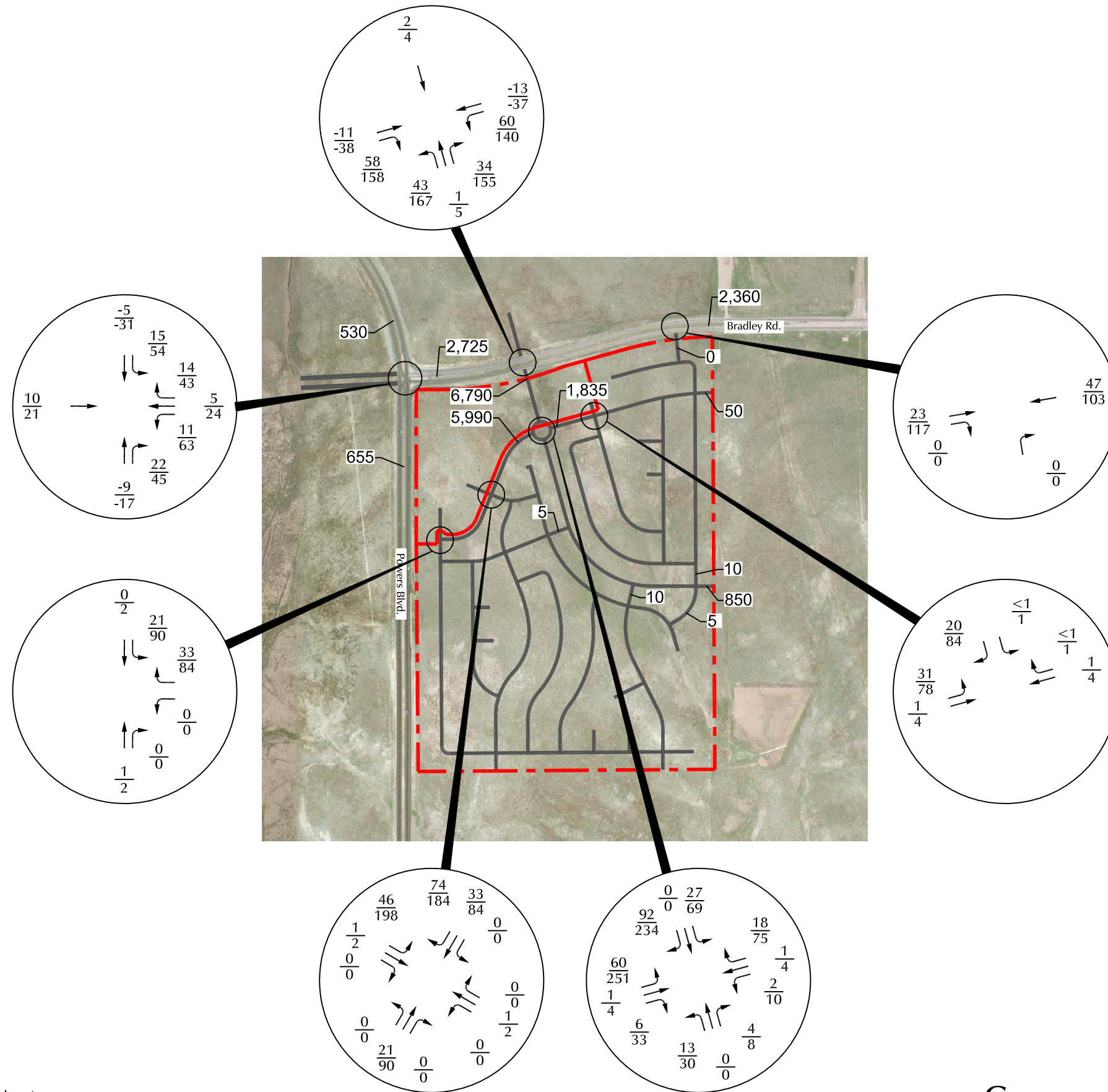
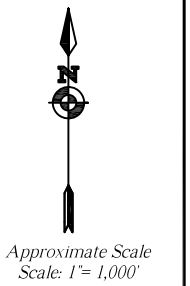


LEGEND:  
 $\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)  
 X,XXX= Average Daily Traffic (vehicles per day)

Figure 11  
**Assignment of Long-Term  
 Residential Site-Generated Traffic**  
 Springs at Waterview East (LSC #184360)







LEGEND:

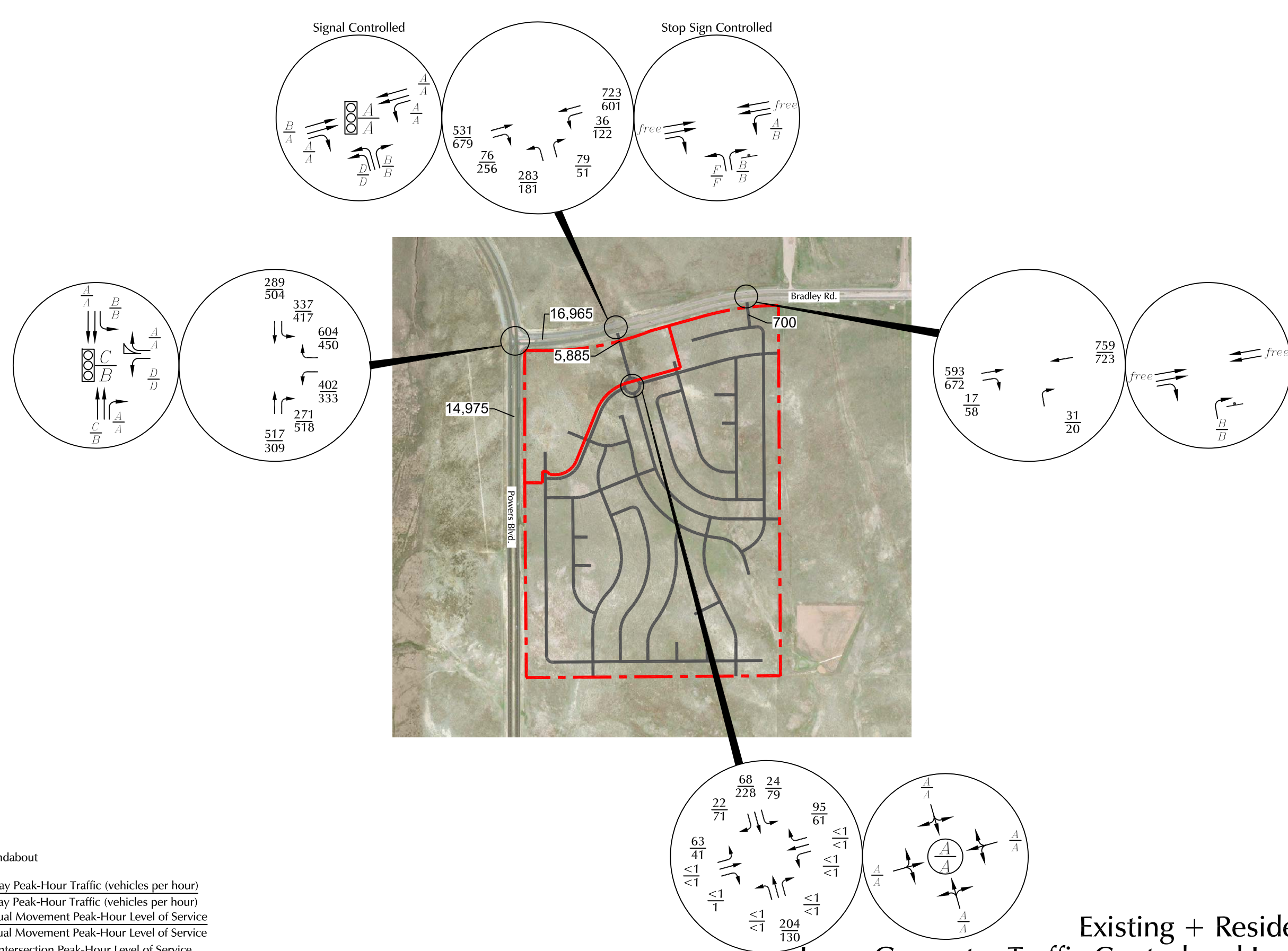
$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)

X,XXX= Average Daily Traffic (vehicles per day)

Figure 13

# Assignment of Long-Term Commercial Site-Generated Traffic

Springs at Waterview East (LSC #184360)



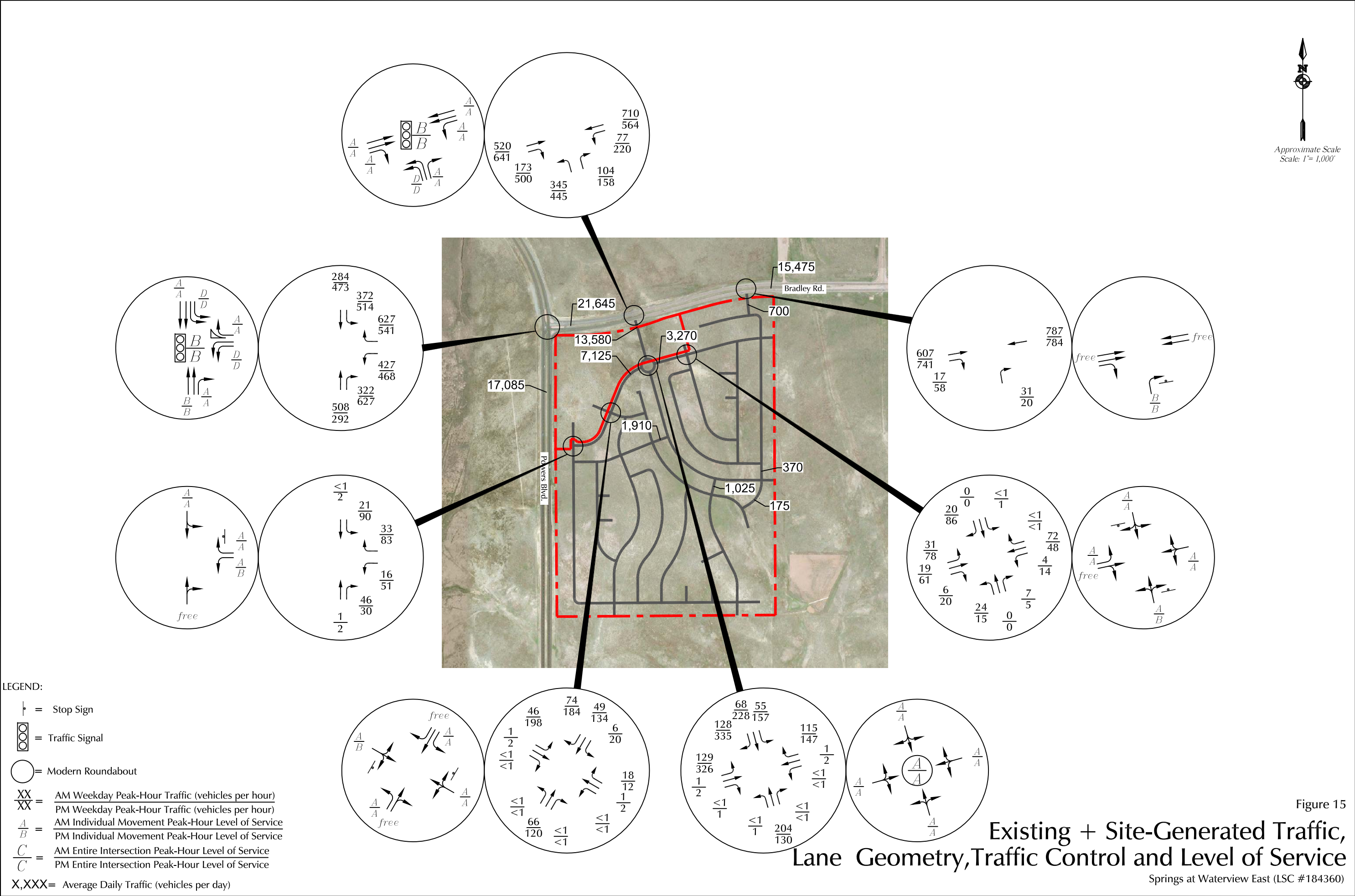
LEGEND:

○ = Modern Roundabout

X,XXX= Average Daily Traffic (vehicles per day)

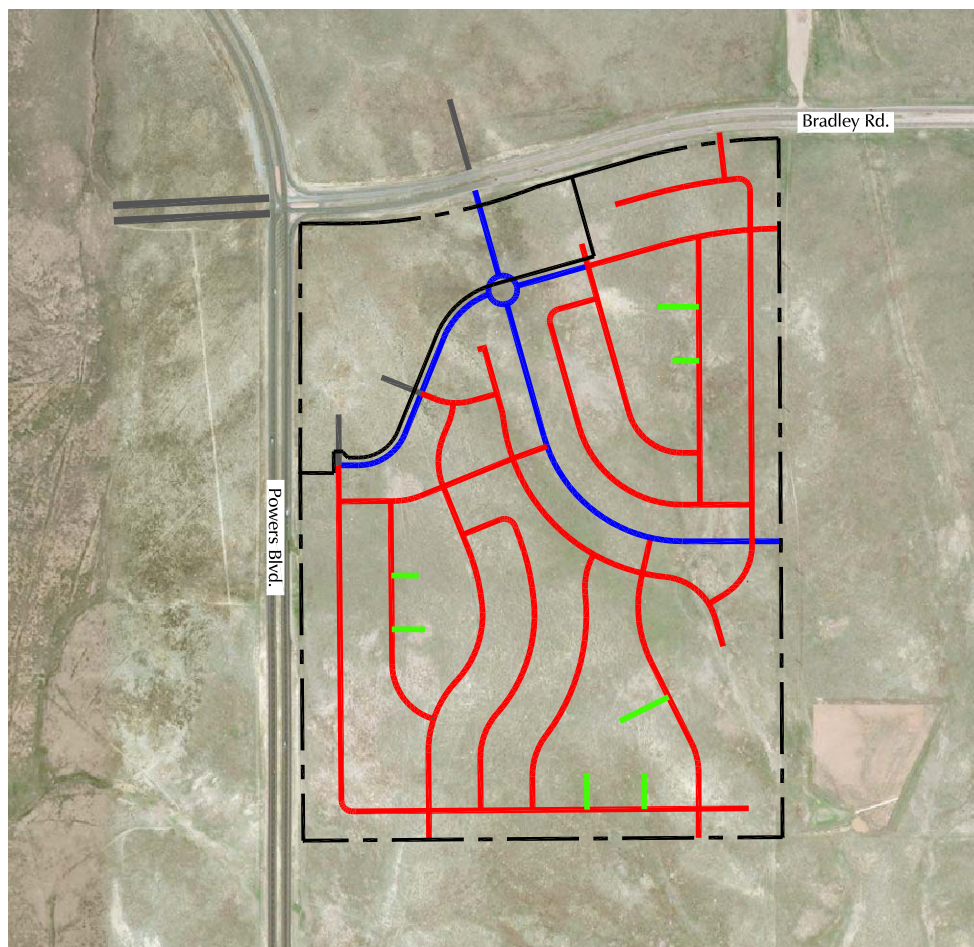
Figure 14











Approximate Scale  
Scale: 1" = 1,000'

LEGEND:

- = Urban Non-Residential Collector
- = Urban Local
- = Urban Local (Low Volume)

Figure 17

## Recommended Classifications

Springs at Waterview East (LSC #184360)

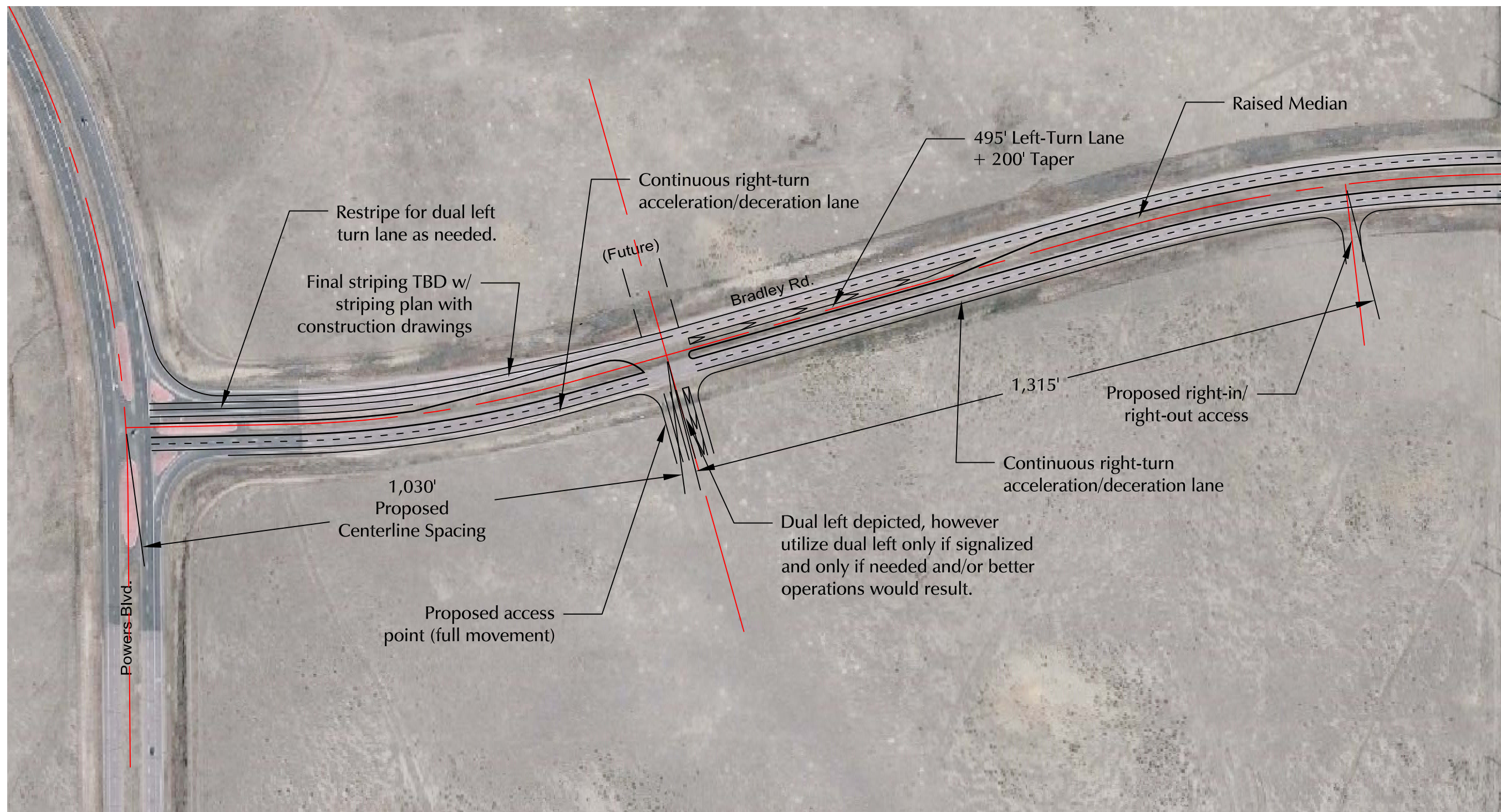


Figure 18

## Short-Term Bradley Road Lane Recommendations

Springs at Waterview East (LSC #184360)



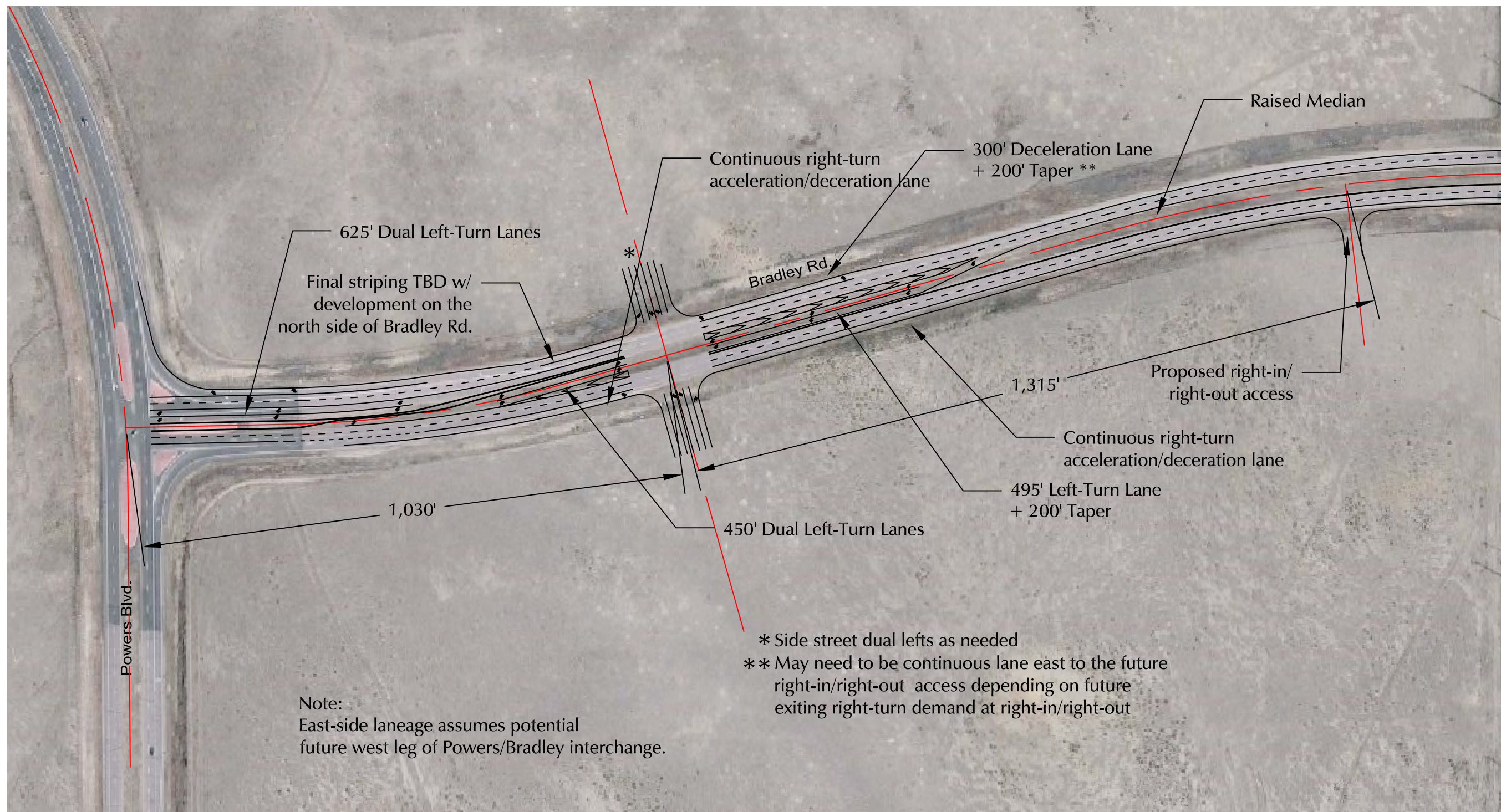


Figure 19

## Long-Term Bradley Road Lane Recommendations

Springs at Waterview East (LSC #184360)



Development Services Department  
2880 International Circle  
Colorado Springs, Colorado 80910

Phone: 719.520.6300  
Fax: 719.520.6695  
Website www.elpasoco.com

## DEVIATION REVIEW AND DECISION FORM

Procedure # R-FM-051-07  
Issue Date: 12/31/07  
Revision Issued: 00/00/00

DSD FILE NO.:

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### General Property Information:

Address of Subject Property (Street Number/Name): N/A  
Tax Schedule ID(s) #: 5500000135  
Legal Description of Property: W2 SEC 9-15-65, EX PT TO RDS

Subdivision or Project Name: Waterview Sketch Plan

Section of ECM from Which Deviation is Sought: 2.2.5.B.1

Specific Criteria from Which a Deviation is Sought: Intersection spacing along a Principal Arterial

Proposed Nature and Extent of Deviation: Request for right-in/right-out access point to both the westbound and eastbound directions of Bradley Road approximately 2,340 feet east of Powers Boulevard to serve the proposed residential (south side of Bradley) and non-residential (north side of Bradley) Sketch Plan land uses east of Powers.

### Applicant Information:

Applicant: CPR Entitlements, LLC Email Address: dse.pak7@gmail.com  
Applicant is: ☐ Owner ☒ Consultant ☐ Contractor  
Mailing Address: 31 North Tejon St., Suite 500, Colorado Springs State: CO Postal Code: 80903  
Telephone Number: 719-227-7388 Fax Number: 719-227-7392

### Engineer Information:

Engineer: Jeffrey C. Hodsdon, P.E., PTOE Email Address: jchodsdon@lscs.com  
Company Name: LSC Transportation Consultants, Inc.  
Mailing Address: 516 North Tejon Street State: CO Postal Code: 80903  
Registration Number: 31684 State of Registration: Colorado  
Telephone Number: (719) 633-2868 Fax Number: (719) 633-5430

### Explanation of Request (Attached diagrams, figures and other documentation to clarify request):

Section of ECM from Which Deviation is Sought: 2.2.5.B.1  
Specific Criteria from Which a Deviation is Sought: Access spacing along a Principal Arterial

Proposed Nature and Extent of Deviation: Request for right-in/right-out access point to both the westbound and eastbound directions of Bradley Road approximately 2,340 feet east of Powers Boulevard to serve the proposed residential (south side of Bradley) and non-residential (north side of Bradley) Sketch Plan land uses east of Powers.

Reason for the Requested Deviation: The deviation is requested to provide second points of access to the proposed sketch plan land uses located north and south of Bradley Road and east of Powers Boulevard. The primary access would be at the currently proposed full-movement access approximately 1,030 feet east of Powers (please refer to separate deviation request). The deviation is requested as the property only has public roadway frontage to Bradley Road and Powers Boulevard and no access will be allowed to Powers. Bradley is the only roadway to which these parcels could have direct access. The right-in/right-out access point would provide a second point of access for these development areas and would improve circulation for these areas. Given the limited access opportunities to these

sketch plan areas, the right-in/right-out access point would distribute the site-generated right-turn movements to/from Bradley Road at two locations instead of one. This will reduce the turning movements at the proposed full-movement access to the west.

Comparison of Proposed Deviation to ECM Standard: The requested accesses would be approximately 1,560 feet west of Foreign Trade Zone Boulevard, 2,340 feet east of Powers Boulevard, and about 1,315 feet east of the proposed full-movement intersection location. The south side right-in/right out would be 1,135 feet west of a future right-in/right-out access to the Bradley Heights development (City of Colorado Springs).

Applicable Regional or National Standards used as Basis: \_\_\_\_\_

**Application Consideration:**

**CHECK IF APPLICATION MEETS CRITERIA FOR CONSIDERATION**

**JUSTIFICATION**

☐ The ECM standard is inapplicable to a particular situation.

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☒ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.

The parcels northeast and northwest of Powers Boulevard/ Bradley Road have no access without either the proposed full-movement access (separate deviation form) or this proposed access. This proposed access is requested for purposes of providing a second access. A future minor connection is planned between Waterview and Bradley Heights to the east but currently, however, this has been planned for connectivity between developments and is not intended to provide other than a minor connection. Given the master-planned uses, the size of the land area to be served, and essentially access to Bradley Road only, a second point of access (right-in/right-out) to Bradley is needed.

☐ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

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**If at least one of the criteria listed above is not met, this application for deviation cannot be considered.**

**Criteria for Approval:**

**PLEASE EXPLAIN HOW EACH OF THE FOLLOWING CRITERIA HAVE BEEN SATISFIED BY THIS REQUEST**

The request for a deviation is not based exclusively on financial considerations.

The request is not based on financial considerations. The request is based on the need to provide a second access to serve the parcels northeast and northwest of Powers Boulevard that would have no access without access to Bradley Road. The first/primary access would be the proposed full-movement to Bradley Road (separate deviation). See the above justification paragraph under "Application Consideration" for additional detail.

The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

The intersection spacing would be sufficient to achieve auxiliary right-turn lanes on Bradley Road. The deviation is requested as the property only has public roadway frontage to Bradley Road and Powers Boulevard and no access will be allowed to Powers. Bradley is the only roadway to which these parcels could have direct access. The right-in/right-out access points would provide a second point of

El Paso County Procedures Manual

Procedure # R-FM-051-07

Issue Date: 12/31/07

Revision Issued: 00/00/00

DSD File No. \_\_\_\_\_ **SKP 16-002** \_\_\_\_\_



access for these development areas and would improve circulation for these areas. Given the limited access opportunities to these parcels, these right-in/right-out access points would distribute the site-generated right-turn movements to/from Bradley Road at two locations instead of one. This will reduce the turning movements at the proposed full-movement access to the west and potentially at the Foreign Trade Zone/Bradley intersection to the east if a future connection is created between Waterview and Foreign Trade Zone Blvd (right-of-way is not currently available, but a connection could potentially be established with the development of the private property to the east of Waterview).

The deviation will not adversely affect safety or operations.

The intersection would operate at a satisfactory level of service based on short-term and long-term traffic volume projections. The intersection spacing would be sufficient to achieve auxiliary right-turn lanes. The center median on Bradley Road would physically prevent left-turn movements. Future traffic signals at the Bradley/Foreign Trade Zone intersection and at the proposed Waterview full-movement intersection to the west would generate gaps in through traffic on Bradley Road which would be utilized by exiting right-turn movements to turn onto Bradley Road. Please refer to the attached LSC Traffic Technical Memorandum for additional technical detail and analysis results.

The deviation will not adversely affect maintenance and its associated cost.

N/A

The deviation will not adversely affect aesthetic appearance.

N/A

**Owner, Applicant and Engineer Declaration:**

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation or condition(s) of approval.

Signature of owner (or authorized representative)

Date

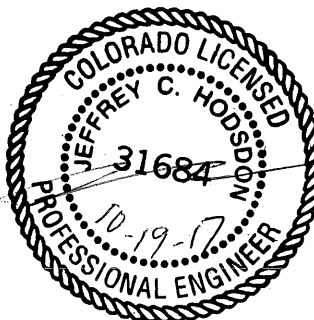
Signature of applicant (if different from owner)

Date

Signature of Engineer

Date

Engineer's Seal



El Paso County Procedures Manual


Procedure # R-FM-051-07

Issue Date: 12/31/07

Revision Issued: 00/00/00

DSD File No. SKP 16-002

**Review and Recommendation:**  
**APPROVED by the ECM Administrator**

<b>Approved</b> <small>by Elizabeth Nijkamp El Paso County Planning and Community Development on behalf of Jennifer Irvine, County Engineer, ECM Administrator</small> <b>03/28/2018 4:04:26 PM</b> <small>Date</small>	
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This request has been determined to have met the criteria for approval. A deviation from Section 2.2.5.B.1 of ECM is hereby granted based on the justification provided. Comments:

The approved RIRO may be closed after a second access has been established to the subdivision.

\_\_\_\_ Additional comments or information are attached.

**DENIED by the ECM Administrator**

\_\_\_\_ Date

This request has been determined not to have met criteria for approval. A deviation from Section \_\_\_\_ of ECM is hereby denied. Comments:

\_\_\_\_ Additional comments or information are attached.



Development Services Department  
2880 International Circle  
Colorado Springs, Colorado 80910

Phone: 719.520.6300  
Fax: 719.520.6695  
Website [www.elpasoco.com](http://www.elpasoco.com)

## DEVIATION REVIEW AND DECISION FORM

Procedure # R-FM-051-07  
Issue Date: 12/31/07  
Revision Issued: 00/00/00

DSD FILE NO.:

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### General Property Information:

Address of Subject Property (Street Number/Name): N/A  
Tax Schedule ID(s) #: 5500000135  
Legal Description of Property: W2 SEC 9-15-65, EX PT TO RDS

Subdivision or Project Name: Waterview Sketch Plan

Section of ECM from Which Deviation is Sought: 2.2.5.B.1

Specific Criteria from Which a Deviation is Sought: Intersection spacing along a Principal Arterial  
Proposed Nature and Extent of Deviation: Request for a full-movement, future public street signalized intersection with Bradley Road approximately 1,030 feet east of Powers Boulevard to serve the proposed residential and non-residential Sketch Plan land uses north and south of Bradley Road and east of Powers.

### Applicant Information:

Applicant: CPR Entitlements, LLC Email Address: [dse.pak7@gmail.com](mailto:dse.pak7@gmail.com)  
Applicant is: ☐ Owner ☒ Consultant ☐ Contractor  
Mailing Address: 31 North Tejon Street, Suite 500, Colorado Springs State: CO Postal Code: 80903  
Telephone Number: 719-227-7388 Fax Number: 719-227-7392

### Engineer Information:

Engineer: Jeffrey C. Hodsdon, P.E., PTOE Email Address: [jchodsdon@lscs.com](mailto:jchodsdon@lscs.com)  
Company Name: LSC Transportation Consultants, Inc.  
Mailing Address: 516 North Tejon Street State: CO Postal Code: 80903  
Registration Number: 31684 State of Registration: Colorado  
Telephone Number: (719) 633-2868 Fax Number: (719) 633-5430

### Explanation of Request (Attached diagrams, figures and other documentation to clarify request):

Section of ECM from Which Deviation is Sought: 2.2.5.B.1  
Specific Criteria from Which a Deviation is Sought: Access spacing along a Principal Arterial

Proposed Nature and Extent of Deviation: Request for a full-movement, future public street signalized intersection with Bradley Road approximately 1,030 feet east of Powers Boulevard to serve the proposed residential and non-residential Sketch Plan land uses north and south of Bradley Road and east of Powers.

Reason for the Requested Deviation: The deviation is requested to provide a future public street intersection and the major access for the proposed Sketch Plan land uses located north and south of Bradley Road and east of Powers Boulevard. The deviation is needed regardless of the exact location of the access because the access would be either less than 1/2-mile from the Powers/Bradley intersection or less than 1/2-mile from the Foreign Trade Zone intersection. The deviation is requested as the property only has public roadway frontage to Bradley Road and Powers Boulevard and no access will be allowed to Powers. Bradley is the only roadway to which these parcels could have direct access.

Also, a full-movement access to Bradley Road was shown on the older approved Sketch Plan.

Comparison of Proposed Deviation to ECM Standard: The requested access would be approximately 2,870 feet west of Foreign Trade Zone Boulevard (exceeds 1/2-mile spacing) and approximately 1,030 feet east of Powers Boulevard, whereas 2,640 feet is the ECM standard.

Applicable Regional or National Standards used as Basis: \_\_\_\_\_

**Application Consideration:**

**CHECK IF APPLICATION MEETS CRITERIA FOR CONSIDERATION**

**JUSTIFICATION**

☐ The ECM standard is inapplicable to a particular situation.

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☒ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.

The parcels northeast and northwest of Powers Boulevard have no access without the proposed access. A future minor connection is planned between Waterview and Bradley Heights to the east; however, this has been planned for connectivity between developments and would not be sufficient access. Also, given the master-planned uses and size of the land area to be served by the access to Bradley, a right-in/right-out access would not suffice. A full-movement access is necessary. A full-movement access between Powers and Foreign Trade Zone Boulevard has been shown on the Waterview Sketch Plan for a number of years. The currently proposed location would be superior to that location previously shown 2,000 feet east of Powers.

☐ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

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**If at least one of the criteria listed above is not met, this application for deviation cannot be considered.**

**Criteria for Approval:**

**PLEASE EXPLAIN HOW EACH OF THE FOLLOWING CRITERIA HAVE BEEN SATISFIED BY THIS REQUEST**

The request for a deviation is not based exclusively on financial considerations.

The request is not based on financial considerations. The request is based on the need to provide a future public street intersection on Bradley Road to serve the parcels northeast and northwest of Powers Boulevard that would have no access without access to Bradley Road. See the above justification paragraph under "Application Consideration" for additional detail.

The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

The intersection spacing would be sufficient to achieve auxiliary left-turn lanes on Bradley Road. The spacing to Powers (west) and Foreign Trade Zone Boulevard (east) will be sufficient to allow this intersection to be signalized. Given the location of land uses to be served in relation to the Powers/Bradley intersection the proposed intersection location would be optimal. Also, the proposed intersection location would be near the north/south dividing line between the proposed commercial and residential development (established as a result of the airport APZ line). This would result in a north/south public street which would serve both the commercial and residential development well. It would provide a buffer between the commercial and residential areas and it would much better serve the

commercial site and make it more viable by moving the full-movement, future signalized intersection to the adjacent northeast corner of the commercial area. The proposed location would be far superior from this perspective. The previous plan showed the first full-movement east of Powers located nearly a quarter-mile to the east of the commercial development area. This, arguably, would not work for commercial development. Commercial/retail development would be most viable when located adjacent to the intersection of Powers and Bradley with a pre-established full-movement, future signalized intersection on Bradley Road at the proposed location. The intersection should be shown at the best location outside the CDOT A-line now.

The deviation will not adversely affect safety or operations.

The intersection would operate at a satisfactory level of service based on short-term and long-term traffic volume projections. The intersection spacing would be sufficient to achieve auxiliary turn lanes and these lanes would accommodate the projected vehicle queues. Good Bradley Road corridor traffic signal progression could be achieved with a future traffic signal at this intersection. The intersection at the proposed location would also provide the option for coordinating the signal at this intersection with the future signal at the Powers/Bradley intersection. Please refer to the attached LSC Traffic Technical Memorandum for additional technical detail and analysis results. The memorandum also addresses the turning movements from Powers onto eastbound Bradley with the relatively short distances to the entry points to the eastbound auxiliary turn lanes at the proposed Waterview intersection.

The deviation will not adversely affect maintenance and its associated cost.

N/A

The deviation will not adversely affect aesthetic appearance.

N/A

**Owner, Applicant and Engineer Declaration:**

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation of condition(s) of approval.

Signature of owner (or authorized representative)

Date

Signature of applicant (if different from owner)

Date

Signature of Engineer

Date

Engineer's Seal





**Review and Recommendation:**  
**APPROVED by the ECM Administrator**



This request has been determined to have met the criteria for approval. A deviation from Section 2.2.5.B.1 of ECM is hereby granted based on the justification provided. Comments:

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\_\_\_\_ Additional comments or information are attached.

**DENIED by the ECM Administrator**

\_\_\_\_ Date

This request has been determined not to have met criteria for approval. A deviation from Section \_\_\_\_\_ of ECM is hereby denied. Comments:

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\_\_\_\_ Additional comments or information are attached.

**LSC Transportation Consultants, Inc.**  
Colorado Springs, CO 80905  
719-633-2868

Default Comments

Change These in The Preferences Window

Select File/Preference in the Main Scree

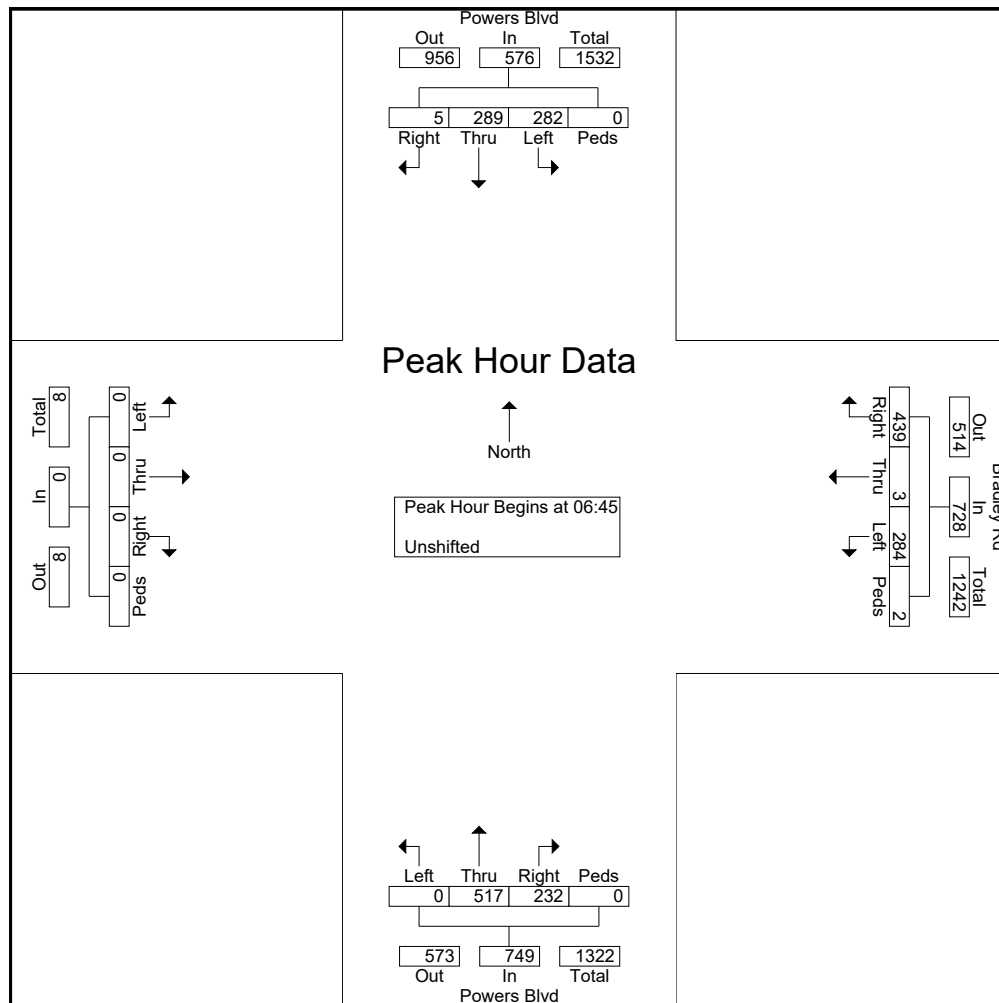
Then Click the Comments Tab

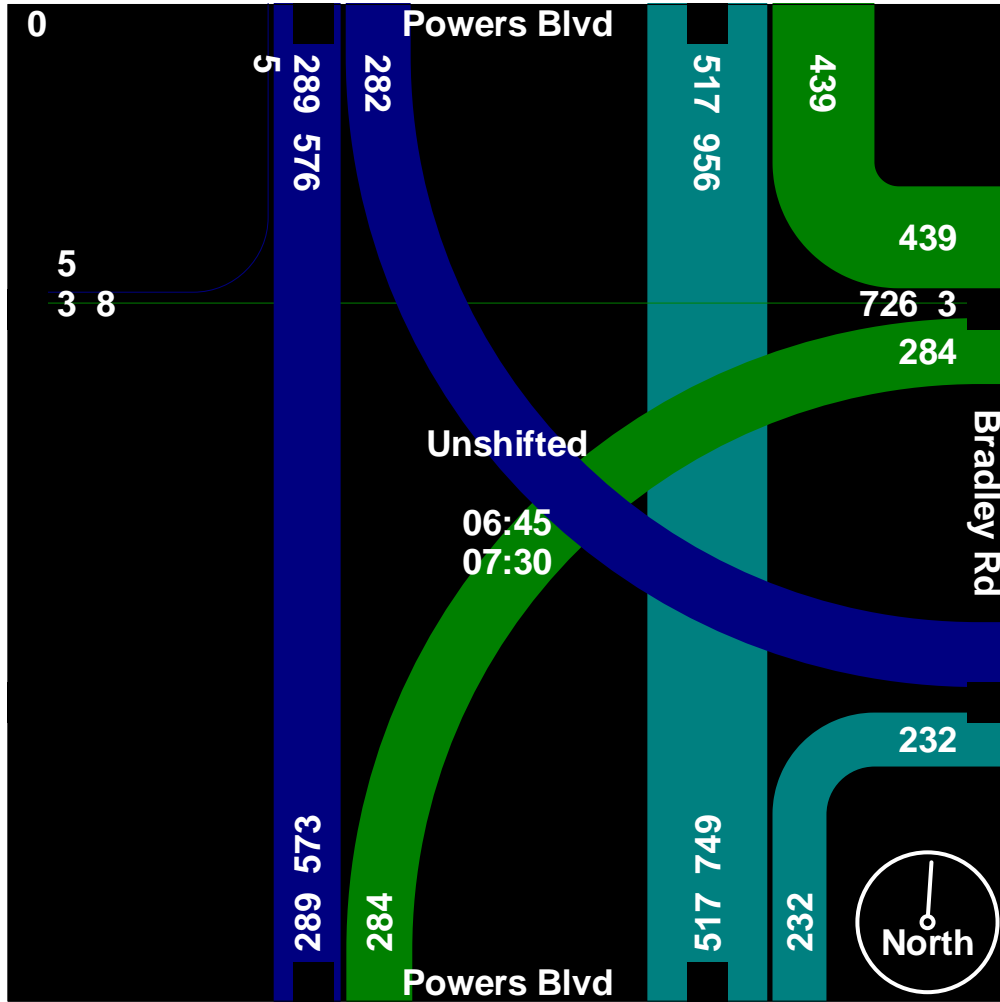
**Groups Printed- Unshifted**

	<b>Powers Blvd Southbound</b>					<b>Bradley Rd Westbound</b>					<b>Powers Blvd Northbound</b>					<b>Eastbound</b>					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:30	61	54	0	0	115	68	0	71	0	139	0	89	73	0	162	0	0	0	0	0	416
06:45	67	68	0	0	135	80	0	104	0	184	0	110	55	0	165	0	0	0	0	0	484
Total	128	122	0	0	250	148	0	175	0	323	0	199	128	0	327	0	0	0	0	0	900
07:00	67	87	0	0	154	71	0	119	0	190	0	120	58	0	178	0	0	0	0	0	522
07:15	66	56	5	0	127	65	3	111	2	181	0	154	65	0	219	0	0	0	0	0	527
07:30	82	78	0	0	160	68	0	105	0	173	0	133	54	0	187	0	0	0	0	0	520
07:45	63	77	0	0	140	78	0	62	0	140	0	93	54	0	147	0	0	0	0	0	427
Total	278	298	5	0	581	282	3	397	2	684	0	500	231	0	731	0	0	0	0	0	1996
08:00	36	66	0	0	102	89	0	70	0	159	0	97	47	0	144	0	0	0	0	0	405
08:15	50	72	0	0	122	93	0	61	0	154	0	73	37	0	110	0	0	0	0	0	386

**LSC Transportation Consultants, Inc.**  
Colorado Springs, CO 80905  
719-633-2868

	Powers Blvd Southbound					Bradley Rd Westbound					Powers Blvd Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45																					
06:45	67	68	0	0	135	80	0	104	0	184	0	110	55	0	165	0	0	0	0	0	484
07:00	67	87	0	0	154	71	0	119	0	190	0	120	58	0	178	0	0	0	0	0	522
07:15	66	56	5	0	127	65	3	111	2	181	0	154	65	0	219	0	0	0	0	0	527
07:30	82	78	0	0	160	68	0	105	0	173	0	133	54	0	187	0	0	0	0	0	520
Total Volume	282	289	5	0	576	284	3	439	2	728	0	517	232	0	749	0	0	0	0	0	2053
% App. Total	49	50.2	0.9	0		39	0.4	60.3	0.3		0	69	31	0		0	0	0	0		
PHF	.860	.830	.250	.000	.900	.888	.250	.922	.250	.958	.000	.839	.892	.000	.855	.000	.000	.000	.000	.000	.974





**LSC Transportation Consultants, Inc.**  
Colorado Springs, CO 80905  
719-633-2868

Default Comments

Change These in The Preferences Window

Select File/Preference in the Main Scree

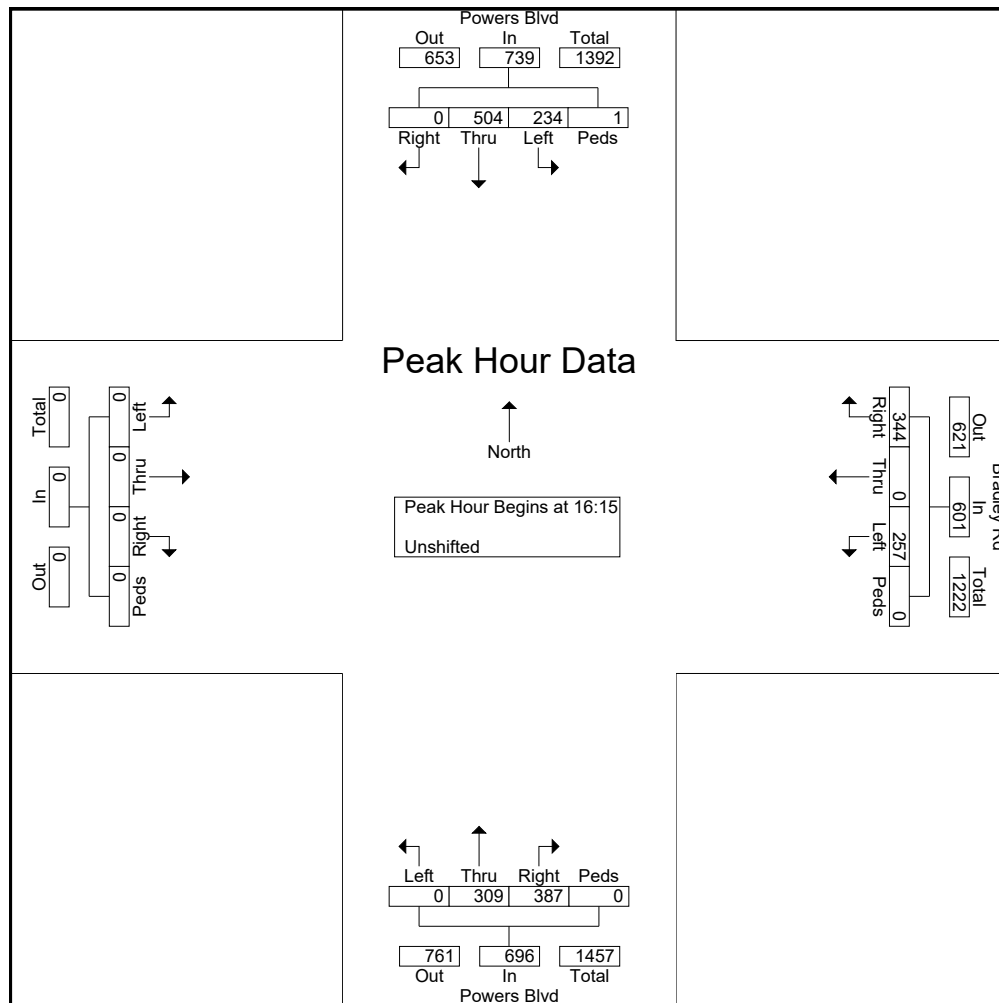
Then Click the Comments Tab

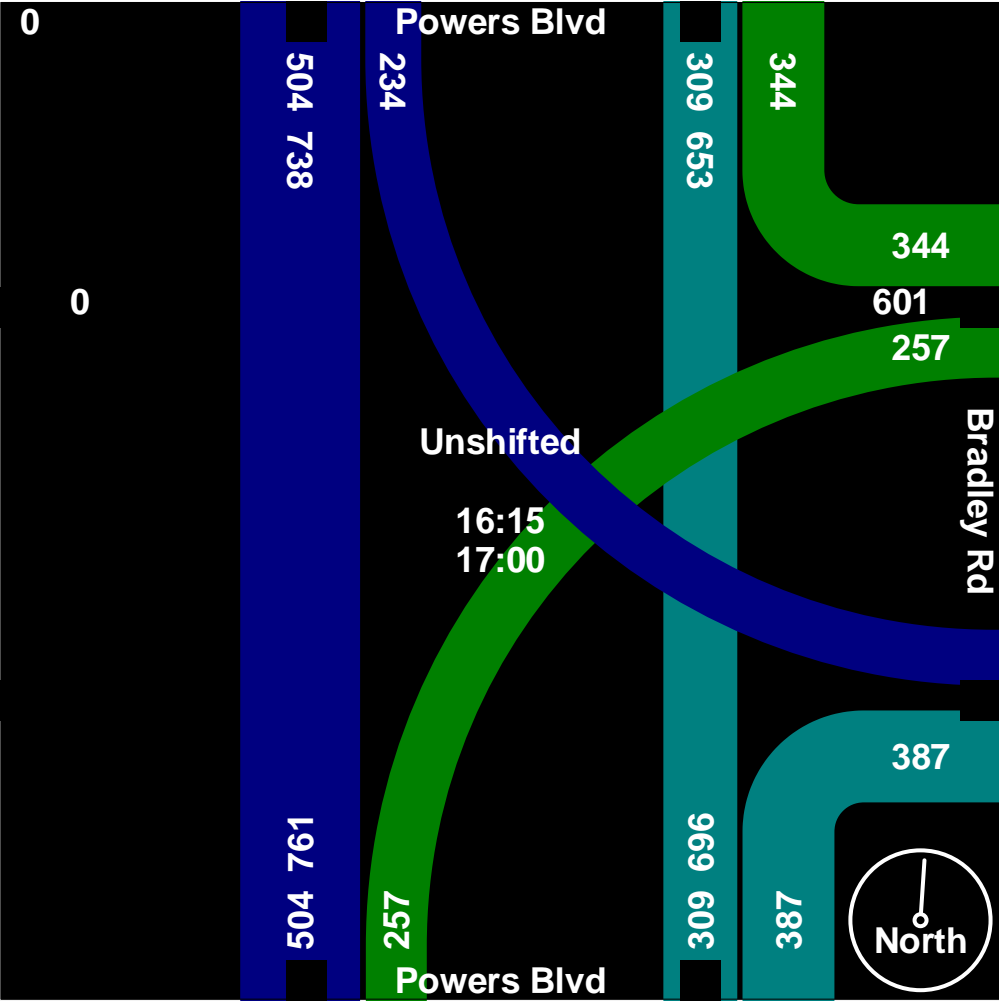
**Groups Printed- Unshifted**

	<b>Powers Blvd Southbound</b>					<b>Bradley Rd Westbound</b>					<b>Powers Blvd Northbound</b>					<b>Eastbound</b>					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
16:00	82	119	0	0	201	55	1	100	0	156	0	75	70	0	145	0	0	0	0	0	502
16:15	66	121	0	0	187	63	0	90	0	153	0	55	115	0	170	0	0	0	0	0	510
16:30	64	122	0	0	186	65	0	95	0	160	0	81	80	0	161	0	0	0	0	0	507
16:45	45	124	0	1	170	64	0	95	0	159	0	66	103	0	169	0	0	0	0	0	498
Total	257	486	0	1	744	247	1	380	0	628	0	277	368	0	645	0	0	0	0	0	2017
17:00	59	137	0	0	196	65	0	64	0	129	0	107	89	0	196	0	0	0	0	0	521
17:15	78	125	0	0	203	52	0	58	0	110	0	77	97	0	174	0	0	0	0	0	487
17:30	55	109	0	0	164	54	0	46	0	100	0	80	78	0	158	0	0	0	0	0	422
17:45	57	116	0	0	173	49	0	52	0	101	0	82	81	0	163	0	0	0	0	0	437
Total	249	487	0	0	736	220	0	220	0	440	0	346	345	0	691	0	0	0	0	0	1867

**LSC Transportation Consultants, Inc.**  
Colorado Springs, CO 80905  
719-633-2868

	Powers Blvd Southbound					Bradley Rd Westbound					Powers Blvd Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:15																					
16:15	66	121	0	0	187	63	0	90	0	153	0	55	115	0	170	0	0	0	0	0	510
16:30	64	122	0	0	186	65	0	95	0	160	0	81	80	0	161	0	0	0	0	0	507
16:45	45	124	0	1	170	64	0	95	0	159	0	66	103	0	169	0	0	0	0	0	498
17:00	59	137	0	0	196	65	0	64	0	129	0	107	89	0	196	0	0	0	0	0	521
Total Volume	234	504	0	1	739	257	0	344	0	601	0	309	387	0	696	0	0	0	0	0	2036
% App. Total	31.7	68.2	0	0.1		42.8	0	57.2	0		0	44.4	55.6	0		0	0	0	0		
PHF	.886	.920	.000	.250	.943	.988	.000	.905	.000	.939	.000	.722	.841	.000	.888	.000	.000	.000	.000	.000	.977





Timings  
37: Powers & Bradley Rd.

Existing Traffic  
AM Peak Hour

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	175	363	530	251	301	267
Future Volume (vph)	175	363	530	251	301	267
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	50.0	50.0	20.0	70.0
Total Split (%)	22.2%	22.2%	55.6%	55.6%	22.2%	77.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None
Act Effect Green (s)	10.8	10.8	16.4	16.4	15.2	36.7
Actuated g/C Ratio	0.19	0.19	0.28	0.28	0.26	0.64
v/c Ratio	0.53	0.61	0.61	0.44	0.72	0.13
Control Delay	28.2	8.0	20.8	4.8	32.7	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.2	8.0	20.8	4.8	32.7	4.6
LOS	C	A	C	A	C	A
Approach Delay	14.6		15.7			19.5
Approach LOS	B		B			B

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 57.6

Natural Cycle: 50

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 16.5

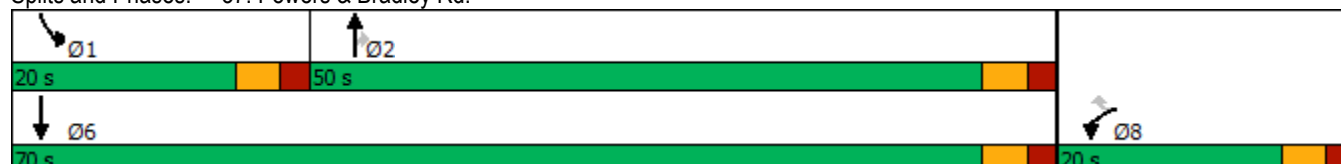
Intersection LOS: B

Intersection Capacity Utilization 53.5%

ICU Level of Service A

Analysis Period (min) 15













Splits and Phases: 37: Powers & Bradley Rd.





Timings  
1: Powers & Bradley Rd.

Existing Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	257	344	309	387	234	504
Future Volume (vph)	257	344	309	387	234	504
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	51.0	51.0	20.0	71.0
Total Split (%)	22.0%	22.0%	56.0%	56.0%	22.0%	78.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None
Act Effect Green (s)	13.8	13.8	11.4	11.4	13.4	29.9
Actuated g/C Ratio	0.26	0.26	0.21	0.21	0.25	0.56
v/c Ratio	0.57	0.52	0.46	0.64	0.56	0.27
Control Delay	24.1	5.9	21.1	7.4	24.3	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.1	5.9	21.1	7.4	24.3	6.7
LOS	C	A	C	A	C	A
Approach Delay	13.7		13.5			12.3
Approach LOS	B		B			B

Intersection Summary

Cycle Length: 91  
 Actuated Cycle Length: 53.8  
 Natural Cycle: 55  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.64  
 Intersection Signal Delay: 13.1  
 Intersection LOS: B  
 Intersection Capacity Utilization 48.2%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.




# Timings

1: Powers & Bradley Rd.

Existing Plus Total Site-Generated Traffic

AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↰	↕↕	↕	↰↰	↕↕
Traffic Volume (vph)	427	627	508	322	372	284
Future Volume (vph)	427	627	508	322	372	284
Turn Type	Prot	Free	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	30.0		45.0	45.0	25.0	70.0
Total Split (%)	30.0%		45.0%	45.0%	25.0%	70.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Max	C-Max	None	C-Max
Act Effect Green (s)	18.3	100.0	49.9	49.9	16.8	71.7
Actuated g/C Ratio	0.18	1.00	0.50	0.50	0.17	0.72
v/c Ratio	0.72	0.42	0.29	0.34	0.69	0.12
Control Delay	42.9	1.5	16.4	3.2	45.5	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.9	1.5	16.4	3.2	45.5	4.9
LOS	D	A	B	A	D	A
Approach Delay	18.3		11.3			27.9
Approach LOS	B		B			C

## Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 18.6

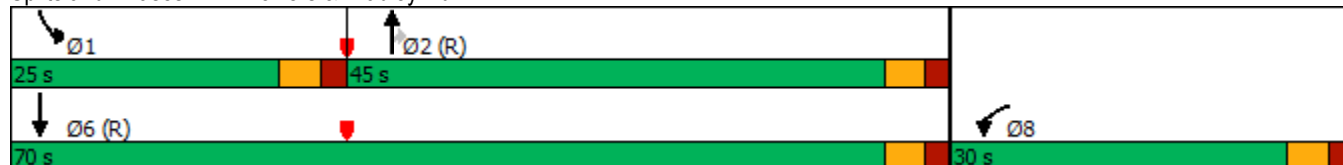
Intersection LOS: B

Intersection Capacity Utilization 49.3%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.



Timings  
2: Waterview Full Access & Bradley Rd.

Existing Plus Total Site-Generated Traffic  
AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↘	↘
Traffic Volume (vph)	520	173	77	710	345	104
Future Volume (vph)	520	173	77	710	345	104
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	21.0	21.0	21.0
Total Split (s)	65.0	65.0	10.0	75.0	25.0	25.0
Total Split (%)	65.0%	65.0%	10.0%	75.0%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effect Green (s)	64.9	64.9	74.0	74.0	16.0	16.0
Actuated g/C Ratio	0.65	0.65	0.74	0.74	0.16	0.16
v/c Ratio	0.25	0.17	0.14	0.29	0.68	0.32
Control Delay	3.6	0.3	4.6	4.9	45.9	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.6	0.3	4.6	4.9	45.9	9.4
LOS	A	A	A	A	D	A
Approach Delay	2.8			4.9	37.4	
Approach LOS	A			A	D	

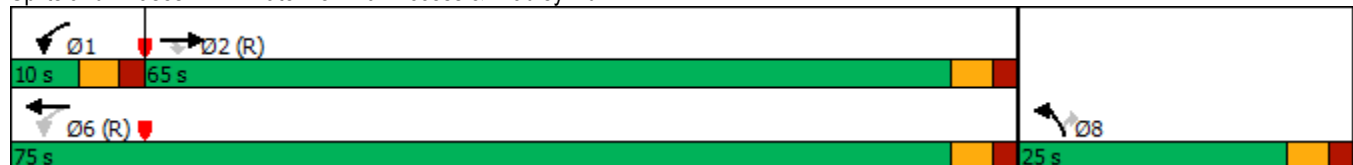
Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 67 (67%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.68  
 Intersection Signal Delay: 11.7  
 Intersection Capacity Utilization 41.0%  
 Analysis Period (min) 15

Intersection LOS: B

ICU Level of Service A

Splits and Phases: 2: Waterview Full Access & Bradley Rd.



HCM 6th TWSC  
3: Waterview RIRO & Bradley Rd.

Existing Plus Total Site-Generated Traffic  
AM Peak Hour

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	607	17	0	787	0	31
Future Vol, veh/h	607	17	0	787	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	500	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	660	18	0	855	0	34
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	330
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	666
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	666
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		10.7	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	666	-	-	-		
HCM Lane V/C Ratio	0.051	-	-	-		
HCM Control Delay (s)	10.7	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		

HCM 6th Roundabout  
5: "A" Street & "K" Street/"C" Street





Existing Plus Total Site-Generated Traffic  
AM Peak Hour

Intersection				
Intersection Delay, s/veh	4.6			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	141	126	222	273
Demand Flow Rate, veh/h	144	127	226	278
Vehicles Circulating, veh/h	136	369	205	1
Vehicles Exiting, veh/h	143	62	75	495
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.1	5.1	5.1	4.3
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	144	127	226	278
Cap Entry Lane, veh/h	1201	947	1120	1378
Entry HV Adj Factor	0.979	0.992	0.980	0.980
Flow Entry, veh/h	141	126	222	273
Cap Entry, veh/h	1176	939	1098	1351
V/C Ratio	0.120	0.134	0.202	0.202
Control Delay, s/veh	4.1	5.1	5.1	4.3
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	1



HCM 6th TWSC  
9: "L" Street/West Retail Access & "K" Street

Existing Plus Total Site-Generated Traffic  
AM Peak Hour

Intersection						
Int Delay, s/veh	5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	16	33	1	46	21	0
Future Vol, veh/h	16	33	1	46	21	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	36	1	50	23	0
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	72	26	0	0	51	0
Stage 1	26	-	-	-	-	-
Stage 2	46	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	932	1050	-	-	1555	-
Stage 1	997	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	918	1050	-	-	1555	-
Mov Cap-2 Maneuver	918	-	-	-	-	-
Stage 1	982	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	8.7	0	7.4			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 918 1050	1555	-		
HCM Lane V/C Ratio	-	- 0.019 0.034	0.015	-		
HCM Control Delay (s)	-	- 9 8.6	7.4	0		
HCM Lane LOS	-	- A A	A	A		
HCM 95th %tile Q(veh)	-	- 0.1 0.1	0	-		

HCM 6th TWSC  
10: "K" Street & Middle Retail Access/"U" Street

Existing Plus Total Site-Generated Traffic  
AM Peak Hour

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	↕
Traffic Vol, veh/h	46	1	0	0	1	18	0	66	0	6	49	74
Future Vol, veh/h	46	1	0	0	1	18	0	66	0	6	49	74
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	205	-	-	205	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	50	1	0	0	1	20	0	72	0	7	53	80






Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	150	139	53	180	219	72	133	0	0	72	0	0
Stage 1	67	67	-	72	72	-	-	-	-	-	-	-
Stage 2	83	72	-	108	147	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	818	752	1014	782	679	990	1452	-	-	1528	-	-
Stage 1	943	839	-	938	835	-	-	-	-	-	-	-
Stage 2	925	835	-	897	775	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	798	748	1014	778	676	990	1452	-	-	1528	-	-
Mov Cap-2 Maneuver	798	748	-	778	676	-	-	-	-	-	-	-
Stage 1	943	835	-	938	835	-	-	-	-	-	-	-
Stage 2	906	835	-	892	771	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.8		8.8		0		0.3	
HCM LOS	A		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1452	-	-	797	966	1528	-
HCM Lane V/C Ratio	-	-	-	0.064	0.021	0.004	-
HCM Control Delay (s)	0	-	-	9.8	8.8	7.4	-
HCM Lane LOS	A	-	-	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.1	0	-

HCM 6th TWSC  
12: 'F' Street/East Retail Access & "C" Street

Existing Plus Total Site-Generated Traffic  
AM Peak Hour

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	19	6	4	72	0	24	0	7	0	0	20
Future Vol, veh/h	31	19	6	4	72	0	24	0	7	0	0	20
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	100	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	34	21	7	4	78	0	26	0	8	0	0	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	78	0	0	28	0	0	190	179	25	183	182	78
Stage 1	-	-	-	-	-	-	93	93	-	86	86	-
Stage 2	-	-	-	-	-	-	97	86	-	97	96	-
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	1520	-	-	1585	-	-	770	715	1051	778	712	983
Stage 1	-	-	-	-	-	-	914	818	-	922	824	-
Stage 2	-	-	-	-	-	-	910	824	-	910	815	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1520	-	-	1585	-	-	738	697	1051	758	694	983
Mov Cap-2 Maneuver	-	-	-	-	-	-	738	697	-	758	694	-
Stage 1	-	-	-	-	-	-	894	800	-	902	822	-
Stage 2	-	-	-	-	-	-	887	822	-	883	797	-








Approach	EB			WB			NB			SB		
HCM Control Delay, s	4.1			0.4			9.8			8.7		
HCM LOS							A			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	791	1520	-	-	1585	-	-	983
HCM Lane V/C Ratio	0.043	0.022	-	-	0.003	-	-	0.022
HCM Control Delay (s)	9.8	7.4	-	-	7.3	0	-	8.7
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	0.1

Timings  
1: Powers & Bradley Rd.

Existing Plus Total Site-Generated Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	468	541	292	627	514	473
Future Volume (vph)	468	541	292	627	514	473
Turn Type	Prot	Free	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	30.0		45.0	45.0	25.0	70.0
Total Split (%)	30.0%		45.0%	45.0%	25.0%	70.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Max	C-Max	None	C-Max
Act Effect Green (s)	20.0	100.0	45.1	45.1	19.9	70.0
Actuated g/C Ratio	0.20	1.00	0.45	0.45	0.20	0.70
v/c Ratio	0.74	0.37	0.21	0.67	0.80	0.20
Control Delay	37.0	1.2	18.1	7.0	47.8	5.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.0	1.2	18.1	7.0	47.8	5.8
LOS	D	A	B	A	D	A
Approach Delay	17.8		10.5			27.7
Approach LOS	B		B			C

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green  
 Natural Cycle: 50  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.80  
 Intersection Signal Delay: 18.7  
 Intersection Capacity Utilization 61.8%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service B

Splits and Phases: 1: Powers & Bradley Rd.



# Timings

## 2: Waterview Full Access & Bradley Rd.

# Existing Plus Total Site-Generated Traffic

PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↘	↘
Traffic Volume (vph)	641	500	220	564	445	158
Future Volume (vph)	641	500	220	564	445	158
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	21.0	9.0	21.0	21.0	21.0
Total Split (s)	65.0	65.0	10.0	75.0	25.0	25.0
Total Split (%)	65.0%	65.0%	10.0%	75.0%	25.0%	25.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effect Green (s)	60.7	60.7	71.8	71.8	18.2	18.2
Actuated g/C Ratio	0.61	0.61	0.72	0.72	0.18	0.18
v/c Ratio	0.32	0.46	0.47	0.24	0.78	0.40
Control Delay	5.8	1.6	8.2	5.3	48.1	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.8	1.6	8.2	5.3	48.1	8.4
LOS	A	A	A	A	D	A
Approach Delay	4.0			6.1	37.7	
Approach LOS	A			A	D	

### Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 67 (67%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 55

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 12.7

Intersection LOS: B

Intersection Capacity Utilization 55.1%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Waterview Full Access & Bradley Rd.



HCM 6th TWSC  
3: Waterview RIRO & Bradley Rd.

Existing Plus Total Site-Generated Traffic  
PM Peak Hour

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	741	58	0	784	0	20
Future Vol, veh/h	741	58	0	784	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	500	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	805	63	0	852	0	22
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	403
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	597
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	597
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.3	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	597	-	-	-		
HCM Lane V/C Ratio	0.036	-	-	-		
HCM Control Delay (s)	11.3	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	-		







HCM 6th Roundabout  
5: "A" Street & "K" Street/"C" Street

Existing Plus Total Site-Generated Traffic  
PM Peak Hour

Intersection				
Intersection Delay, s/veh	8.5			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	357	162	142	783
Demand Flow Rate, veh/h	364	164	145	797
Vehicles Circulating, veh/h	426	506	536	3
Vehicles Exiting, veh/h	374	175	254	667
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.9	6.5	6.5	9.2
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	364	164	145	797
Cap Entry Lane, veh/h	894	824	799	1376
Entry HV Adj Factor	0.981	0.988	0.981	0.982
Flow Entry, veh/h	357	162	142	783
Cap Entry, veh/h	876	813	783	1352
V/C Ratio	0.407	0.199	0.182	0.579
Control Delay, s/veh	8.9	6.5	6.5	9.2
LOS	A	A	A	A
95th %tile Queue, veh	2	1	1	4

HCM 6th TWSC  
9: "L" Street/West Retail Access & "K" Street

Existing Plus Total Site-Generated Traffic  
PM Peak Hour

Intersection						
Int Delay, s/veh	7.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	51	83	2	30	90	2
Future Vol, veh/h	51	83	2	30	90	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	55	90	2	33	98	2
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	217	19	0	0	35	0
Stage 1	19	-	-	-	-	-
Stage 2	198	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	771	1059	-	-	1576	-
Stage 1	1004	-	-	-	-	-
Stage 2	835	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	723	1059	-	-	1576	-
Mov Cap-2 Maneuver	723	-	-	-	-	-
Stage 1	942	-	-	-	-	-
Stage 2	835	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	9.3	0	7.3			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 723 1059 1576	-	-		
HCM Lane V/C Ratio	-	- 0.077 0.085 0.062	-	-		
HCM Control Delay (s)	-	- 10.4 8.7 7.4	0			
HCM Lane LOS	-	- B A A	A			
HCM 95th %tile Q(veh)	-	- 0.2 0.3 0.2	-			

HCM 6th TWSC  
10: "K" Street & Middle Retail Access/"U" Street

Existing Plus Total Site-Generated Traffic  
PM Peak Hour

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	↕
Traffic Vol, veh/h	198	2	0	0	2	12	0	120	0	20	134	184
Future Vol, veh/h	198	2	0	0	2	12	0	120	0	20	134	184
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	205	-	-	205	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	215	2	0	0	2	13	0	130	0	22	146	200






Major/Minor	Minor2		Minor1		Major1		Major2	
Conflicting Flow All	328	320	146	421	520	130	346	0
Stage 1	190	190	-	130	130	-	-	-
Stage 2	138	130	-	291	390	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-
Pot Cap-1 Maneuver	625	597	901	543	461	920	1213	-
Stage 1	812	743	-	874	789	-	-	-
Stage 2	865	789	-	717	608	-	-	-
Platoon blocked, %								-
Mov Cap-1 Maneuver	607	588	901	535	454	920	1213	-
Mov Cap-2 Maneuver	607	588	-	535	454	-	-	-
Stage 1	812	732	-	874	789	-	-	-
Stage 2	850	789	-	704	599	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.2	9.6	0	0.4
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1213	-	-	607	802	1455	-
HCM Lane V/C Ratio	-	-	-	0.358	0.019	0.015	-
HCM Control Delay (s)	0	-	-	14.2	9.6	7.5	-
HCM Lane LOS	A	-	-	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.6	0.1	0	-

HCM 6th TWSC  
12: 'F' Street/East Retail Access & "C" Street

Existing Plus Total Site-Generated Traffic  
PM Peak Hour

Intersection												
Int Delay, s/veh	5.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	78	61	20	14	48	0	15	0	5	1	0	86
Future Vol, veh/h	78	61	20	14	48	0	15	0	5	1	0	86
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	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	85	66	22	15	52	0	16	0	5	1	0	93

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	52	0	0	88	0	0	376	329	77	332	340	52
Stage 1	-	-	-	-	-	-	247	247	-	82	82	-
Stage 2	-	-	-	-	-	-	129	82	-	250	258	-
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	1554	-	-	1508	-	-	581	590	984	621	582	1016
Stage 1	-	-	-	-	-	-	757	702	-	926	827	-
Stage 2	-	-	-	-	-	-	875	827	-	754	694	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1554	-	-	1508	-	-	501	552	984	587	545	1016
Mov Cap-2 Maneuver	-	-	-	-	-	-	501	552	-	587	545	-
Stage 1	-	-	-	-	-	-	715	663	-	875	819	-
Stage 2	-	-	-	-	-	-	787	819	-	709	656	-








Approach	EB			WB			NB			SB		
HCM Control Delay, s	3.7			1.7			11.6			8.9		
HCM LOS							B			A		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	571	1554	-	-	1508	-	-	1008
HCM Lane V/C Ratio	0.038	0.055	-	-	0.01	-	-	0.094
HCM Control Delay (s)	11.6	7.5	-	-	7.4	0	-	8.9
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	0.3

Timings  
1: Powers & Bradley Rd.

Existing Plus Residential Site-Generated Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	402	604	517	271	337	289
Future Volume (vph)	402	604	517	271	337	289
Turn Type	Prot	Free	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2	6	
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	35.0		45.0	45.0	20.0	65.0
Total Split (%)	35.0%		45.0%	45.0%	20.0%	65.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Max	C-Max	None	C-Max
Act Effect Green (s)	27.3	100.0	44.1	44.1	62.7	62.7
Actuated g/C Ratio	0.27	1.00	0.44	0.44	0.63	0.63
v/c Ratio	0.88	0.40	0.37	0.35	0.66	0.14
Control Delay	50.1	1.3	20.6	3.6	15.7	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.1	1.3	20.6	3.6	15.7	8.3
LOS	D	A	C	A	B	A
Approach Delay	20.8		14.7			12.3
Approach LOS	C		B			B

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 16.6

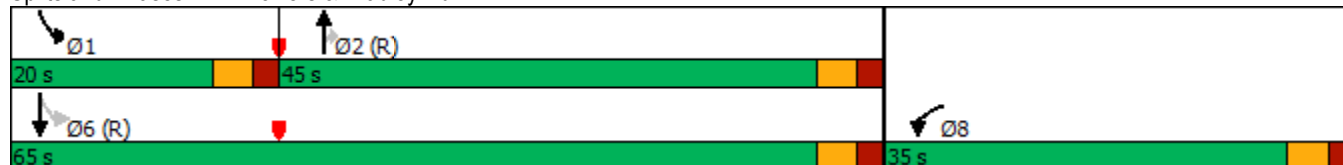
Intersection LOS: B

Intersection Capacity Utilization 67.7%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.





Timings  
2: Waterview Full Access & Bradley Rd.

Existing Plus Residential Site-Generated Traffic  
AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↘	↘
Traffic Volume (vph)	531	76	36	723	283	79
Future Volume (vph)	531	76	36	723	283	79
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5	22.5
Total Split (s)	60.0	60.0	10.0	70.0	30.0	30.0
Total Split (%)	60.0%	60.0%	10.0%	70.0%	30.0%	30.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effect Green (s)	70.2	70.2	76.7	76.7	14.3	14.3
Actuated g/C Ratio	0.70	0.70	0.77	0.77	0.14	0.14
v/c Ratio	0.23	0.07	0.06	0.29	0.63	0.29
Control Delay	10.2	5.5	3.5	4.0	46.0	10.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	5.5	3.5	4.0	46.0	10.7
LOS	B	A	A	A	D	B
Approach Delay	9.6			4.0	38.3	
Approach LOS	A			A	D	

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 47 (47%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.63  
 Intersection Signal Delay: 13.2  
 Intersection Capacity Utilization 38.2%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 2: Waterview Full Access & Bradley Rd.



HCM 6th TWSC  
2: Waterview Full Access & Bradley Rd.

Existing Plus Residential Site-Generated Traffic  
AM Peak Hour

Intersection						
Int Delay, s/veh	43.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Vol, veh/h	531	76	36	723	283	79
Future Vol, veh/h	531	76	36	723	283	79
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	415	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	577	83	39	786	308	86

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	660	0	1048
Stage 1	-	-	-	-	577
Stage 2	-	-	-	-	471
Critical Hdwy	-	-	4.14	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.22	-	3.52
Pot Cap-1 Maneuver	-	-	924	-	~ 223
Stage 1	-	-	-	-	525
Stage 2	-	-	-	-	594
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	924	-	~ 214
Mov Cap-2 Maneuver	-	-	-	-	~ 214
Stage 1	-	-	-	-	503
Stage 2	-	-	-	-	594

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	208.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	214	708	-	-	924	-
HCM Lane V/C Ratio	1.437	0.121	-	-	0.042	-
HCM Control Delay (s)	263.7	10.8	-	-	9.1	-
HCM Lane LOS	F	B	-	-	A	-
HCM 95th %tile Q(veh)	18.1	0.4	-	-	0.1	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	593	17	0	759	0	31
Future Vol, veh/h	593	17	0	759	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	500	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	645	18	0	825	0	34
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	323
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	673
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	673
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		10.6	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	673	-	-	-		
HCM Lane V/C Ratio	0.05	-	-	-		
HCM Control Delay (s)	10.6	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		








HCM 6th Roundabout  
5: "A" Street & "L" Street

Existing Plus Residential Site-Generated Traffic  
AM Peak Hour

Intersection				
Intersection Delay, s/veh	4.1			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	68	103	222	124
Demand Flow Rate, veh/h	69	104	226	125
Vehicles Circulating, veh/h	101	295	95	0
Vehicles Exiting, veh/h	24	26	75	399
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.4	4.5	4.5	3.4
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	69	104	226	125
Cap Entry Lane, veh/h	1245	1021	1252	1380
Entry HV Adj Factor	0.986	0.990	0.980	0.988
Flow Entry, veh/h	68	103	222	124
Cap Entry, veh/h	1227	1012	1228	1364
V/C Ratio	0.055	0.102	0.180	0.091
Control Delay, s/veh	3.4	4.5	4.5	3.4
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	0

Timings  
1: Powers & Bradley Rd.

Existing Plus Residential Site-Generated Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	333	450	309	518	417	504
Future Volume (vph)	333	450	309	518	417	504
Turn Type	Prot	Free	NA	Perm	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2	6	
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	35.0		45.0	45.0	20.0	65.0
Total Split (%)	35.0%		45.0%	45.0%	20.0%	65.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		C-Max	C-Max	None	C-Max
Act Effect Green (s)	24.4	100.0	45.9	45.9	65.6	65.6
Actuated g/C Ratio	0.24	1.00	0.46	0.46	0.66	0.66
v/c Ratio	0.81	0.30	0.21	0.56	0.62	0.23
Control Delay	47.1	0.7	18.1	4.1	13.3	7.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.1	0.7	18.1	4.1	13.3	7.9
LOS	D	A	B	A	B	A
Approach Delay	20.5		9.3			10.3
Approach LOS	C		A			B

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 13.0

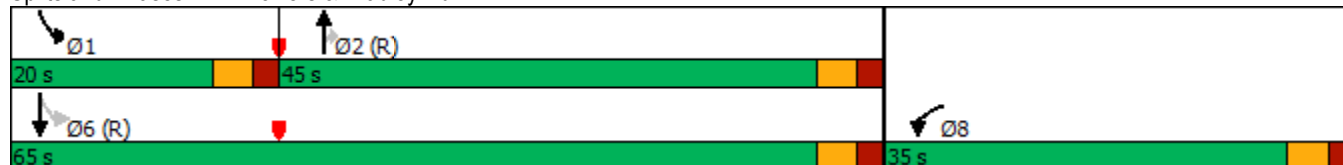
Intersection LOS: B

Intersection Capacity Utilization 63.5%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.





Timings  
2: Waterview Full Access & Bradley Rd.

Existing Plus Residential Site-Generated Traffic  
PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↘	↘
Traffic Volume (vph)	679	256	122	601	181	51
Future Volume (vph)	679	256	122	601	181	51
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	1	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5	22.5
Total Split (s)	60.0	60.0	10.0	70.0	30.0	30.0
Total Split (%)	60.0%	60.0%	10.0%	70.0%	30.0%	30.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Act Effect Green (s)	68.2	68.2	79.9	79.9	11.1	11.1
Actuated g/C Ratio	0.68	0.68	0.80	0.80	0.11	0.11
v/c Ratio	0.31	0.24	0.23	0.23	0.52	0.25
Control Delay	9.7	3.5	3.4	2.8	46.5	13.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.7	3.5	3.4	2.8	46.5	13.7
LOS	A	A	A	A	D	B
Approach Delay	8.0			2.9	39.4	
Approach LOS	A			A	D	

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 47 (47%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 55  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.52  
 Intersection Signal Delay: 9.9  
 Intersection Capacity Utilization 41.9%  
 Analysis Period (min) 15

Intersection LOS: A  
 ICU Level of Service A

Splits and Phases: 2: Waterview Full Access & Bradley Rd.



HCM 6th TWSC  
2: Waterview Full Access & Bradley Rd.

Existing Plus Residential Site-Generated Traffic  
PM Peak Hour

Intersection						
Int Delay, s/veh	39.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↑	↑↑	↑	↑
Traffic Vol, veh/h	679	256	122	601	181	51
Future Vol, veh/h	679	256	122	601	181	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	415	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	738	278	133	653	197	55

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1016
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.14
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.22
Pot Cap-1 Maneuver	-	-	678
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	678
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2	\$ 318.8
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	117	628	-	-	678	-
HCM Lane V/C Ratio	1.682	0.088	-	-	0.196	-
HCM Control Delay (s)	\$ 405.4	11.3	-	-	11.6	-
HCM Lane LOS	F	B	-	-	B	-
HCM 95th %tile Q(veh)	14.9	0.3	-	-	0.7	-


































Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	672	58	0	723	0	20
Future Vol, veh/h	672	58	0	723	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	500	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	730	63	0	786	0	22
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	365
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	632
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	632
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		10.9	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	632	-	-	-		
HCM Lane V/C Ratio	0.034	-	-	-		
HCM Control Delay (s)	10.9	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	-		

Intersection				
Intersection Delay, s/veh	4.8			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	45	66	141	411
Demand Flow Rate, veh/h	46	67	144	419
Vehicles Circulating, veh/h	340	190	133	0
Vehicles Exiting, veh/h	79	87	253	257
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.2	3.7	4.1	5.3
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	46	67	144	419
Cap Entry Lane, veh/h	976	1137	1205	1380
Entry HV Adj Factor	0.978	0.985	0.980	0.981
Flow Entry, veh/h	45	66	141	411
Cap Entry, veh/h	954	1120	1181	1354
V/C Ratio	0.047	0.059	0.120	0.304
Control Delay, s/veh	4.2	3.7	4.1	5.3
LOS	A	A	A	A
95th %tile Queue, veh	0	0	0	1

Timings  
1: Powers & Bradley Rd

2040 Background Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 		 	 		 	  		 	  	
Traffic Volume (vph)	26	201	75	252	257	609	100	1909	359	420	930	19
Future Volume (vph)	26	201	75	252	257	609	100	1909	359	420	930	19
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			Free			6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	10.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	15.0		9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	10.0	17.0		25.0	32.0		17.0	57.0		31.0	71.0	71.0
Total Split (%)	7.7%	13.1%		19.2%	24.6%		13.1%	43.8%		23.8%	54.6%	54.6%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None		None	None		None	None		C-Max	None	None
Act Effect Green (s)	17.4	12.4	130.0	15.1	26.5	130.0	9.3	52.0	130.0	30.5	73.2	73.2
Actuated g/C Ratio	0.13	0.10	1.00	0.12	0.20	1.00	0.07	0.40	1.00	0.23	0.56	0.56
v/c Ratio	0.16	0.63	0.05	0.65	0.37	0.40	0.42	0.97	0.23	0.54	0.33	0.02
Control Delay	38.4	65.1	0.1	51.1	35.3	2.3	62.7	52.0	0.3	47.4	16.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.4	65.1	0.1	51.1	35.3	2.3	62.7	52.0	0.3	47.4	16.4	0.1
LOS	D	E	A	D	D	A	E	D	A	D	B	A
Approach Delay		46.7			20.9			44.6			25.7	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 125 (96%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 34.6

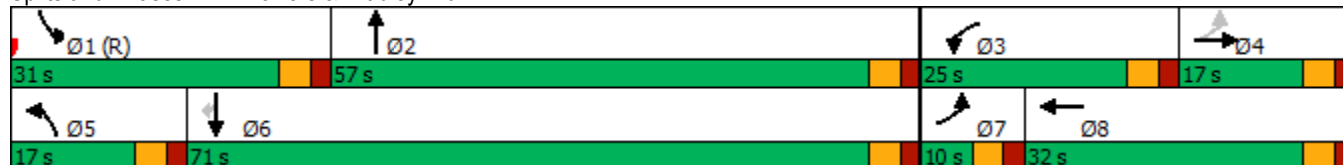
Intersection LOS: C

Intersection Capacity Utilization 81.1%

ICU Level of Service D

Analysis Period (min) 15












Splits and Phases: 1: Powers & Bradley Rd





Timings  
2: "A" Street & Bradley Rd

2040 Background Traffic  
AM Peak Hour

											
Lane Group	EBL	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR	Ø1
Lane Configurations											
Traffic Volume (vph)	265	705	10	1049	43	10	10	70	10	59	
Future Volume (vph)	265	705	10	1049	43	10	10	70	10	59	
Turn Type	Prot	NA	Perm	NA	Perm	Prot	NA	Prot	NA	Perm	
Protected Phases	5	2		6		3	8	7	4		1
Permitted Phases			2		6					4	
Detector Phase	5	2	2	6	6	3	8	7	4	4	
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	20.0	68.0	68.0	60.0	60.0	35.0	15.0	35.0	15.0	15.0	12.0
Total Split (%)	15.4%	52.3%	52.3%	46.2%	46.2%	26.9%	11.5%	26.9%	11.5%	11.5%	9%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lag	Lead	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	15.0	110.1	110.1	89.1	89.1	6.0	6.4	8.2	8.4	8.4	
Actuated g/C Ratio	0.12	0.85	0.85	0.69	0.69	0.05	0.05	0.06	0.06	0.06	
v/c Ratio	0.70	0.25	0.01	0.46	0.04	0.07	0.12	0.34	0.09	0.26	
Control Delay	69.5	9.2	0.0	11.6	0.1	60.0	61.6	62.2	57.4	2.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	69.5	9.2	0.0	11.6	0.1	60.0	61.6	62.2	57.4	2.7	
LOS	E	A	A	B	A	E	E	E	E	A	
Approach Delay		25.4		11.1			60.8		36.7		
Approach LOS		C		B			E		D		

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 74 (57%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 19.5

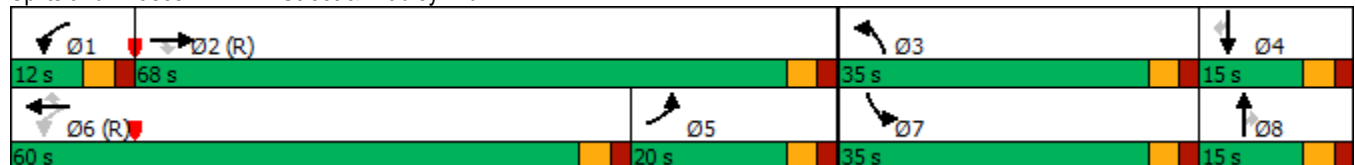
Intersection LOS: B

Intersection Capacity Utilization 57.7%

ICU Level of Service B

























Analysis Period (min) 15

Splits and Phases: 2: "A" Street & Bradley Rd



Timings  
1: Powers & Bradley Rd

2040 Background Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	343	210	437	384	619	175	842	377	506	1736	110
Future Volume (vph)	71	343	210	437	384	619	175	842	377	506	1736	110
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			Free			6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	9.0		9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	10.0	29.0		30.0	49.0		15.0	33.0		38.0	56.0	56.0
Total Split (%)	7.7%	22.3%		23.1%	37.7%		11.5%	25.4%		29.2%	43.1%	43.1%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None		None	None		None	Max		C-Max	Max	Max
Act Effect Green (s)	23.5	18.5	130.0	21.7	37.1	130.0	11.3	28.0	130.0	41.9	58.6	58.6
Actuated g/C Ratio	0.18	0.14	1.00	0.17	0.29	1.00	0.09	0.22	1.00	0.32	0.45	0.45
v/c Ratio	0.37	0.72	0.14	0.79	0.39	0.40	0.61	0.79	0.25	0.47	0.78	0.14
Control Delay	35.8	61.5	0.2	45.3	25.7	1.1	66.2	54.4	0.4	38.3	34.5	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	61.5	0.2	45.3	25.7	1.1	66.2	54.4	0.4	38.3	34.5	2.2
LOS	D	E	A	D	C	A	E	D	A	D	C	A
Approach Delay		37.9			21.1			41.3			33.8	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 1 (1%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 32.9

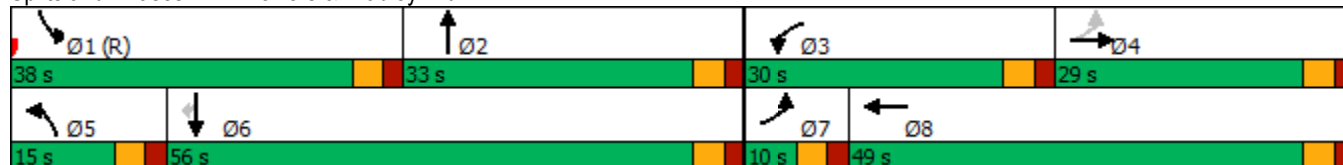
Intersection LOS: C

Intersection Capacity Utilization 77.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd























# Timings

## 2: "A" Street & Bradley Rd

2040 Background Traffic

PM Peak Hour

											
Lane Group	EBL	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	SBR	Ø1
Lane Configurations											
Traffic Volume (vph)	352	824	50	1159	49	25	10	312	10	256	
Future Volume (vph)	352	824	50	1159	49	25	10	312	10	256	
Turn Type	Prot	NA	Perm	NA	Perm	pm+pt	NA	pm+pt	NA	Perm	
Protected Phases	5	2		6		3	8	7	4		1
Permitted Phases			2		6	8		4		4	
Detector Phase	5	2	2	6	6	3	8	7	4	4	
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	15.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	25.0	75.0	75.0	65.0	65.0	30.0	10.0	30.0	10.0	10.0	15.0
Total Split (%)	19.2%	57.7%	57.7%	50.0%	50.0%	23.1%	7.7%	23.1%	7.7%	7.7%	12%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lead	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	18.8	97.1	97.1	73.3	73.3	12.9	6.4	22.9	13.9	13.9	
Actuated g/C Ratio	0.14	0.75	0.75	0.56	0.56	0.10	0.05	0.18	0.11	0.11	
v/c Ratio	0.75	0.33	0.04	0.61	0.06	0.08	0.12	0.60	0.06	0.66	
Control Delay	42.7	10.1	2.2	22.6	0.1	43.6	61.6	52.3	51.8	14.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	42.7	10.1	2.2	22.6	0.1	43.6	61.6	52.3	51.8	14.1	
LOS	D	B	A	C	A	D	E	D	D	B	
Approach Delay		19.2		21.6			49.0		35.4		
Approach LOS		B		C			D		D		

### Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 39 (30%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.75

Intersection Signal Delay: 23.6

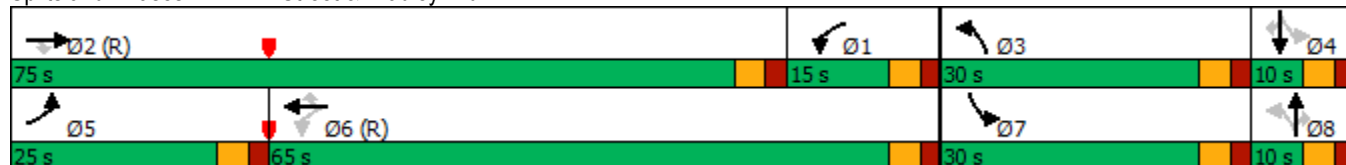
Intersection LOS: C

Intersection Capacity Utilization 70.1%

ICU Level of Service C

Analysis Period (min) 15


































Splits and Phases: 2: "A" Street & Bradley Rd



# Timings

## 1: Powers & Bradley Rd

2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 		 	 		 	  		 	  	
Traffic Volume (vph)	26	222	75	314	295	723	100	1900	398	469	925	19
Future Volume (vph)	26	222	75	314	295	723	100	1900	398	469	925	19
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			Free			6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	10.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	15.0		9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	10.0	17.0		25.0	32.0		17.0	57.0		31.0	71.0	71.0
Total Split (%)	7.7%	13.1%		19.2%	24.6%		13.1%	43.8%		23.8%	54.6%	54.6%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None		None	None		None	None		C-Max	None	None
Act Effect Green (s)	17.3	12.3	130.0	17.1	28.3	130.0	9.3	52.0	130.0	28.7	71.4	71.4
Actuated g/C Ratio	0.13	0.09	1.00	0.13	0.22	1.00	0.07	0.40	1.00	0.22	0.55	0.55
v/c Ratio	0.16	0.70	0.05	0.72	0.39	0.47	0.42	0.96	0.26	0.64	0.34	0.02
Control Delay	38.0	69.0	0.1	49.1	35.0	2.8	62.7	51.2	0.4	51.2	17.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.0	69.0	0.1	49.1	35.0	2.8	62.7	51.2	0.4	51.2	17.3	0.1
LOS	D	E	A	D	C	A	E	D	A	D	B	A
Approach Delay		50.5			20.9			43.2			28.3	
Approach LOS		D			C			D			C	

### Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 125 (96%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 34.4

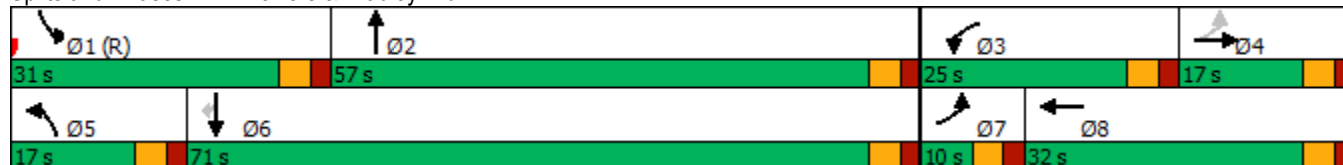
Intersection LOS: C

Intersection Capacity Utilization 84.0%

ICU Level of Service E

Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd



























# Timings

## 2: "A" Street & Bradley Rd

2040 Total Traffic

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	265	705	118	95	1036	43	238	15	110	70	13	59
Future Volume (vph)	265	705	118	95	1036	43	238	15	110	70	13	59
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6			8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	20.0	68.0	68.0	12.0	60.0	60.0	35.0	15.0	15.0	35.0	15.0	15.0
Total Split (%)	15.4%	52.3%	52.3%	9.2%	46.2%	46.2%	26.9%	11.5%	11.5%	26.9%	11.5%	11.5%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	15.0	81.8	81.8	75.7	75.7	75.7	14.8	13.3	13.3	8.2	6.6	6.6
Actuated g/C Ratio	0.12	0.63	0.63	0.58	0.58	0.58	0.11	0.10	0.10	0.06	0.05	0.05
v/c Ratio	0.70	0.33	0.12	0.25	0.53	0.05	0.64	0.08	0.40	0.34	0.15	0.29
Control Delay	72.7	23.7	12.1	15.2	18.6	0.1	62.4	52.5	8.4	62.2	62.1	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.7	23.7	12.1	15.2	18.6	0.1	62.4	52.5	8.4	62.2	62.1	3.4
LOS	E	C	B	B	B	A	E	D	A	E	E	A
Approach Delay		34.4			17.7			45.7			37.8	
Approach LOS		C			B			D			D	

### Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 74 (57%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 29.0

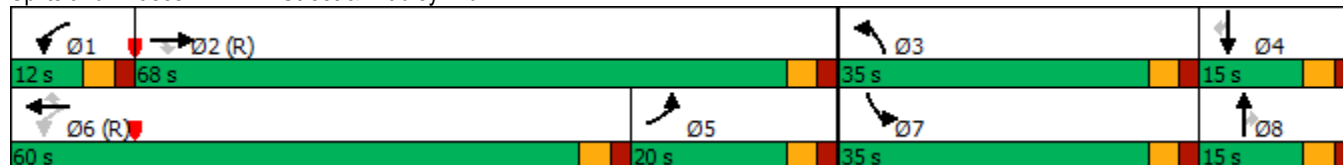
Intersection LOS: C

Intersection Capacity Utilization 62.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: "A" Street & Bradley Rd





HCM 6th TWSC  
3: Waterview RIRO & Bradley Rd

2040 Total Traffic  
AM Peak Hour

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	874	11	0	1174	0	30
Future Vol, veh/h	874	11	0	1174	0	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	95	95	98	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	892	12	0	1198	0	32
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	446
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	560
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	560
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.8	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	560	-	-	-		
HCM Lane V/C Ratio	0.056	-	-	-		
HCM Control Delay (s)	11.8	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		





HCM 6th Roundabout  
5: "A" Street & "L" Street

2040 Total Traffic  
AM Peak Hour

Intersection				
Intersection Delay, s/veh	4.4			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	124	94	206	244
Demand Flow Rate, veh/h	126	96	210	249
Vehicles Circulating, veh/h	132	324	170	17
Vehicles Exiting, veh/h	134	56	88	403
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.9	4.6	4.8	4.2
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	126	96	210	249
Cap Entry Lane, veh/h	1206	992	1160	1356
Entry HV Adj Factor	0.984	0.979	0.982	0.982
Flow Entry, veh/h	124	94	206	244
Cap Entry, veh/h	1187	971	1139	1331
V/C Ratio	0.104	0.097	0.181	0.184
Control Delay, s/veh	3.9	4.6	4.8	4.2
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	1

HCM 6th TWSC  
9: "L" Street & West Retail Access

2040 Total Traffic  
AM Peak Hour

Intersection						
Int Delay, s/veh	5.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	12	33	1	34	21	0
Future Vol, veh/h	12	33	1	34	21	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	36	1	37	23	0
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	66	20	0	0	38	0
Stage 1	20	-	-	-	-	-
Stage 2	46	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	939	1058	-	-	1572	-
Stage 1	1003	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	925	1058	-	-	1572	-
Mov Cap-2 Maneuver	925	-	-	-	-	-
Stage 1	988	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	8.6	0	7.3			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 925 1058 1572	-	-		
HCM Lane V/C Ratio	-	- 0.014 0.034 0.015	-	-		
HCM Control Delay (s)	-	- 8.9 8.5 7.3	0			
HCM Lane LOS	-	- A A A	A			
HCM 95th %tile Q(veh)	-	- 0 0.1 0	-			

HCM 6th TWSC  
10: "L" Street & Middle Retail Access/"U" Street

2040 Total Traffic  
AM Peak Hour

Intersection												
Int Delay, s/veh	2.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	↕
Traffic Vol, veh/h	46	1	0	0	1	13	0	55	0	5	45	74
Future Vol, veh/h	46	1	0	0	1	13	0	55	0	5	45	74
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	205	-	-	205	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	50	1	0	0	1	14	0	60	0	5	49	80






Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	127	119	49	160	199	60	129	0	0	60	0	0
Stage 1	59	59	-	60	60	-	-	-	-	-	-	-
Stage 2	68	60	-	100	139	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	849	773	1022	808	699	1008	1463	-	-	1550	-	-
Stage 1	955	848	-	954	847	-	-	-	-	-	-	-
Stage 2	945	847	-	909	784	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	834	771	1022	805	697	1008	1463	-	-	1550	-	-
Mov Cap-2 Maneuver	834	771	-	805	697	-	-	-	-	-	-	-
Stage 1	955	845	-	954	847	-	-	-	-	-	-	-
Stage 2	931	847	-	905	782	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	9.6	8.7	0	0.3
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1463	-	-	833 977	1550	-	-
HCM Lane V/C Ratio	-	-	-	0.061 0.016	0.004	-	-
HCM Control Delay (s)	0	-	-	9.6 8.7	7.3	-	-
HCM Lane LOS	A	-	-	A A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2 0	0	-	-

HCM 6th TWSC  
12: 'F' Street/East Retail Access & "C" Street

2040 Total Traffic  
AM Peak Hour

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	22	20	0	0	67	0	0	0	0	0	0	13
Future Vol, veh/h	22	20	0	0	67	0	0	0	0	0	0	13
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	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	22	0	0	73	0	0	0	0	0	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	73	0	0	22	0	0	150	143	22	143	143	73
Stage 1	-	-	-	-	-	-	70	70	-	73	73	-
Stage 2	-	-	-	-	-	-	80	73	-	70	70	-
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	1527	-	-	1593	-	-	818	748	1055	826	748	989
Stage 1	-	-	-	-	-	-	940	837	-	937	834	-
Stage 2	-	-	-	-	-	-	929	834	-	940	837	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1527	-	-	1593	-	-	797	736	1055	816	736	989
Mov Cap-2 Maneuver	-	-	-	-	-	-	797	736	-	816	736	-
Stage 1	-	-	-	-	-	-	925	824	-	922	834	-
Stage 2	-	-	-	-	-	-	916	834	-	925	824	-

























Approach	EB	WB	NB	SB
HCM Control Delay, s	3.9	0	0	8.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1527	-	-	1593	-	-	989
HCM Lane V/C Ratio	-	0.016	-	-	-	-	-	0.014
HCM Control Delay (s)	0	7.4	-	-	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	-	0	-	-	0	-	-	0



Timings  
1: Powers & Bradley Rd

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	401	210	533	429	726	175	825	479	671	1705	110
Future Volume (vph)	71	401	210	533	429	726	175	825	479	671	1705	110
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			Free			6
Detector Phase	7	4		3	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	9.0	9.0		9.0	9.0		9.0	9.0		9.0	9.0	9.0
Total Split (s)	10.0	29.0		30.0	49.0		15.0	33.0		38.0	56.0	56.0
Total Split (%)	7.7%	22.3%		23.1%	37.7%		11.5%	25.4%		29.2%	43.1%	43.1%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None		None	None		None	Max		C-Max	Max	Max
Act Effect Green (s)	25.3	20.3	130.0	23.8	41.2	130.0	10.6	28.0	130.0	37.8	55.2	55.2
Actuated g/C Ratio	0.19	0.16	1.00	0.18	0.32	1.00	0.08	0.22	1.00	0.29	0.42	0.42
v/c Ratio	0.35	0.76	0.14	0.87	0.39	0.47	0.64	0.78	0.31	0.69	0.81	0.15
Control Delay	33.4	61.8	0.2	55.0	28.9	1.3	68.9	53.8	0.5	46.2	37.5	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.4	61.8	0.2	55.0	28.9	1.3	68.9	53.8	0.5	46.2	37.5	2.3
LOS	C	E	A	D	C	A	E	D	A	D	D	A
Approach Delay		39.9			25.2			38.3			38.3	
Approach LOS		D			C			D			D	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 1 (1%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 35.0

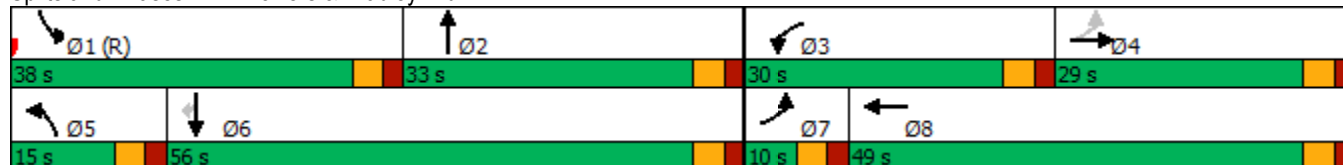
Intersection LOS: D

Intersection Capacity Utilization 80.9%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd



























# Timings

## 2: "A" Street & Bradley Rd

2040 Total Traffic

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	352	824	375	258	1122	49	310	17	203	312	19	256
Future Volume (vph)	352	824	375	258	1122	49	310	17	203	312	19	256
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	15.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	25.0	75.0	75.0	15.0	65.0	65.0	30.0	10.0	10.0	30.0	10.0	10.0
Total Split (%)	19.2%	57.7%	57.7%	11.5%	50.0%	50.0%	23.1%	7.7%	7.7%	23.1%	7.7%	7.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	18.2	74.0	74.0	65.8	65.8	65.8	27.8	10.1	10.1	24.1	8.2	8.2
Actuated g/C Ratio	0.14	0.57	0.57	0.51	0.51	0.51	0.21	0.08	0.08	0.19	0.06	0.06
v/c Ratio	0.77	0.42	0.37	0.67	0.64	0.06	0.50	0.12	0.67	0.56	0.17	0.76
Control Delay	48.5	14.6	4.5	39.6	26.4	0.1	44.0	57.4	18.0	45.2	60.5	21.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.5	14.6	4.5	39.6	26.4	0.1	44.0	57.4	18.0	45.2	60.5	21.5
LOS	D	B	A	D	C	A	D	E	B	D	E	C
Approach Delay		19.9			27.9			34.5			35.4	
Approach LOS		B			C			C			D	

### Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 39 (30%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.77

Intersection Signal Delay: 26.8

Intersection LOS: C

Intersection Capacity Utilization 69.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: "A" Street & Bradley Rd



HCM 6th TWSC  
3: Waterview RIRO & Bradley Rd

2040 Total Traffic  
PM Peak Hour

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	1301	38	0	1429	0	19
Future Vol, veh/h	1301	38	0	1429	0	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	95	95	98	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1328	40	0	1458	0	20
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	664
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	403
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	403
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		14.4	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	403	-	-	-		
HCM Lane V/C Ratio	0.05	-	-	-		
HCM Control Delay (s)	14.4	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		





HCM 6th Roundabout  
5: "A" Street & "K" Street/"C" Street

2040 Total Traffic  
PM Peak Hour

Intersection				
Intersection Delay, s/veh	7.9			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	336	138	179	686
Demand Flow Rate, veh/h	343	139	183	698
Vehicles Circulating, veh/h	401	478	449	48
Vehicles Exiting, veh/h	345	154	295	569
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.3	5.9	6.4	8.6
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	343	139	183	698
Cap Entry Lane, veh/h	917	847	873	1314
Entry HV Adj Factor	0.979	0.992	0.979	0.983
Flow Entry, veh/h	336	138	179	686
Cap Entry, veh/h	898	841	855	1292
V/C Ratio	0.374	0.164	0.210	0.531
Control Delay, s/veh	8.3	5.9	6.4	8.6
LOS	A	A	A	A
95th %tile Queue, veh	2	1	1	3

HCM 6th TWSC  
9: "L" Street/West Retail Access & "K" Street

2040 Total Traffic  
PM Peak Hour

Intersection						
Int Delay, s/veh	7.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	39	83	2	22	90	2
Future Vol, veh/h	39	83	2	22	90	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	200	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	90	2	24	98	2
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	212	14	0	0	26	0
Stage 1	14	-	-	-	-	-
Stage 2	198	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	776	1066	-	-	1588	-
Stage 1	1009	-	-	-	-	-
Stage 2	835	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	728	1066	-	-	1588	-
Mov Cap-2 Maneuver	728	-	-	-	-	-
Stage 1	946	-	-	-	-	-
Stage 2	835	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	9.2	0	7.3			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT		
Capacity (veh/h)	-	- 728 1066 1588	-	-		
HCM Lane V/C Ratio	-	- 0.058 0.085 0.062	-	-		
HCM Control Delay (s)	-	- 10.3 8.7 7.4	0			
HCM Lane LOS	-	- B A A	A			
HCM 95th %tile Q(veh)	-	- 0.2 0.3 0.2	-			

HCM 6th TWSC  
10: "K" Street & Middle Retail Access/"U" Street

2040 Total Traffic  
PM Peak Hour

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	198	2	0	0	2	9	0	112	0	15	122	184
Future Vol, veh/h	198	2	0	0	2	9	0	112	0	15	122	184
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	205	-	-	205	-	155
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	215	2	0	0	2	10	0	122	0	16	133	200

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	293	287	133	388	487	122	333	0	0	122	0	0
Stage 1	165	165	-	122	122	-	-	-	-	-	-	-
Stage 2	128	122	-	266	365	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
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	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	659	623	916	571	481	929	1226	-	-	1465	-	-
Stage 1	837	762	-	882	795	-	-	-	-	-	-	-
Stage 2	876	795	-	739	623	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	645	616	916	565	476	929	1226	-	-	1465	-	-
Mov Cap-2 Maneuver	645	616	-	565	476	-	-	-	-	-	-	-
Stage 1	837	754	-	882	795	-	-	-	-	-	-	-
Stage 2	864	795	-	729	616	-	-	-	-	-	-	-






Approach	EB		WB		NB		SB	
HCM Control Delay, s	13.4		9.6		0		0.3	
HCM LOS	B		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1226	-	-	645 792	1465	-	-
HCM Lane V/C Ratio	-	-	-	0.337 0.015	0.011	-	-
HCM Control Delay (s)	0	-	-	13.4 9.6	7.5	-	-
HCM Lane LOS	A	-	-	B A	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.5 0	0	-	-



HCM 6th TWSC  
12: 'F' Street/East Retail Access & "C" Street

2040 Total Traffic  
PM Peak Hour

Intersection												
Int Delay, s/veh	5.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	78	53	16	24	36	1	10	0	13	1	0	86
Future Vol, veh/h	78	53	16	24	36	1	10	0	13	1	0	86
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	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	85	58	17	26	39	1	11	0	14	1	0	93

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	40	0	0	75	0	0	375	329	67	336	337	40
Stage 1	-	-	-	-	-	-	237	237	-	92	92	-
Stage 2	-	-	-	-	-	-	138	92	-	244	245	-
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	1570	-	-	1524	-	-	582	590	997	618	584	1031
Stage 1	-	-	-	-	-	-	766	709	-	915	819	-
Stage 2	-	-	-	-	-	-	865	819	-	760	703	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1570	-	-	1524	-	-	501	549	997	577	543	1031
Mov Cap-2 Maneuver	-	-	-	-	-	-	501	549	-	577	543	-
Stage 1	-	-	-	-	-	-	725	671	-	866	805	-
Stage 2	-	-	-	-	-	-	773	805	-	709	665	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.9	2.9	10.4	8.9
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	697	1570	-	-	1524	-	-	1022
HCM Lane V/C Ratio	0.036	0.054	-	-	0.017	-	-	0.093
HCM Control Delay (s)	10.4	7.4	-	-	7.4	0	-	8.9
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0.1	-	-	0.3

## Queuing and Blocking Report

## Intersection: 2: "A" Street &amp; Bradley Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	R	L	T	T	R	L	L	T
Maximum Queue (ft)	182	206	710	848	369	336	347	434	333	191	204	66
Average Queue (ft)	103	123	114	149	42	196	226	262	33	97	122	21
95th Queue (ft)	165	189	328	399	199	317	328	380	157	162	182	54
Link Distance (ft)			910	910	910		1231	1231				413
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	450	450				495			235	300	300	
Storage Blk Time (%)								11				
Queuing Penalty (veh)								5				

## Intersection: 2: "A" Street &amp; Bradley Rd

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	L	T	R
Maximum Queue (ft)	78	254	214	69	263
Average Queue (ft)	46	152	92	19	129
95th Queue (ft)	70	227	196	52	230
Link Distance (ft)		276	276	276	276
Upstream Blk Time (%)		0	0		2
Queuing Penalty (veh)		0	0		0
Storage Bay Dist (ft)	300				
Storage Blk Time (%)					
Queuing Penalty (veh)					

## Intersection: 12: 'F' Street/East Retail Access &amp; "C" Street

Movement	EB	WB	NB	SB
Directions Served	L	LTR	LTR	LTR
Maximum Queue (ft)	31	24	35	79
Average Queue (ft)	3	2	15	33
95th Queue (ft)	17	15	40	56
Link Distance (ft)		468	144	191
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150			
Storage Blk Time (%)				
Queuing Penalty (veh)				

## Zone Summary

Zone wide Queuing Penalty: 5

# **Waterview North**

## **Sketch Plan Amendment and**

## **RM-12 Rezone**

## **Master Traffic Impact Analysis**

### **SKP202**

Prepared for:  
CPR Entitlements, LLC  
31 N Tejon St #500,  
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Contact: Mr. P. A. Koscielski, Manager

SEPTEMBER 25, 2020  
(NOVEMBER 17, 2020 MINOR REVISION)

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LSC #204210



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Figure 19 Long-Term Bradley Road Lane Recommendations figure from the *Springs at Waterview East Preliminary Plan Traffic Impact Study*



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September 25, 2020  
(November 17, 2020 Minor Revision)

Mr. P. A. Koscielski, Manager  
CPR Entitlements, LLC  
31 N Tejon St #500,  
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RE: Waterview North Sketch Plan Amendment (SKP202)  
Waterview North RM-12 Rezone (P202)  
Master Traffic Impact Analysis  
El Paso County, CO  
LSC #204210

Dear Mr. Koscielski,

In response to your request, LSC Transportation Consultants, Inc. has prepared this updated traffic impact and access analysis for Waterview North Sketch Plan Amendment and the Waterview North RM-12 Rezone. As shown in Figure 1, the “Waterview North site” is located northeast of the intersection of Powers Boulevard and Bradley Road in El Paso County, Colorado. The amendment area also includes the proposed rezone of a site southeast of Bradley Road & Legacy Hill Drive. This report contains the following:

## **REPORT CONTENTS**

This report has been prepared to address the project’s traffic impact at the proposed access points and adjacent intersections.

This report contains the following:

- The existing street and traffic conditions in the site’s vicinity including the street widths, lane geometries, traffic controls, and existing traffic counts at key area intersections;
- The projected future background traffic volumes, which include estimates of traffic from other area development projects and increases in through traffic on the adjacent arterial streets;
- The estimated average weekday and peak-hour trip generation;
- The estimated directional distribution of site-generated trips and the projected site-generated traffic volumes;



## Waterview North Sketch Plan Amend. &amp; RM-12 Rezone

- Estimates of the resulting total traffic volumes on the adjacent streets and intersections; and
- The projected levels of service at the site access point and adjacent intersections.

**PREVIOUS TRAFFIC REPORTS COMPLETED IN THE AREA**

A list of other traffic studies in the area of study completed within the past five years (that LSC is aware of) is attached for reference. This study accounts for the land use, trip generation and the roadway network included in these studies. Figure 1 shows the location of the other known developments in the area.

**LAND USE AND ACCESS****Land Use**Sketch Plan Amendment

The Waterview North site is located north of Bradley Road and east of Powers Boulevard. The site is included as part of the Waterview Sketch Plan area. A copy of the Waterview 2020 Sketch Plan Amendment is attached. The currently-proposed Waterview North Sketch Plan Amendment includes the parcels shown as P-14, P-15, and P-19 on the sketch plan amendment.

Figure 2 shows the proposed site plan for Waterview North. The site is planned to include about 325,000 square feet of industrial floor space, 175,000 square feet of general retail floor space, 425 single-family homes, and 425 multi-family residential dwelling units.

Waterview North RM-12 Rezone

Parcel P-21 is planned to be rezoned to multi-family residential. This parcel was previously planned to be developed with commercial uses. This change is being submitted as a rezone application. This parcel is planned to be developed with a maximum of 60 multi-family residential dwelling units.

The Springs at Waterview East Preliminary Plan area, located south of the site, includes the parcels shown as P-17, P-18, and P-21 on the Waterview 2020 Sketch Plan Amendment. The Trails at Aspen Ridge residential development located within parcel P-18 was recently approved. Parcel P-17 is planned to be developed with commercial uses. This is consistent with prior studies done by LSC for the Waterview development.

The Peak Innovation Park is a mixed-use development currently under review that is located north and east of the Waterview North Site. The Peak Innovation Park is planned to include a mix of office, industrial, and commercial land uses.

**Access**

Access to Bradley Road is proposed via a full-movement intersection 1,030 feet east of Powers Boulevard aligning with the future Legacy Hill Drive, which will serve the Springs at Waterview East Preliminary Plan area and the proposed Waterview North RM-12 Rezone. An additional right-in/right-out-only access is proposed about 1,317 feet east of Legacy Hill Drive. These access points were approved as part of the Waterview Sketch Plan SKP162. The approved deviation requests have been attached. The site plan also includes a future connection to the Peak Innovation Park site.

**Sight Distance**

The criteria for intersection sight distance contained in Table 2-21 of the *El Paso County Engineering Criteria Manual* (ECM) apply only to two-lane roads with stop control. As Bradley Road has two through lanes in each direction, the sight distance has been calculated using the formula  $d = 1.47 * V_m * t_c$  where  $V_m$  is the design speed in miles per hour and  $t_c$  is the gap that drivers will accept for entering a roadway in seconds. The acceptable gap time has been increased by from the typical 7.5 seconds used for a two-lane road to 8.0 seconds to account for multiple lanes on Bradley Road. Based on a design speed of 55 miles per hour, the calculated sight distance is 650 feet. The horizontal and vertical site distance was checked in the field. The available sight distance at the future intersection of Legacy Hill Drive is about 860 feet to the west and more than  $\frac{1}{4}$  of a mile to the east. The available sight distance at the proposed right-in/right-out only access is more than  $\frac{1}{4}$  of a mile to the east. The available sight distance at both access points exceeds the ECM criteria. To maintain acceptable lines of sight, the vegetation within the median on Bradley Road should be maintained so as to be no taller than 18 inches high.

**Pedestrian and Bicycle Access**

There are currently no schools located within two miles of the proposed development. There are no existing sidewalks on Bradley Road or Powers Boulevard. Sidewalks should be provided on all of the internal streets within Waterview North. Sidewalks are also planned on Legacy Hill Drive south of Bradley Road.

**STREET AND TRAFFIC CONDITIONS****Area Streets**

The adjacent streets are shown in Figure 1 and are described below. Copies of the 2016 El Paso County Major Transportation Corridors Plan (MTCP) 2040 Roadway Plan and 2016 MTCP 2060 Corridor Preservation Plan with the site location identified on them have been attached to this report.

- **Powers Boulevard** (State Highway 21) is classified as a Freeway (FW). Powers Boulevard is one of the region's main north/south corridors. Powers Boulevard has a center median and a posted speed limit of 60 miles per hour (mph) north of Crestera Parkway. South of this point, the posted speed limit is 65 mph. Powers Boulevard is ultimately planned to be converted to a Freeway with grade-separated intersections.
- **Bradley Road** is shown with a Minor Arterial classification east of Grinnell Boulevard on the 2016 2040 El Paso County *Major Transportation Corridors Plan (MTCP)*. Adjacent to the site, Bradley Road is a four-lane roadway with a 50-mph posted speed limit and has an edge-of-asphalt median, left-turn lanes, and rural paved shoulders. There is a short existing section of raised median approaching Powers Boulevard. The 2040 MTCP includes the construction of Bradley Road between Grinnell Boulevard and Powers Boulevard in the 2040 roadway improvement B list projects.
- **Marksheffel Road** extends north from the Link Road/C&S Road intersection in Fountain, Colorado to north of Woodmen Road. It has recently been upgraded north and south of Bradley Road with a PPRTA project and is shown as a four-lane Expressway on the El Paso County *Major Transportation Corridors Plan (MTCP)*. The posted speed limit on Marksheffel Road in the vicinity of Bradley Road is 55 mph.

## 2018 Traffic Volumes

Figure 3 shows the traffic volumes at the intersections of Powers Boulevard/Bradley Road and Marksheffel Road/Bradley Road, based on the attached traffic counts conducted by LSC in April and October 2018. Figure 3 also shows the 2018 Colorado Department of Transportation (CDOT) Average Annual Daily Traffic Volume (AADT) on Powers Boulevard and estimates of the average daily traffic volume on Bradley Road based on the peak-hour traffic counts, assuming the afternoon peak hour represents 10 percent of the daily traffic volume. This ratio was based on the Colorado Department of Transportation 30<sup>th</sup> highest annual hourly traffic volume, reported as percentage of average annual daily traffic volumes for Powers Boulevard adjacent to the site.

## Existing Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from "A" to "F." LOS A represents control delay of less than 10 seconds for unsignalized and signalized intersections. LOS F represents control delay of more than 50 seconds for unsignalized intersections and more than 80 seconds for signalized intersections. Table 1 shows the level of service delay ranges.

**Table 1: Intersection Levels of Service Delay Ranges**

Level of Service	Signalized Intersections	Unsignalized Intersections
	Average Control Delay (seconds per vehicle)	Average Control Delay (seconds per vehicle) <sup>(1)</sup>
A	10.0 sec or less	10.0 sec or less
B	10.1-20.0 sec	10.1-15.0 sec
C	20.1-35.0 sec	15.1-25.0 sec
D	35.1-55.0 sec	25.1-35.0 sec
E	55.1-80.0 sec	35.1-50.0 sec
F	80.1 sec or more	50.1 sec or more
(1) For unsignalized intersections if V/C ratio is greater than 1.0 the level of service is LOS F regardless of the projected average control delay per vehicle.		

The intersections of Powers/Bradley and Marksheffel/Bradley have been analyzed based on the unsignalized intersection analysis procedures from the *Highway Capacity Manual, 6<sup>th</sup> Edition* by the Transportation Research Board. A summary of the methodology used to calculate the existing peak-hour factors has been attached. Figure 3 shows the level of service analysis results.

All movements at these intersections are currently operating at LOS D or better during the peak hours.

## BACKGROUND TRAFFIC

Background traffic is the traffic estimated to be on the adjacent roadways and at adjacent intersections without the proposed development's trip generation of site-generated traffic volumes. Background traffic includes the through traffic and the traffic generated by nearby developments, but assumes zero traffic generated by the site.

Figure 4 shows the projected short-term (Year 2023) background traffic volumes. These traffic volumes are based on the existing traffic volumes shown in Figure 3, assuming a growth rate of 1 percent per year. This growth rate is an estimate by LSC, based on the Colorado Department of Transportation 20-year factor for Powers Boulevard adjacent to the site. The 20-year factor is 1.07 which calculates to a growth rate of less than 1 percent per year. The short-term background traffic volumes also include additional traffic projected to be generated by development of The Trails at Aspen Ridge Filing No. 1 and the Trails at Aspen Ridge PUD. The projected additional traffic volumes were taken from a traffic impact study prepared by LSC. The short-term background traffic volumes assume a connection has not yet been constructed to the Peak Innovation Park.

Figure 5 shows the projected 2040 background traffic volumes. The 2040 background traffic volumes were based on the *Trails at Aspen Ridge Filing No. 1 Updated Traffic Impact and Access*

*Analysis* by LSC dated December 12, 2019. These volumes assume buildout of The Trails at Aspen Ridge Filing No. 1, the Trails at Aspen Ridge PUD, Bradley Heights, and the Peak Innovation Park. The 2040 background traffic volumes do not include any traffic projected to be generated by Waterview North (P-14, P-15, and P-19), the Waterview North RM-12 rezone (P-21) and the future commercial parcel located on the southwest corner of Bradley/Legacy Hill (P-17). The long-term background volumes assume Bradley Road has been constructed between Goldfield Drive and Powers Boulevard and assumes a connection to the Peak Innovation Park.

**Note: The 2040 background traffic volumes have been updated from previous versions of this report to account for the change in trips associated with the currently-proposed Waterview North RM-12 Rezone south of Bradley Road.** The background traffic figures depict this area of amendment.

## TRIP GENERATION

The site-generated vehicle trips were estimated using the nationally published trip generation rates from *Trip Generation, 10th Edition, 2017* by the Institute of Transportation Engineers (ITE). Table 2 shows the average weekday and peak-hour trip generation estimates. Table 2 also shows a projected trip generation estimate for other parcels within the Waterview 2020 Sketch Plan Amendment area and a comparison to the trip generation estimate assumed in previous traffic impact studies prepared by LSC in the vicinity of the site.

The total number of vehicle trips generated by the land uses has been reduced to account for the internal vehicle trips made within the site between land uses, without use of the external streets surrounding the site. Table 2 shows the number of internal trips assumed for each land use. The internal trip reduction for the commercial parcels is an estimate by LSC, based on *National Highway Cooperative Highway Research Program (NCHRP) Report 684 Enhancing Internal Trip Capture Estimation for Mixed-Use Developments*. The results of the spreadsheet model are attached.

The total number of vehicle trips generated has also been reduced to take into account the “pass-by” phenomena. A pass-by trip is made by a motorist who would already be on the adjacent roadways regardless of the proposed development, but who stops in at the site while passing by. The motorist would then continue on his or her way to a final destination in the original direction. The pass-by percentages shown in Table 2 are from the *Trip Generation Handbook - An ITE Proposed Recommended Practice, 3rd Edition, 2017* by ITE.

As there are limited existing mass transit options in the vicinity of the site, no reductions were assumed to account for multimodal travel.

At buildout, the portion of Waterview North north of Bradley Road (P-14, P-15, and P-19) is projected to generate about 14,419 new external vehicle trips on the average weekday, with

about half entering and half exiting the site. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 371 vehicles would enter and 496 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:15 and 6:15 p.m., about 822 vehicles would enter and 759 vehicles would exit the site.

The Waterview North RM-12 Rezone Site (P-21) is projected to generate about 430 new external vehicle trips on the average weekday, with about half entering and half exiting the site. During the morning peak hour, about 6 vehicles would enter and 21 vehicles would exit the site. During the afternoon peak hour, about 21 vehicles would enter and 12 vehicles would exit the site.

The remaining portion of the Waterview 2020 Sketch Plan Amendment Area located southeast of the intersection of Bradley/Legacy Hill is projected to generate about 4,419 total external vehicle trips on the average weekday, with about half entering and half exiting the area. During the morning peak hour, about 123 vehicles would enter and 78 vehicles would exit the site. During the afternoon peak hour, about 294 vehicles would enter and 315 vehicles would exit the site.

## **TRIP DISTRIBUTION AND ASSIGNMENT**

The directional distribution of the site-generated traffic volumes on the adjacent roadway system is one of the most important factors in determining the traffic impacts of the site. Figure 6 shows the short-term and long-term directional distributions of traffic projected to be generated by the residential uses. Figure 7 shows the short-term and long-term directional distributions of traffic projected to be generated by the non-residential uses. The short-term directional distribution estimates were based on the existing area roadway system and the traffic counts. The long-term directional distribution estimates were based on the anticipated regional development and future roadway networks including the construction of Bradley Road between Grinnell Street and Powers Boulevard and a future north/south connection between Bradley Road and Fontaine Boulevard through the Bradley Heights development located east of the Waterview East Preliminary Plan area.

This distribution was estimated with a focus on peak-hour trip assignment, as the intersection analysis is based on peak-hour volumes.

- The distribution percentages to/from the east account for:
  - o Some longer trip lengths by commuters;
  - o The proximity of this development to Marksheffel Road;
  - o Anticipated use of Marksheffel Road north as a viable alternative to Powers to/from many destinations east of and within the Powers Boulevard corridor. Powers Boulevard intersections experience congestion during peak hours. Marksheffel has recently been upgraded north and south of Bradley with a PPRTA project, which has increased its attractiveness as a north/south travel route;



- o Bradley to/from the east being the route to Schriever Air Force Base and the improved east gate of Peterson Air Force Base; and
- o Development occurring in the Marksheffel corridor and, over time, the number of trip destinations continuing to increase.
- The distribution percentages to/from the Bradley Heights connection account for:
  - o Planned alternative street connections within Bradley Heights to Bradley Road and Marksheffel Road (south);
  - o Future trip destinations within Bradley Heights;
  - o The school and some potential future commercial within Lorson Ranch to the southeast;
  - o The long-term distribution split accounts for a north-south road connection between Bradley Heights and Fontaine Boulevard, as shown on the Banning Lewis Master Plan and the City of Colorado Springs Intermodal Transportation Plan. This includes trips oriented to the south and southeast.
- The percentages to/from the south on Powers account for trips from the south and southeast, paired with destinations primarily in Fountain and Fort Carson as well as the south connection to Interstate 25.
- The percentages to/from the north on Powers primarily account for trips using Milton Proby Parkway and the Powers Boulevard corridor for travel.

When the distribution percentages (from Figures 6 and 7) are applied to the trip-generation estimates (from Table 2), the resulting site-generated traffic volumes can be determined. Figures 8 and 9 show the projected short-term and long-term site-generated traffic volume due to development of the portion of Waterview North north of Bradley Road (P-14, P-15, and P-19) Figures 10 and 11 show the projected short-term and long-term site-generated traffic volumes due to development of the Waterview North RM-12 Rezone site. Figure 12 shows the projected long-term site-generated traffic volumes due to development of the remaining sketch plan amendment area (P-17).

## **BUILDOUT TOTAL TRAFFIC**

Figure 13 shows the projected short-term total traffic volumes. The short-term total traffic volumes are the sum of the short-term background traffic volumes (from Figure 4) plus the short-term site-generated traffic volumes due to development of the portion of Waterview North north of Bradley Road (P-14, P-15, and P-19) (from Figure 8) and the short-term site-generated traffic volumes due to the development of the Waterview North RM-12 Rezone site (P-21) (from Figure 10).

Figure 14 shows the projected 2040 total traffic volumes. The 2040 total traffic volumes are the sum of the 2040 background traffic volumes (from Figure 5) plus the long-term site-generated traffic volumes due to development of the portion of Waterview North north of Bradley Road (P-14, P-15, and P-19) (from Figure 9), the long-term site-generated traffic volumes due to the development of the Waterview North RM-12 Rezone site (P-21) (from Figure 11) and the

long-term site-generated traffic volumes due to development of the remaining portion of the Sketch Plan Amendment Area (P-17) (from Figure 12).

## **PROJECTED LEVELS OF SERVICE**

The key area intersections have been analyzed to determine the projected levels of service for the short-term and 2040 background and short-term and 2040 total traffic volumes. The signalized intersections of Powers/Bradley and Legacy Hill/Bradley were analyzed using Synchro. The proposed right-in/right-out only access to Bradley Road was analyzed based on the unsignalized method of analysis from the *Highway Capacity Manual, 6th Edition* by the Transportation Research Board. Figures 4, 5, 13, and 14 show the results of the level of service analysis. The level of service reports are attached.

### **Powers/Bradley**

The intersection of Powers/Bradley is currently signalized and is operating at a satisfactory level of service. All movements at this intersection are projected to operate at LOS D or better during the peak hours, based on the short-term total traffic volumes. The short-term analysis assumes the addition of a second southbound left-turn lane. By 2040, it was assumed that the section of Bradley Road between Goldfield Drive and Powers Boulevard would be constructed. Based on the 2040 total traffic volumes shown and the lane geometry shown in Figure 14, the intersection is projected to operate at an overall LOS D during the peak hours. However, some of the minor movements are projected to operate at LOS E or F during the peak hours. It is common for left-turn and side-street through movements to have projected delays in the LOS E or F range, as signal coordination timing plans generally give priority to moving through traffic. This often results in higher delay for left-turn and side-street movements and can result in movement/approach delays in the E or F range even though they are projected to have sufficient capacity for the projected traffic volumes. Note: This intersection is planned to be converted to a grade-separated interchange in the long-term future. Figure 15 shows the projected level of service if this occurs by 2040. As shown in Figure 15, all movements are projected to operate at LOS D or better during the peak hours.

### **Legacy Hill/Bradley**

The intersection of Bradley Road/Legacy Hill Drive is projected to operate at LOS D or better during the peak hours for all movements as a signal-controlled intersection, based on the projected short-term total traffic volumes. By 2040, some of the minor movements are projected to operate at LOS E during the peak hours.

**Site Access/Bradley**

All movements at the proposed right-in/right-out intersection of Bradley Road are projected to operate at LOS D or better during the peak hours, based on the projected short-term and 2040 total traffic volumes.

**Marksheffel/Bradley**

The intersection of Marksheffel/Bradley is currently signalized and is operating at a satisfactory level of service. A second eastbound left-turn lane will be needed in the short-term to maintain an acceptable level of service (LOS D or better) for the eastbound left-turn movement. By 2040, the eastbound left-turn movement is projected to operate at LOS E during the peak hours, even with dual eastbound left-turn lanes.

**QUEUING ANALYSIS**

A queuing analysis was performed using Synchro/SimTraffic to determine the storage length needed to accommodate the projected left-turn queue on Bradley Road, based on the 2040 total traffic volumes. The 2040 total morning and afternoon peak-hour traffic volumes were entered into the Synchro model. The simulation was run five times. The queuing reports are attached.

Based on the projected 2040 total traffic, the projected maximum eastbound left-turn queue on Bradley Road approaching Legacy Hill Drive is about 147 feet during the morning peak hour and 388 feet during the afternoon peak hour.

The projected maximum westbound left-turn queue on Bradley Road approaching Powers Boulevard is about 531 feet during the morning peak hour and 264 feet during the afternoon peak hour.

A copy of Figure 19 Long-Term Bradley Road Lane Recommendations figure from the *Springs at Waterview East Preliminary Plan Traffic Impact Study* has been attached. The projected queues can be accommodated by the lane recommendations shown in the figure.

**TRAFFIC-SIGNAL WARRANT ANALYSIS**

The intersection of Bradley Road and Legacy Hill Drive was analyzed to determine when either an Eight-Hour or a Four-Hour Vehicular-Volume Traffic-Signal Warrant would be met or be close to being met, based on traffic projected to be generated by the Waterview North development only. As discussed in the *Trails at Aspen Ridge Filing No. 1 Updated Traffic Impact and Access Analysis* by LSC dated December 12, 2019, a Four-Hour Vehicular-Volume Traffic-Signal Warrant is projected to be met, once about 242 of the planned 786 lots for single-family homes are developed. This analysis assumes none of the homes in the Trails at Aspen Ridge have been developed.

Table 3 shows that Four-Hour and Eight-Hour Vehicular-Volume Traffic-Signal Warrants are projected to be met once either the residential or retail portion of the Waterview North site is fully developed. The satisfaction of warrants does not indicate that a signal must be installed. The decision to require a signal to be installed at this location rests with the County.

### **Details of the Analysis**

The lower threshold volume for an Eight-Hour Vehicular-Volume Traffic-Signal Warrant for Condition B - Interruption of Continuous Traffic for a major street with two or more lanes and a posted speed limit greater than 40 mph, and a minor street approach with one lane, is 53 vehicles per hour. This lower threshold is applicable when the major street volumes (eastbound and westbound left, through, and right movements) exceed 630 vehicles per hour. The lower threshold volume for a Four-Hour Vehicular-Volume Traffic-Signal Warrant for a major street with two or more lanes and a posted speed limit greater than 40 mph, and a minor street approach with one lane, is 60 vehicles per hour. This lower threshold is applicable when the major street volumes (eastbound and westbound left, through, and right movements) exceed 1,000 vehicles per hour. The existing through volumes on Bradley Road adjacent to the site currently exceeds 1,000 vehicles per hour, during both the morning and afternoon peak hours.

Detailed analyses are presented in Table 3. The off-peak through volumes on Bradley Road were estimated, based on 24-hour counts conducted by CDOT on Powers Boulevard just south of Bradley Road. The off-peak volumes on Legacy Hill Drive were based on the short-term site-generated traffic volumes and hourly variation data published by the Institute of Transportation Engineers in August 2018.

### **COUNTY ROAD IMPACT FEE PROGRAM**

The applicant will be required to participate in the County Road Impact Fee Program. Details to be determined at Prelim/Plat stages.

### **TRAFFIC-SIGNAL PERCENTAGES**

During the April 23, 2019 El Paso County Road Impact Free Advisory Committee meeting, it was recommended that a future signal at Bradley Road and Legacy Hill Drive be included as an eligible improvement. A copy of the draft meeting minutes have been attached. The minutes are draft only because, as of the date of this report, the committee has not met again to vote on approval of the minutes. No changes are anticipated.

The *Trails at Aspen Ridge Filing No. 1 Updated Traffic Impact and Access Analysis* by LSC dated December 12, 2019 included a traffic signal escrow analysis for a future traffic signal at the intersection of Bradley Road Legacy Hill Drive. However, as the signal is now considered an eligible improvement under the County free program, escrow will no longer be required. Should the actual cost of the signal installation exceed the reimbursable unit cost, LSC has prepared a

table that could be used to determine a fair share contribution towards the amount above the unit cost for each of the area developments anticipated to add traffic to the intersection. The results of the analysis are shown in Table 4.

The table shows a total cost of \$350,000, which is likely a reasonable amount for “private project” installation of a traffic signal, should one of the individual area developments need to install the signal sooner than the County would be able to do so (In which case, the development entity installing the signal would be eligible for unit-cost credit in accordance with Fee Program provisions). The primary area developers could potentially agree on a different number for purposes of sharing the up-front cost if the “private project” scenario for signal installation is likely.

## **DEVIATIONS**

Deviations to the El Paso County *Engineering Criteria Manual* for the two access points to Bradley Road were approved as part of the Waterview Sketch Plan SKP162. The approved deviation requests have been attached.

## **RECOMMENDED IMPROVEMENTS**

A list of all recommended improvements in the vicinity of the site is presented in Table 5.

\* \* \* \* \*

We trust this master traffic impact analysis will assist you in gaining approval of the proposed Sketch Plan Amendment, which includes the Waterview North mixed-use development, and the Waterview North RM-12 Rezone. Please contact me if you have any questions or need further assistance.

Waterview North Sketch Plan Amend. & RM-12 Rezone

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By \_\_\_\_\_  
Jeffrey C. Hodsdon, P.E.  
Principal

JCH:KDF:jas

Enclosures: Tables 2-5  
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# Tables

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**Table 2**  
**Trip Generation Estimate**  
**Waterview North**

			Trip Generation Rates <sup>(1)</sup>						Total Trips Generated						Total Internal Trips Generated						Total External Trips Generated						Total Passby Trips Generated						Total New "External" Trips Generated										
Planning Area	Land Use Code	Land Description	Trip Generation Units	Average		Morning		Peak-Hour		Average		Morning		Peak-Hour		Internal Trips <sup>(2)</sup>	Average		Morning		Peak-Hour		Average		Morning		Peak-Hour		Pass-by Trip Percent <sup>(3)</sup>	Average		Morning		Peak-Hour		Average		Morning		Peak-Hour			
				Weekday	Traffic	In	Out	Peak-Hour	In	Out	Weekday	Traffic	In	Out	Peak-Hour		In	Out	Weekday	Traffic	In	Out	Peak-Hour	In	Out	Weekday	Traffic	In		Out	Peak-Hour	In	Out	Weekday	Traffic	In	Out	Peak-Hour	In	Out	Weekday	Traffic	In
Trip Generation Estimate For the Portion of the Watervior North Development North of Bradley Road																																											
P-14	130	Industrial Park	325 KSF	5.33		0.32		0.08	0.08	0.32	1,733	105	25	27	103	0%	0	0	0	0	0	1,733	105	25	27	103	0%	0	0	0	0	0	1,733	105	25	27	103						
P-15	820	Shopping Center	90.26	0.85		0.52		2.26	2.44	8,796	148	91	395	428	2%	174	4	2	4	11	8,622	144	89	391	417	34%	2,931	41	41	140	140	5,691	103	48	251	277							
P-19	210	Single-Family Detached Housing	425 DU <sup>(4)</sup>	5.44		0.19		0.56	0.62	0.37	4,012	79	236	265	136	2%	72	1	2	6	2	3,884	77	232	254	152	0%	0	0	0	0	0	3,940	78	234	259	154						
P-19	220	Multifamily Housing Low-Rise	425 DU	7.32		0.11		0.35	0.35	0.21	4,319	65	151	159	88	2%	45	1	2	6	2	4,111	65	151	159	88	0%	0	0	0	0	0	4,165	66	160	165	86						
Total Trip Generation Estimate for P-14, P15, and P-19 (Watervior NW)																																											
17,652 377 902 837 774 302 6 15 15 17,350 371 496 822 759 2,931 41 41 140 140 14,419 330 455 682 619																																											
Trip Generation Estimate for the Watervior North RM-12 Rezone Site																																											
P-21	220	Multifamily Housing Low-Rise	60 DU	7.32		0.11		0.35	0.35	0.21	439	6	21	21	12	2%	9	0	0	0	0	430	6	21	21	12	0%	0	0	0	0	0	430	6	21	21	12						
Future Trip Generation Estimate for the Remaining Watervior 2020 Sketch Plan Amendment Area																																											
P-17	820	Shopping Center	121 KSF	56.56		1.09		0.67	2.48	2.69	6,844	132	81	300	325	2%	148	9	3	6	10	6,696	123	78	294	315	34%	2,277	36	36	106	106	4,419	87	42	188	209						
Total Trip Generation Estimate for P-17 & P-21																																											
6,844 132 81 300 325 148 9 3 6 10 6,696 123 78 294 315 2,277 36 36 106 106 4,419																																											
Total Trip Generation Estimate for P-14, P15, P-19, P-17 & P-21																																											
24,935 515 604 1,158 1,112 459 15 9 21 25 24,476 500 595 1,137 1,087 5,208 77 77 246 246 19,268 423 518 891 841																																											
Trip Generation Estimate Assumed in the Trails at Aspend Ridge Fill No. 1 and PUD Updated Trip Impact Analysis by LSC dated December 12, 2019																																											
P-14 & P-15	770	Business Park	720 KSF	11.61		1.14		0.20	0.32	0.90	8,362	820	145	227	646	2%	167	16	3	5	13	8,195	804	142	222	633	0%	0	0	0	0	0	8,195	804	142	222	633						
P-19	220	Multifamily Housing Low-Rise	288 DU	7.32		0.11		0.35	0.35	0.21	2,108	30	102	102	60	1%	21	0	1	1	1	2,087	30	101	101	59	0%	0	0	0	0	0	2,087	30	101	101	59						
P-19	210	Single-Family Detached Housing	312 DU	9.44		0.19		0.56	0.62	0.37	2,945	58	173	195	114	1%	29	1	2	2	1	2,916	57	171	193	113	0%	0	0	0	0	0	2,916	57	171	193	113						
Total Trip Generation Estimate for P-14, P-15 & P-19																																											
13,416 908 420 823 820 217 17 6 8 15 13,198 891 414 815 805 0 0 0 0 0 13,198																																											
Change In Trip Generation Estimate for P-14, P-15 & P-19																																											
-4,237 -531 82 314 -46 -4,152 -420 82 397 -46																																											
P-17 & P-21	820	Shopping Center	148 KSF	53.03		0.95		0.58	2.36	2.55	7,849	140	86	349	378	2%	148	9	3	6	10	7,849	140	86	349	378	34%	2,669	38	38	123	123	5,032	93	44	219	244						
Change In Trip Generation Estimate for P-17 & P-21																																											
-1,008 -8 -6 -48 -62 -1,153 -17 -8 -54 -62																																											
Total Trip Generation Estimate for P-14, P15, P-19, P-17 & P-21																																											
21,264 1,048 506 872 1,197 21,047 1,031 500 864 1,182																																											
Change In Trip Generation Estimate for P-14, P15, P-19, P-17 & P-21																																											
3,671 -533 98 287 -85 3,429 -531 95 274 -95 18,230 984 458 734 1,049 1,038 -561 60 157 -208																																											

**Notes:**

(1) Source: based on *Trip Generation*, 10th Edition, 2017 by the Institute of Transportation Engineers (ITE)

(2) Internal trips within P-14, P-15, and P-19 were based on the attached NCHRP 684 Internal Trip Capture Estimation Tool. Internal trips for P-17 and P-21 include trips projected to and from P-18 and were based on the *Trails at Aspens Ridge Fil No. 1* and *PUD Updated Traffic Impact Analysis* by LSC dated December 12, 2019.

(3) Source: "Trip Generation Handbook - An ITE Proposed Recommended Practice 3rd Edition, September 2017" by ITE.

(4) KSF = 1,000 square feet

(5) DU = dwelling unit

**Table 3**  
**Waterview North**  
**Traffic Signal Warrant Analysis of Legacy Hill Drive/Bradley Road**  
**Based on the Projected Volumes for the North Leg (Waterview North Access) Only**

Period	2 or More Lanes on Major Approach & 1 Lane on Minor Approach																															
	Traffic Volumes														Warrant 1, Eight Hour Vehicular Volume Evaluation												Warrant 2, Four Hour Vehicular Volume Evaluation					
															Warrant Threshold Met?																	
Hour	Existing <sup>(1)</sup>		Added by Residential Uses (950 DUs <sup>(4)</sup> )		Added by Commercial Uses		Added by Industrial Uses		Existing + Residential Uses		Existing + Commercial Uses		Existing + Industrial Uses		Warrant Thresholds				Existing + Residential		Existing + Commercial		Existing + Industrial		Existing + Residential		Existing + Commercial		Existing + Industrial			
															Condition A 70%		Condition B 70%															
	Major <sup>(2)</sup>	Minor <sup>(3)</sup>	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	Major	Minor	A 70%	B 70%	A 70%	B 70%	A 70%	B 70%	Minor Street Minimum	Met?	Minor Street Minimum	Met?	Minor Street Minimum	Met?		
6:00 AM	1002	0	123	58	26	5	64	3	1125	58	1028	5	1066	3	420	105	630	53	No	Yes	No	No	No	No	60	No	60	No	60	No		
7:00 AM	1237	0	244	107	119	23	105	7	1481	107	1356	23	1342	7	420	105	630	53	Yes	Yes	No	No	No	No	60	Yes	60	No	60	No		
8:00 AM	1098	0	237	88	221	38	63	10	1335	88	1319	38	1161	10	420	105	630	53	No	Yes	No	No	No	No	60	Yes	60	No	60	No		
9:00 AM	866	0	195	61	400	64	41	17	1061	61	1266	64	907	17	420	105	630	53	No	Yes	No	Yes	No	No	60	Yes	60	Yes	65	No		
10:00 AM	884	0	183	50	604	105	44	19	1067	50	1488	105	928	19	420	105	630	53	No	No	No	Yes	No	No	60	No	60	Yes	64	No		
11:00 AM	1039	0	221	53	324	92	173	20	1260	53	1363	92	1212	20	420	105	630	53	No	No	No	Yes	No	No	60	No	60	Yes	60	No		
12:00 Noon	824	0	230	55	354	127	239	26	1054	55	1178	127	1063	26	420	105	630	53	No	Yes	Yes	Yes	No	No	60	No	60	Yes	60	No		
1:00 PM	789	0	225	54	307	128	206	16	1014	54	1096	128	995	16	420	105	630	53	No	Yes	Yes	Yes	No	No	60	No	60	Yes	60	No		
2:00 PM	792	0	266	61	297	124	181	23	1058	61	1089	124	973	23	420	105	630	53	No	Yes	Yes	Yes	No	No	60	Yes	60	Yes	61	No		
3:00 PM	949	0	308	57	284	122	148	31	1257	57	1233	122	1097	31	420	105	630	53	No	Yes	Yes	Yes	No	No	60	No	60	Yes	60	No		
4:00 PM	1165	0	397	65	297	127	87	25	1562	65	1462	127	1252	25	420	105	630	53	No	Yes	Yes	Yes	No	No	60	Yes	60	Yes	60	No		
5:00 PM	1222	0	361	67	307	127	28	31	1583	67	1529	127	1250	31	420	105	630	53	No	Yes	Yes	Yes	No	No	60	Yes	60	Yes	60	No		
6:00 PM	995	0	334	60	254	115	3	6	1329	60	1249	115	998	6	420	105	630	53	No	Yes	Yes	Yes	No	No	60	No	60	Yes	60	No		
																		1	11	7	10	0	0			6			10	0		
																		No	Yes	No	Yes	No	No			Yes			Yes	No		

Notes:

- (1) Hourly variation based on traffic counts on Powers Boulevard south of Bradley Road  
(2) The major street volumes include all (left/through/right) movements on Bradley Rd  
(3) The minor street volumes includes only the southbound left movement on Legacy Hills Drive  
(4) DU = Dwelling Unit

Source: LSC Transportation Consultants, Inc.

**Table 4**  
**Legacy Hill Drive and Bradley Road Signal Fair Share Analysis**  
**Waterview North**

Development	Minor Approach Volume <sup>(1)</sup>		Fair Share
	AM	PM	
Based on Projected 2040 Total Traffic Volumes			
Trails at Aspen Ridge Fil No. 1	55	37	6.1%
Trails at Aspen Ridge PUD	176	118	19.5%
Waterview North P-14	20	60	5.3%
Waterview North P-15	52	238	19.2%
Waterview North P-19	261	142	26.7%
Waterview North RM-12 Rezone (P-21)	17	10	1.8%
Waterview North P-17 (Future Commercial)	47	175	14.7%
Bradley Heights	10	25	2.3%
Peak Innovation Park	12	52	4.2%

**Notes:**

(1) Minor approach volume includes all northbound left-turn and through movements plus 25% of northbound right-turn movements and all southbound left-turn and through movements plus the portion of the southbound right-turn movements anticipated to ultimately travel south on Powers Boulevard

Source: LSC Transportation Consultants, Inc.

11/17/2020

**Table 5  
Improvements Table  
Waterview North**

Improvement	Timing / Trigger Point(s)	Required Length	Proposed Length	Responsibility <sup>(1)</sup>
<b>Access Points to Bradley Road (Future Public Street Intersections)</b>				
Full-movement access to the north side of Bradley Road 1,030 feet east of Powers Boulevard (aligning with Legacy Hill Drive on the south side)	With this development	---	---	Applicant
Right-in/right-out access 1,317 feet east of Legacy Hill Drive	With this development	---	---	Applicant
<b>Traffic Signals</b>				
Traffic Signal Installation - Installation of the traffic signal at Legacy Hill Drive/Bradley Road.	As determined by El Paso County Public Works - typically this is when traffic signal warrants are met, however traffic signal warrants are guidelines and the actual timing of installation is at the discretion of El Paso County Public Works. An Eight-Hour Vehicular Volume Traffic Signal Warrant is projected to be met once any of the following levels of development are reached: 31% of the Trails at Aspen Ridge (242 DUs) 23% of the commercial portion of Springs at Waterview East 93% of the residential portion of Waterview North (884 DUs) 44% of the commercial/industrial portion of Waterview North A warrant may be met sooner if the residential and non-residential portions of either Waterview North or the Trails at Aspen Ridge and Springs at Waterview East are developed concurrently. These trigger points/timing estimates and the need for the signal are subject to change and would be evaluated with each final plat application. County public works approval is required for signal installation.	---	---	This intersection is considered an eligible improvement under the El Paso County Road Impact Fee Program. (Please refer to the attached draft minutes of the County Fee Program Advisory Committee dated April 23, 2020 regarding this intersection.)
<b>Auxiliary Turn Lanes</b>				
Extend the existing northbound right-turn deceleration lane on Powers Boulevard approaching Bradley Road	As specified in the terms and conditions of a CDOT Access Permit if not completed sooner by another development. This can be addressed with plat applications.	800' plus 25:1 transition taper	Extend existing lane approximately 200'	To be evaluated with each final plat if not completed sooner by another development
Eastbound dual left-turn lane on Bradley Road approaching Legacy Hill Drive (the dual left would be striped as a single left-turn lane until the intersection is signalized AND dual left-turn operation is operationally necessary)	westbound left-turn volume of 25 vehicles per hour	435' plus 200' taper	250' plus 200' taper	Applicant
Westbound right-turn deceleration lane on Bradley Road approaching proposed right-in/right-out only access	eastbound right-turn volume of 50 vehicles per hour.	235' plus 200' taper	235' plus 200' taper	Applicant
Westbound right-turn deceleration lane on Bradley Road approaching Legacy Hills Drive	eastbound right-turn volume of 50 vehicles per hour.	235' plus 200' taper	235' plus 200' taper	Applicant
Reconstruct the Powers Boulevard median north of Bradley Road to provide dual southbound left-turn lanes. The existing mast arm will need to be lengthened for the second left turn.	With this development if not completed by other development(s) or CDOT. The timing of this improvement could be evaluated with each final plat.	---	---	Likely the applicant if not completed by other development(s) or CDOT.
Reconstruct the Bradley Road to provide dual eastbound left-turn lanes approaching Marksheffel Road	The timing of this improvement could be evaluated with each final plat.	---	---	Applicant
<b>Other Improvements (CDOT)</b>				
Per CDOT comments dated 8/3/2020, the northbound Powers Blvd right turn onto Bradley Rd. acceleration lane shall be reconfigured to provide necessary sight distance decisions for left turning traffic northbound onto proposed Legacy Hill Drive. (LSC suggests this be addressed with the Preliminary Plan/Plat and/or through the access permit process - no access permit will be submitted at the Sketch Plan stage of the process).				
Per CDOT comments dated 8/3/2020, escrow funds will be required as a term and condition of Access Permit for a portion of the future SH21A(Powers Blvd.) / Bradley Rd. interchange based on a pro-rata share determined by the traffic impact study. (LSC suggests this be determined with the Preliminary Plan/Plat traffic study and/or through the access permit process - no access permit will be submitted at the Sketch Plan stage of the process).				
Source: LSC Transportation Consultants, Inc. (11-9-2020)				

## Appendix Table 1

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**Appendix Table 1**  
**Area Traffic Impact Studies**  
**Waterview North**

<b>Study</b>	<b>Consultant</b>	<b>Date</b>
Bradley Heights Trip Generation Letter	LSC Transportation Consultants,	September 11, 2014
Springs at Waterview East Preliminary Plan Traffic Impact and Access Analysis	LSC Transportation Consultants,	August 24, 2018
Trails as Aspen Ridge Filing No. 1 and PUD Updated Traffic Impact and Access	LSC Transportation Consultants,	December 12, 2019
Redemption Hill Church Traffic Impact Study	LSC Transportation Consultants,	April 13, 2020
Peak Innovation Park	Kimley Horn and Associates, Inc.	April 2020
<i>Source: LSC Transportation Consultants, Inc. (May 2020)</i>		



# NCHRP Report 684 Internal Trip Capture Estimation Tool

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NCHRP 684 Internal Trip Capture Estimation Tool					
<b>Project Name:</b>	Waterview North	<b>Organization:</b>	LSC Transportation Consultants, Inc.		
<b>Project Location:</b>	Powers/Bradley	<b>Performed By:</b>	KDF		
<b>Scenario Description:</b>	Buildout	<b>Date:</b>	4/22/2020		
<b>Analysis Year:</b>	2040	<b>Checked By:</b>			
<b>Analysis Period:</b>	AM Street Peak Hour	<b>Date:</b>			

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				239	148	91
Restaurant				0		
Cinema/Entertainment				0		
Residential				511	124	387
Hotel				0		
All Other Land Uses <sup>2</sup>				130	105	25
				880	377	503

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses <sup>2</sup>						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	2	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	4	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	880	377	503
Internal Capture Percentage	1%	2%	1%
External Vehicle-Trips <sup>5</sup>	868	371	497
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	3%	2%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

<sup>1</sup> Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
<sup>2</sup> Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
<sup>3</sup> Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i> ).
<sup>4</sup> Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.
<sup>5</sup> Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.
<sup>6</sup> Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

NCHRP 684 Internal Trip Capture Estimation Tool					
<b>Project Name:</b>	Waterview North	<b>Organization:</b>	LSC Transportation Consultants, Inc.		
<b>Project Location:</b>	Powers/Bradley	<b>Performed By:</b>	KDF		
<b>Scenario Description:</b>	Buildout	<b>Date:</b>	4/22/2020		
<b>Analysis Year:</b>	2040	<b>Checked By:</b>			
<b>Analysis Period:</b>	PM Street Peak Hour	<b>Date:</b>			

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips <sup>3</sup>		
	ITE LUCs <sup>1</sup>	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				823	395	428
Restaurant				0		
Cinema/Entertainment				0		
Residential				659	415	244
Hotel				0		
All Other Land Uses <sup>2</sup>				130	27	103
				1,612	837	775

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized	Veh. Occ. <sup>4</sup>	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses <sup>2</sup>						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1000			5280	
Retail					5280	
Restaurant						
Cinema/Entertainment						
Residential		5280				
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	11	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	4	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	1,612	837	775
Internal Capture Percentage	2%	2%	2%
External Vehicle-Trips <sup>5</sup>	1,582	822	760
External Transit-Trips <sup>6</sup>	0	0	0
External Non-Motorized Trips <sup>6</sup>	0	0	0

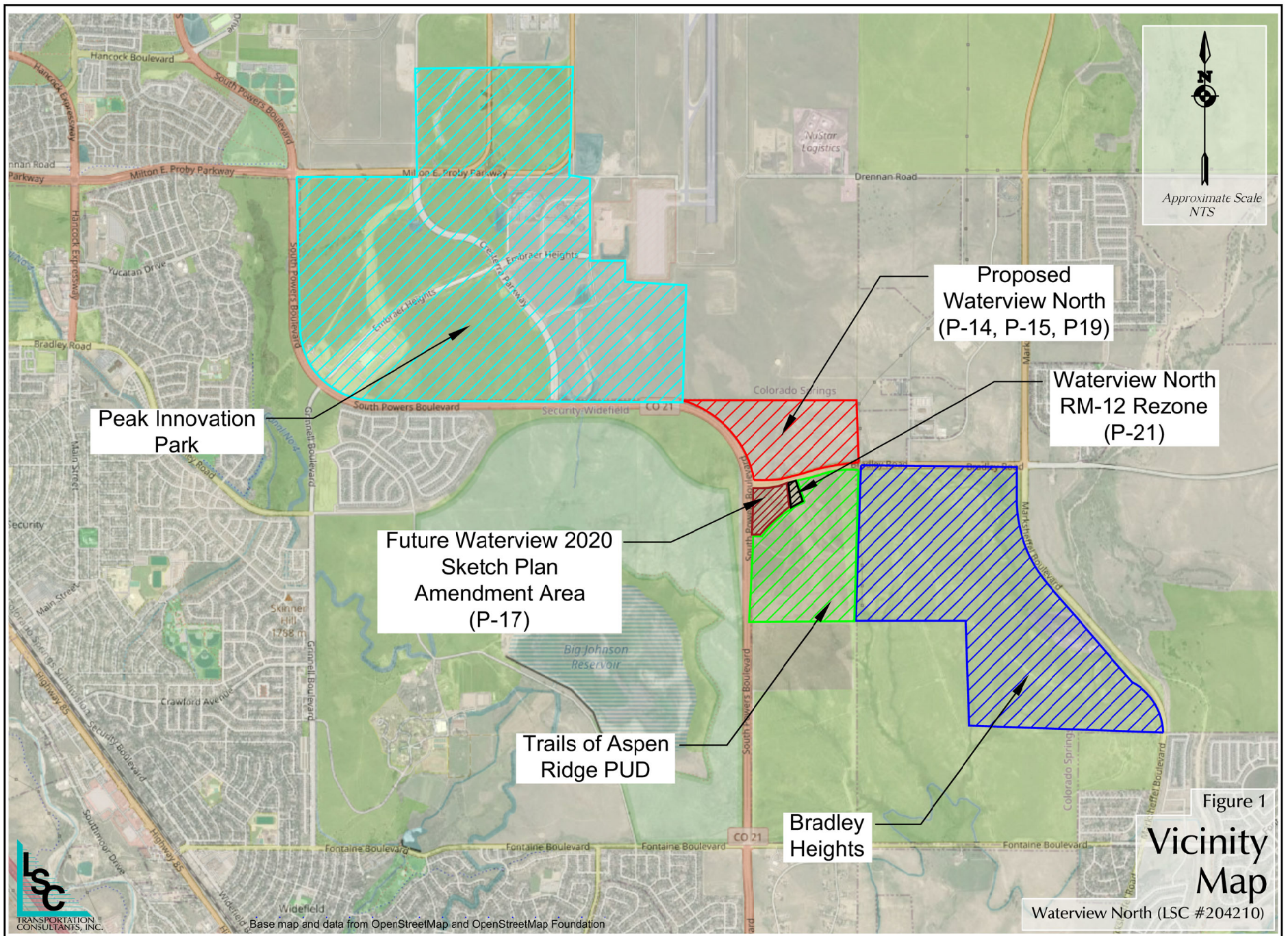
Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	1%	3%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	3%	2%
Hotel	N/A	N/A

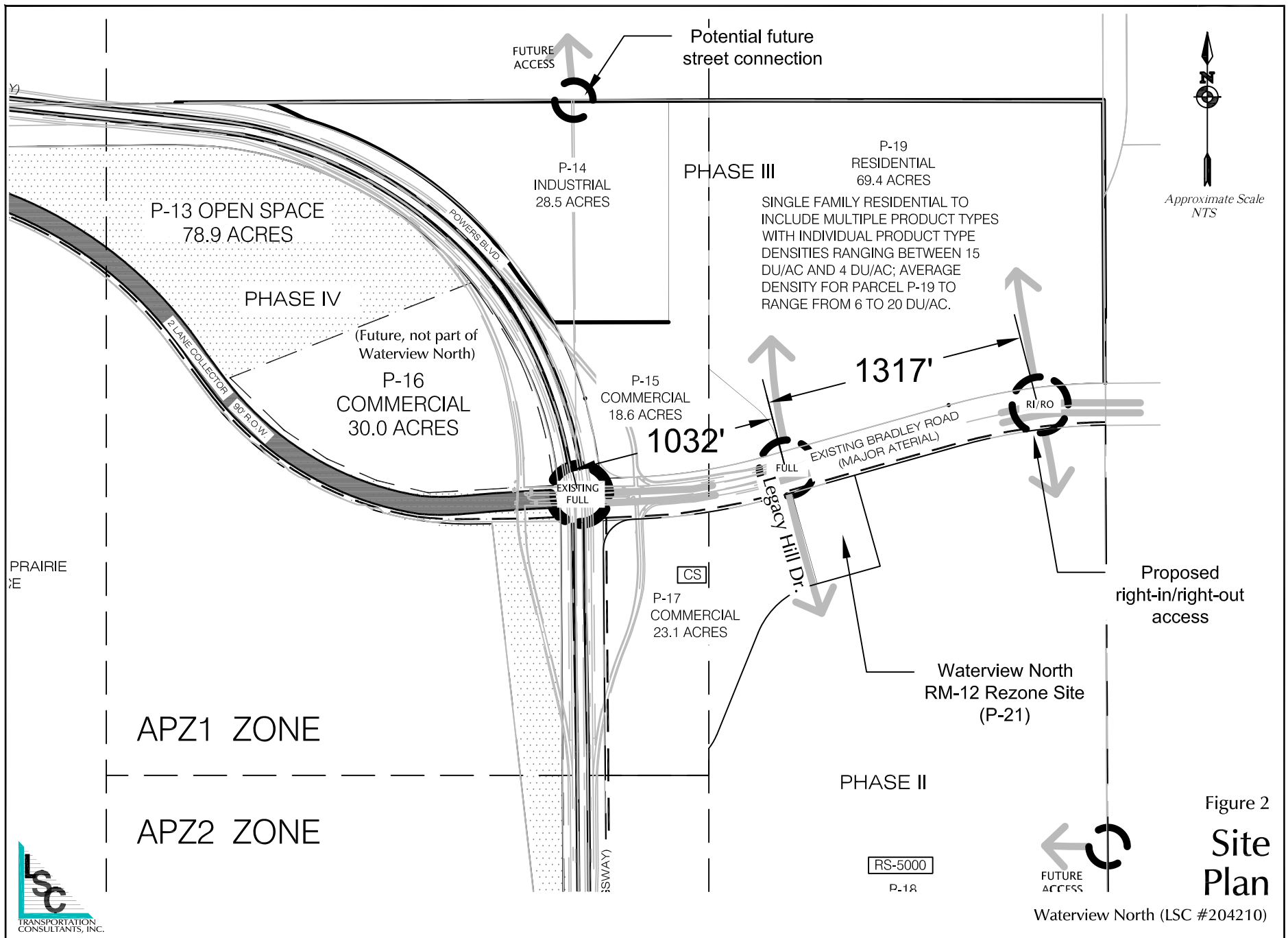
<sup>1</sup> Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
<sup>2</sup> Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
<sup>3</sup> Enter trips assuming no transit or non-motorized trips (as assumed in <i>ITE Trip Generation Manual</i> ).
<sup>4</sup> Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made.
<sup>5</sup> Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
<sup>6</sup> Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

## Figures 1-12

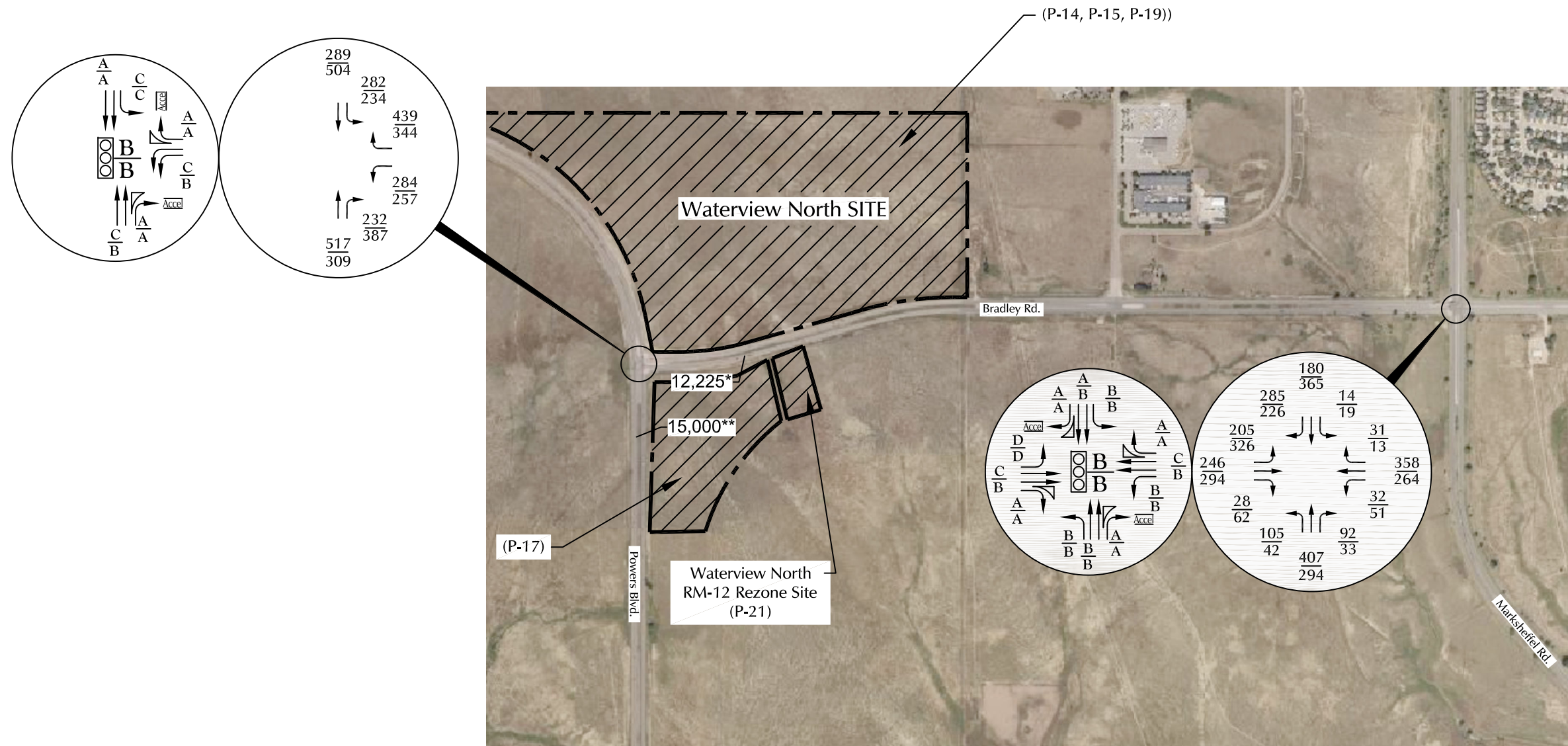
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Approximate Scale  
Scale: 1" = 1,000'

LEGEND:

= Traffic Signal

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
PM Weekday Peak-Hour Traffic (vehicles per hour)

$\frac{A}{B}$  = AM Individual Movement Peak-Hour Level of Service  
PM Individual Movement Peak-Hour Level of Service

$\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service  
PM Entire Intersection Peak-Hour Level of Service

X,XXX = Average Daily Traffic (vehicles per day)

\* Estimate by LSC  
\*\* 2018 AADT CDOT

Counts by LSC April and October 2018

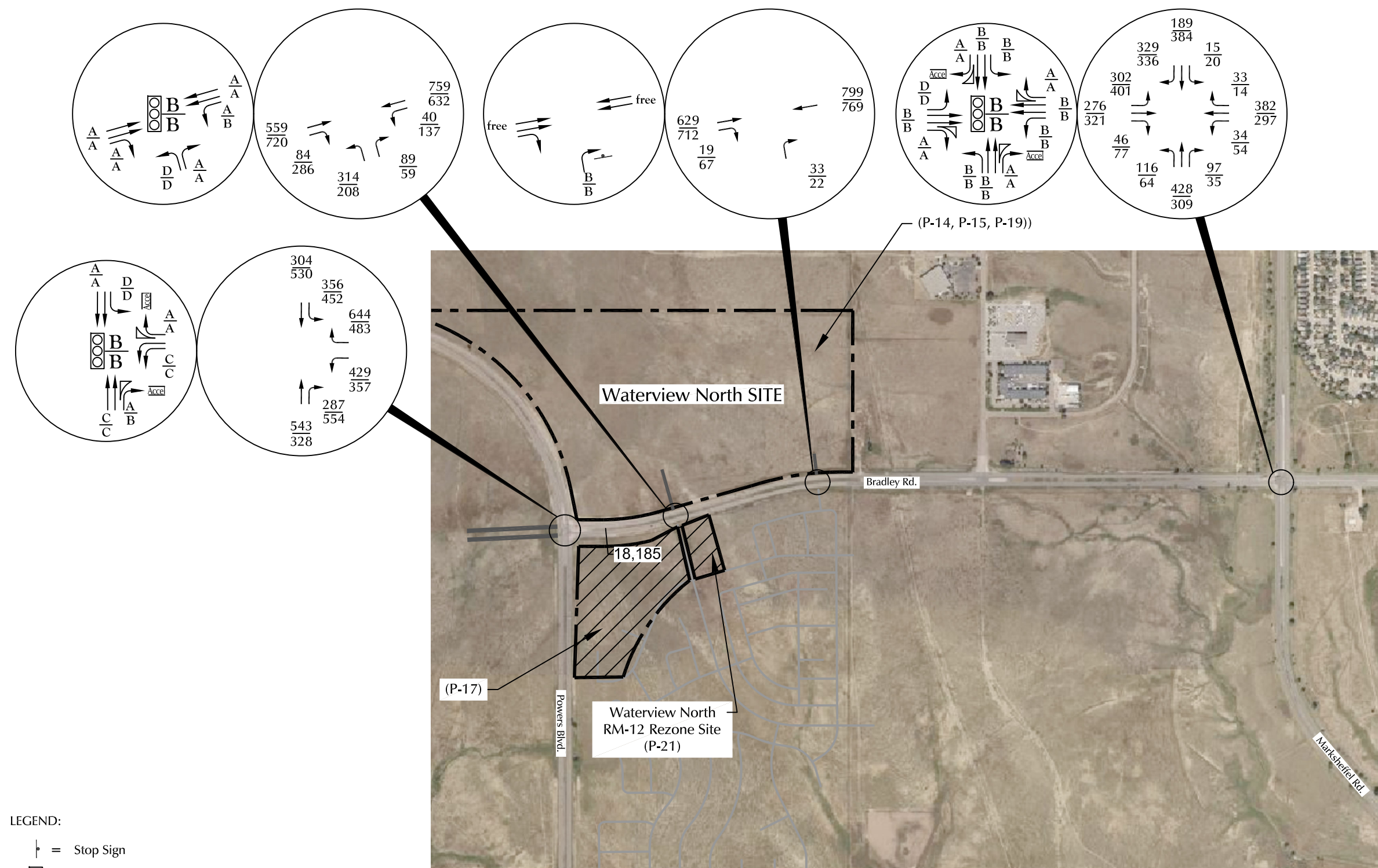


## Existing 2018 Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview North (LSC #204210)

Figure 3





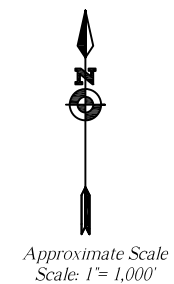
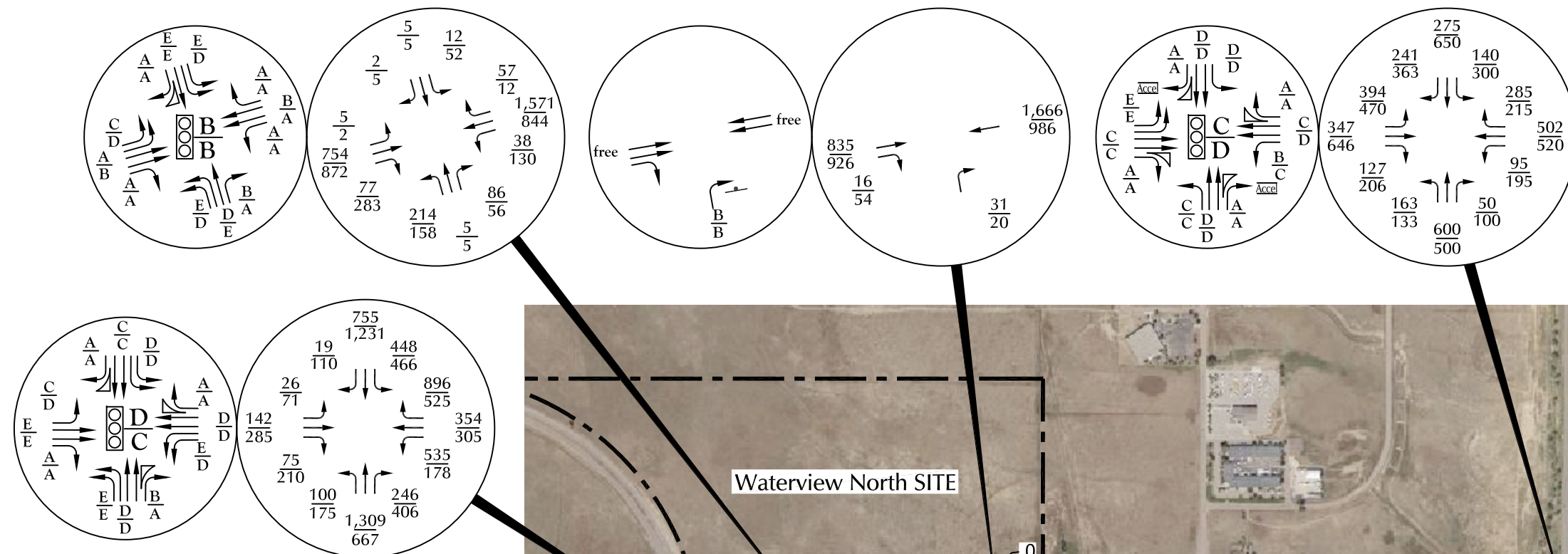
- LEGEND:

Figure 4

## Short-Term Background Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview North (LSC #204210)





LEGEND:

⊥ = Stop Sign

⊞ = Traffic Signal

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)

$\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)

$\frac{A}{B}$  = AM Individual Movement Peak-Hour Level of Service

$\frac{A}{B}$  = PM Individual Movement Peak-Hour Level of Service

$\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service

$\frac{C}{C}$  = PM Entire Intersection Peak-Hour Level of Service

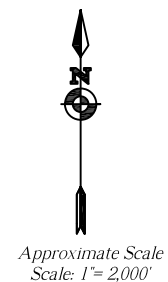
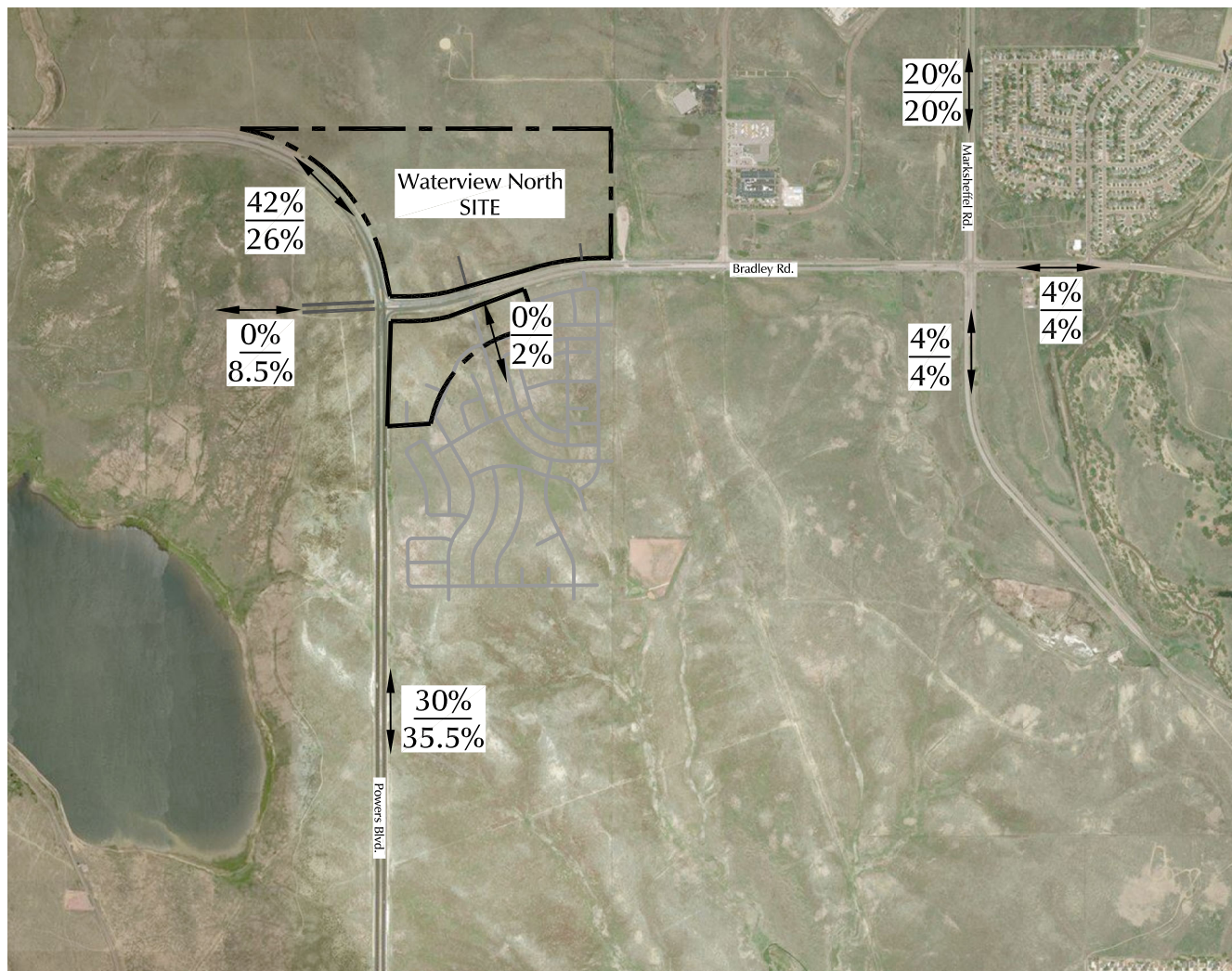
X,XXX= Average Daily Traffic (vehicles per day)



Figure 5

# Year 2040 Background Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview North (LSC #204210)



LEGEND:

$\frac{XX\%}{XX\%}$

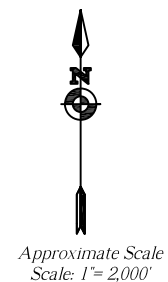
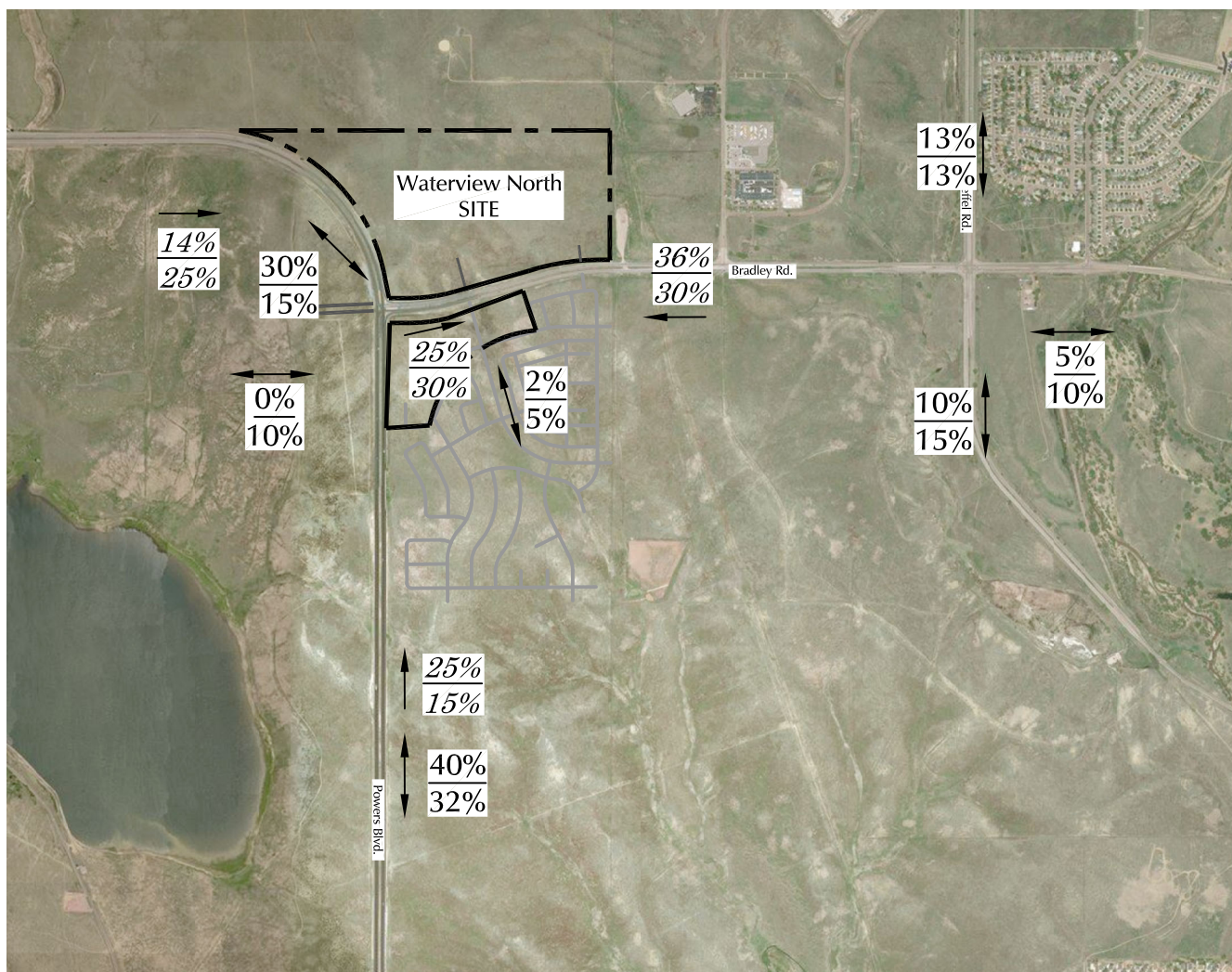
= Short-Term Percent Directional Distribution  
Long-Term Percent Directional Distribution

## Directional Distribution of Residential Site Generated Traffic

Waterview North (LSC #204210)

Figure 6





LEGEND:

$\frac{XX\%}{XX\%}$  = Short-Term Percent Directional Distribution  
 Long-Term Percent Directional Distribution

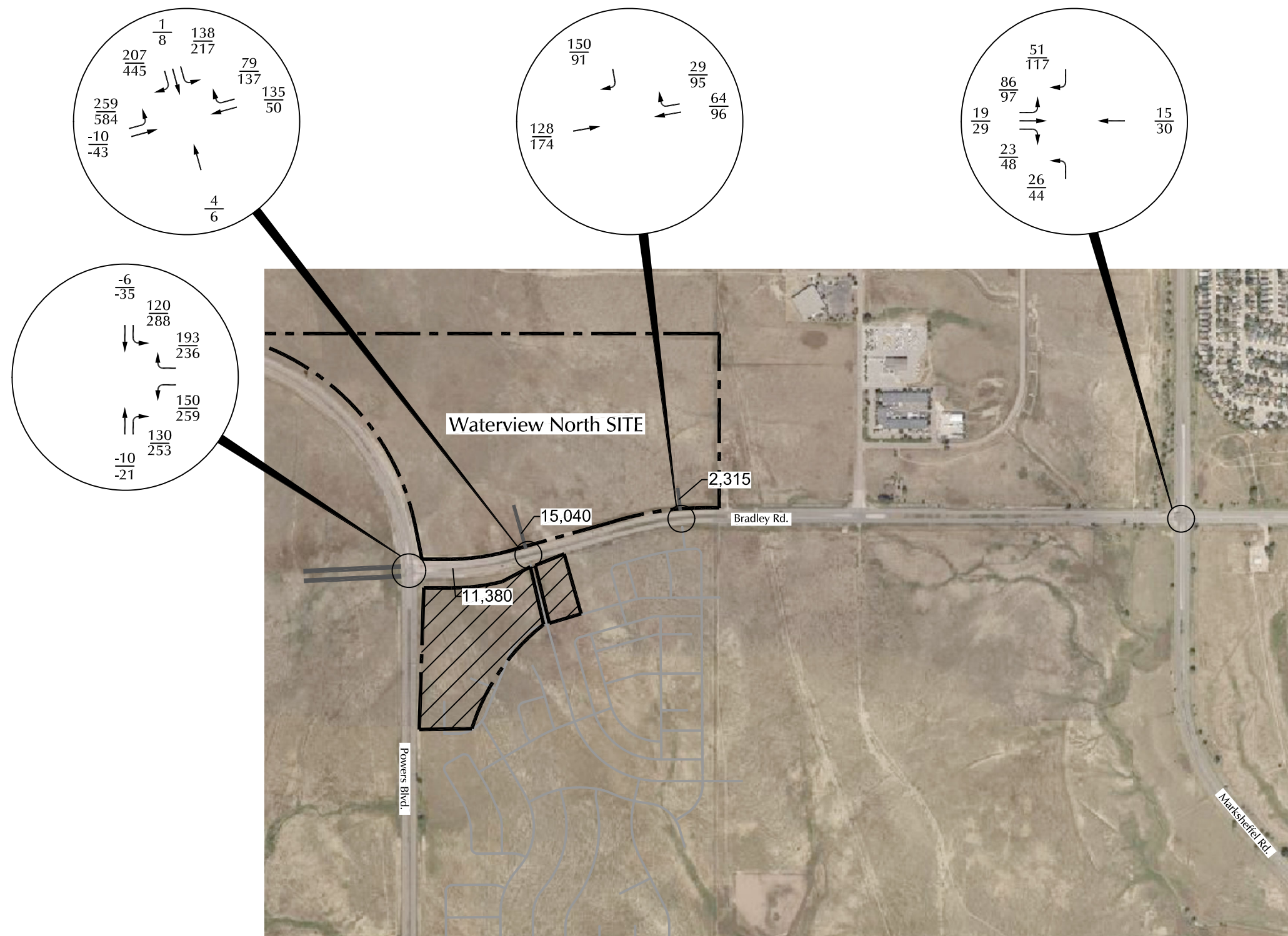
$\frac{XX\%}{XX\%}$  = Passby Percent Directional Distribution AM  
 Passby Percent Directional Distribution PM



# Directional Distribution of Non-Residential Site Generated Traffic

Waterview North (LSC #204210)

Figure 7



Approximate Scale  
Scale: 1" = 1,000'

Figure 8

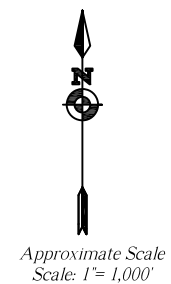
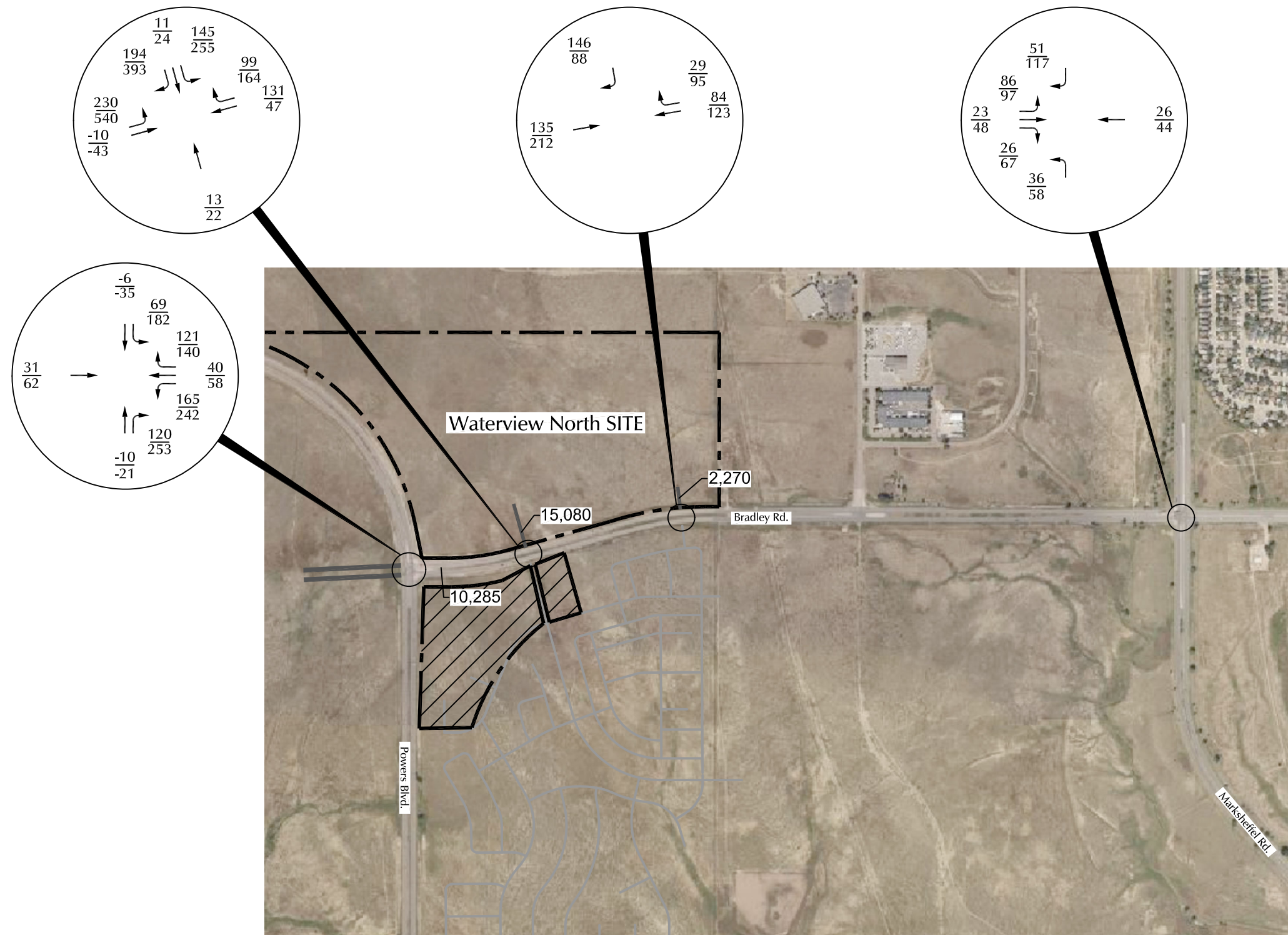
**Short-Term Assignment  
of P-14, P-15, & P-19 Generated Traffic**

Waterview North (LSC #204210)

LEGEND:

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)  
 X,XXX = Average Daily Traffic (vehicles per day)





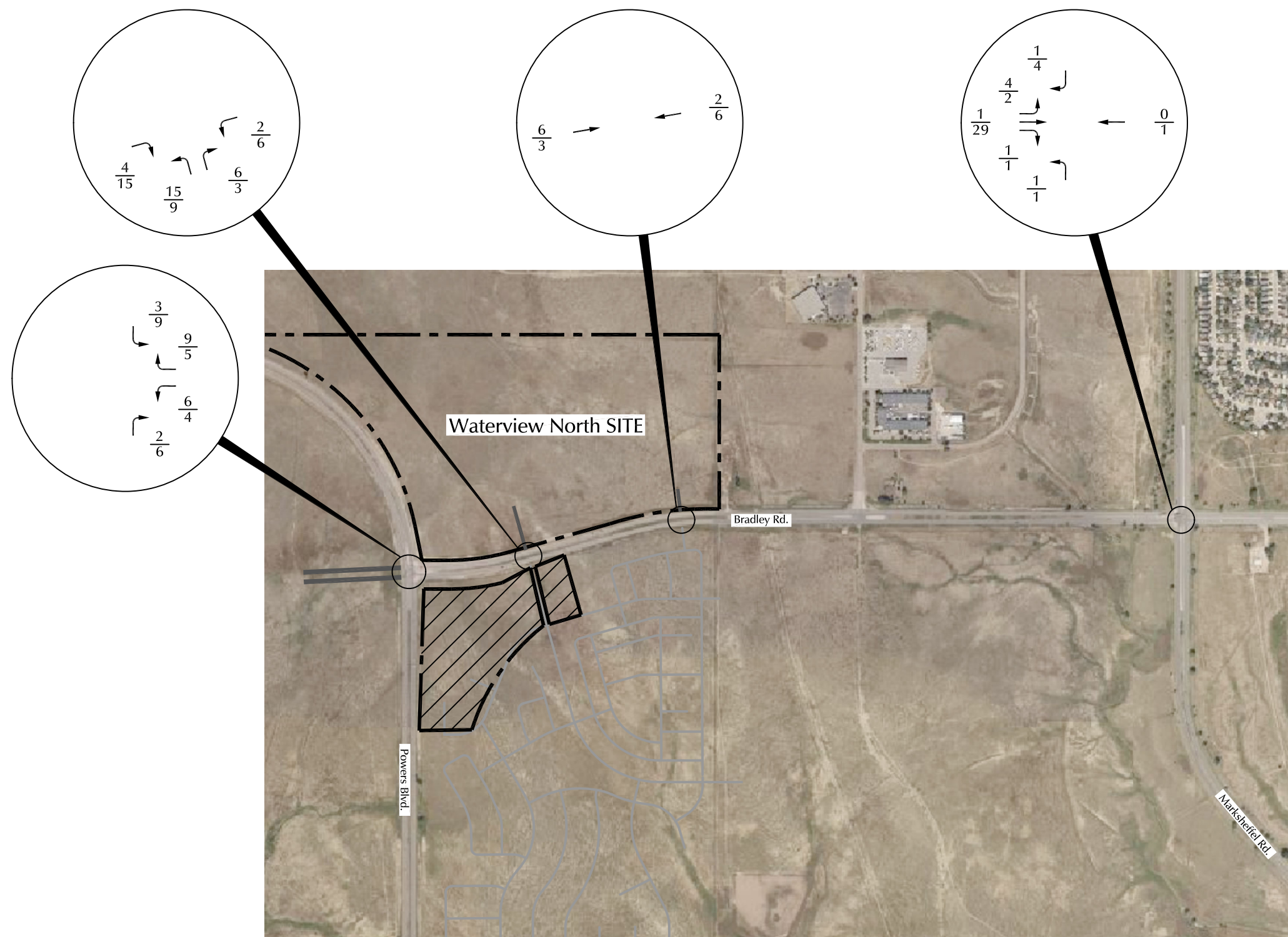
LEGEND:

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)  
 X,XXX = Average Daily Traffic (vehicles per day)

Figure 9

## Long-Term Assignment of P-14, P-15, & P-19 Generated Traffic

Waterview North (LSC #204210)



Approximate Scale  
Scale: 1" = 1,000'

LEGEND:

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)  
 X,XXX = Average Daily Traffic (vehicles per day)

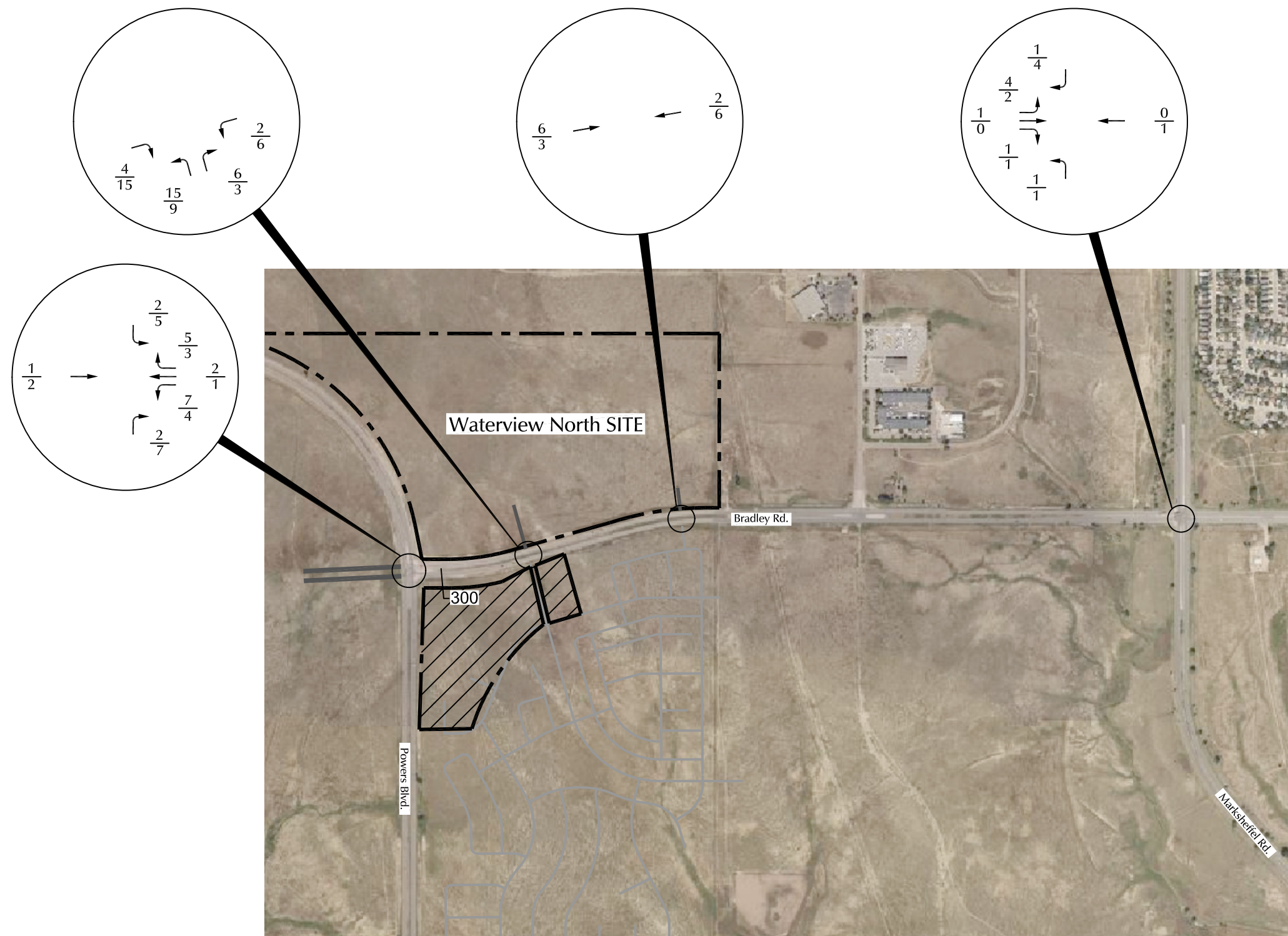


Figure 10

## Short-Term Assignment of P-21 Generated Traffic

Waterview North (LSC #204210)





Approximate Scale  
Scale: 1" = 1,000'

LEGEND:

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
PM Weekday Peak-Hour Traffic (vehicles per hour)

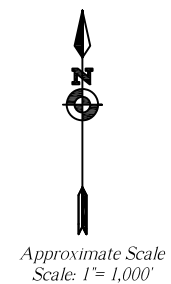
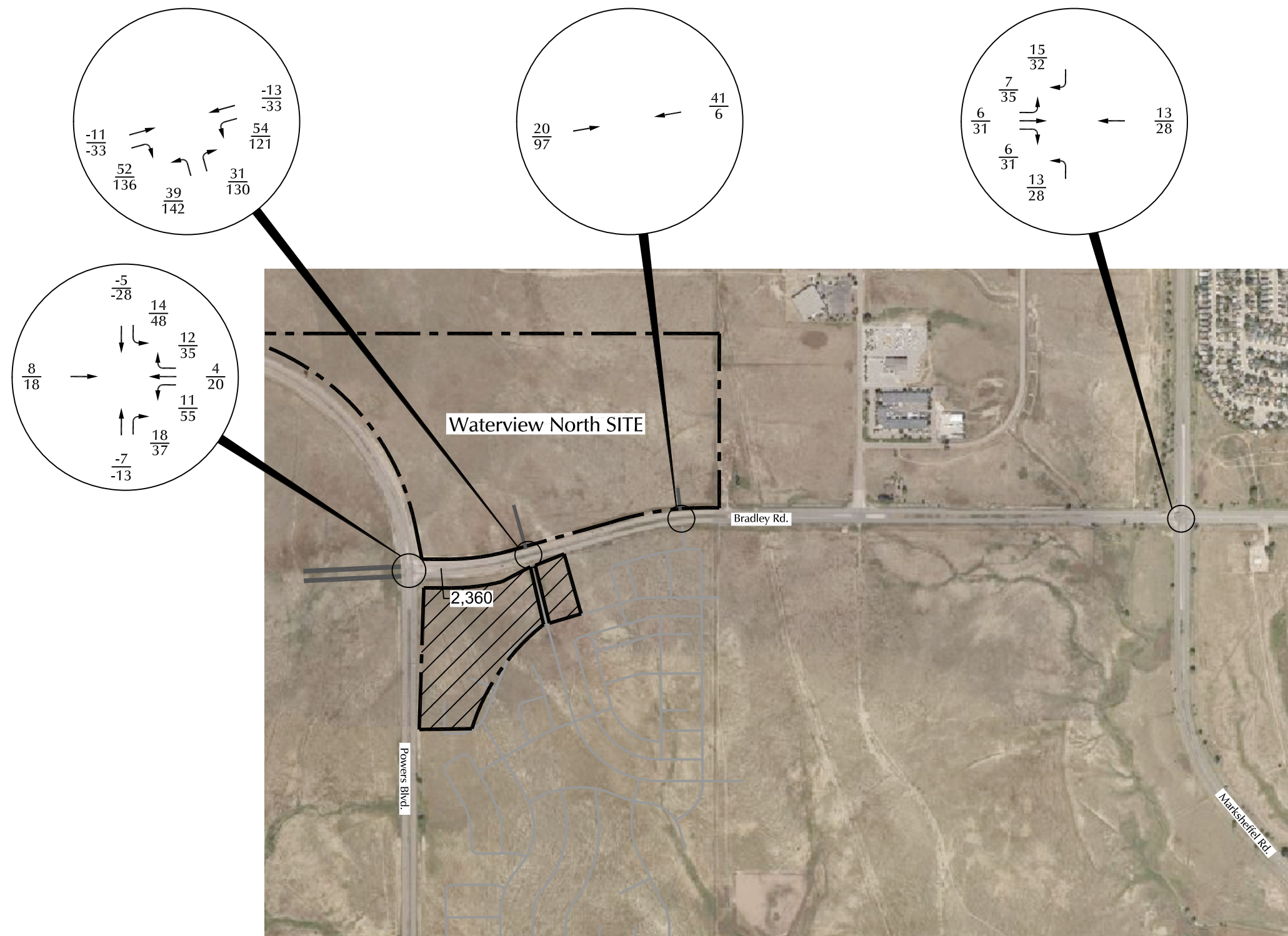
X,XXX= Average Daily Traffic (vehicles per day)



Figure 11

## Long-Term Assignment of P-21 Generated Traffic

Waterview North (LSC #204210)



LEGEND:

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
 $\frac{XX}{XX}$  = PM Weekday Peak-Hour Traffic (vehicles per hour)  
 X,XXX = Average Daily Traffic (vehicles per day)

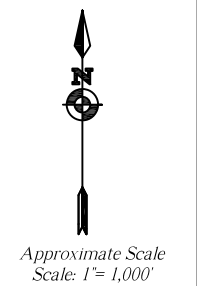
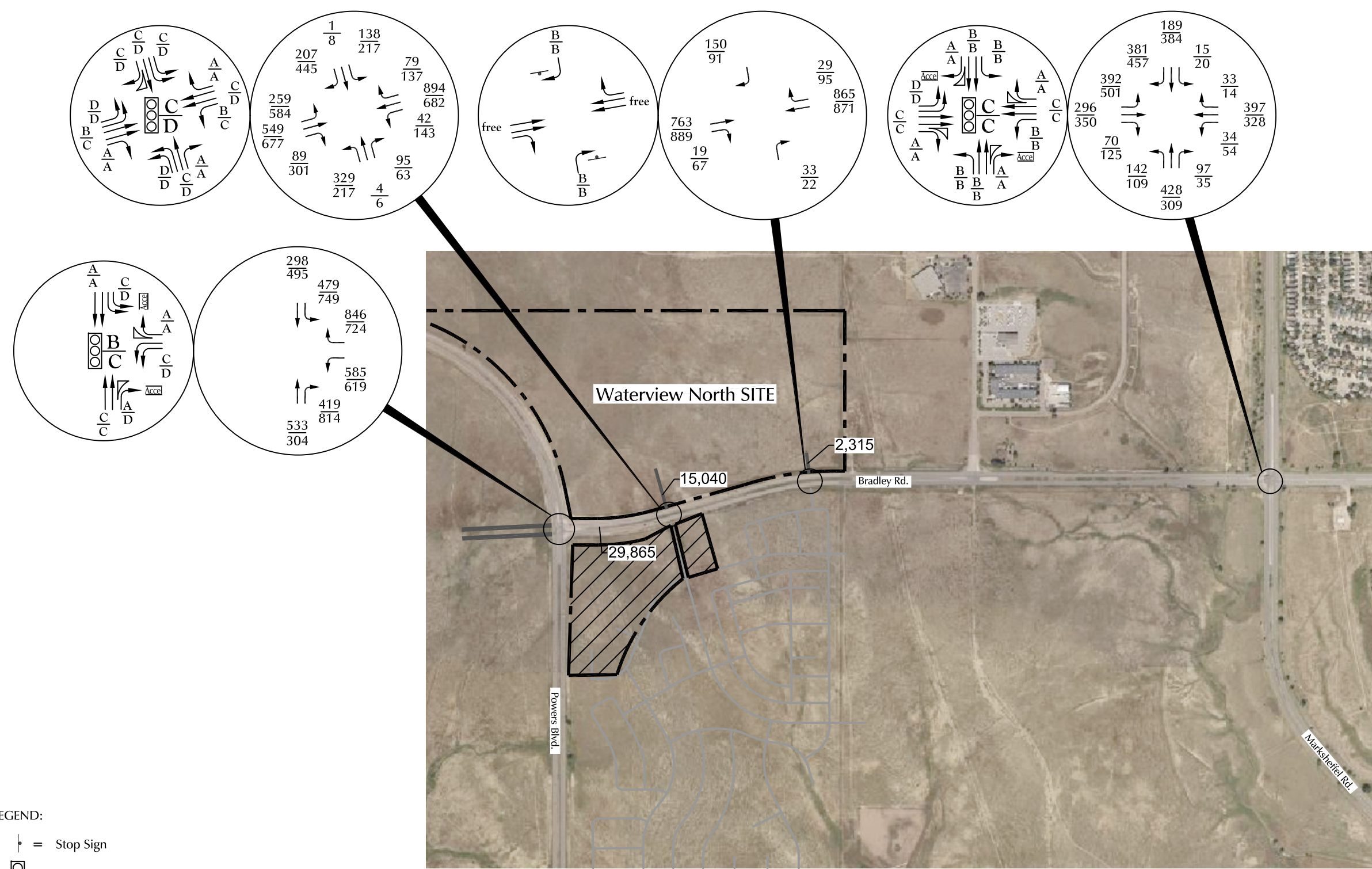


Figure 12

# Long-Term Assignment of P-17 Generated Traffic

Waterview North (LSC #204210)





LEGEND:

⊥ = Stop Sign

⊞ = Traffic Signal

○ = Modern Roundabout

$\frac{XX}{XX}$  = AM Weekday Peak-Hour Traffic (vehicles per hour)  
PM Weekday Peak-Hour Traffic (vehicles per hour)

$\frac{A}{B}$  = AM Individual Movement Peak-Hour Level of Service  
PM Individual Movement Peak-Hour Level of Service

$\frac{C}{C}$  = AM Entire Intersection Peak-Hour Level of Service  
PM Entire Intersection Peak-Hour Level of Service

X,XXX = Average Daily Traffic (vehicles per day)

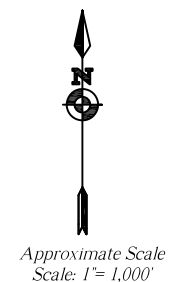
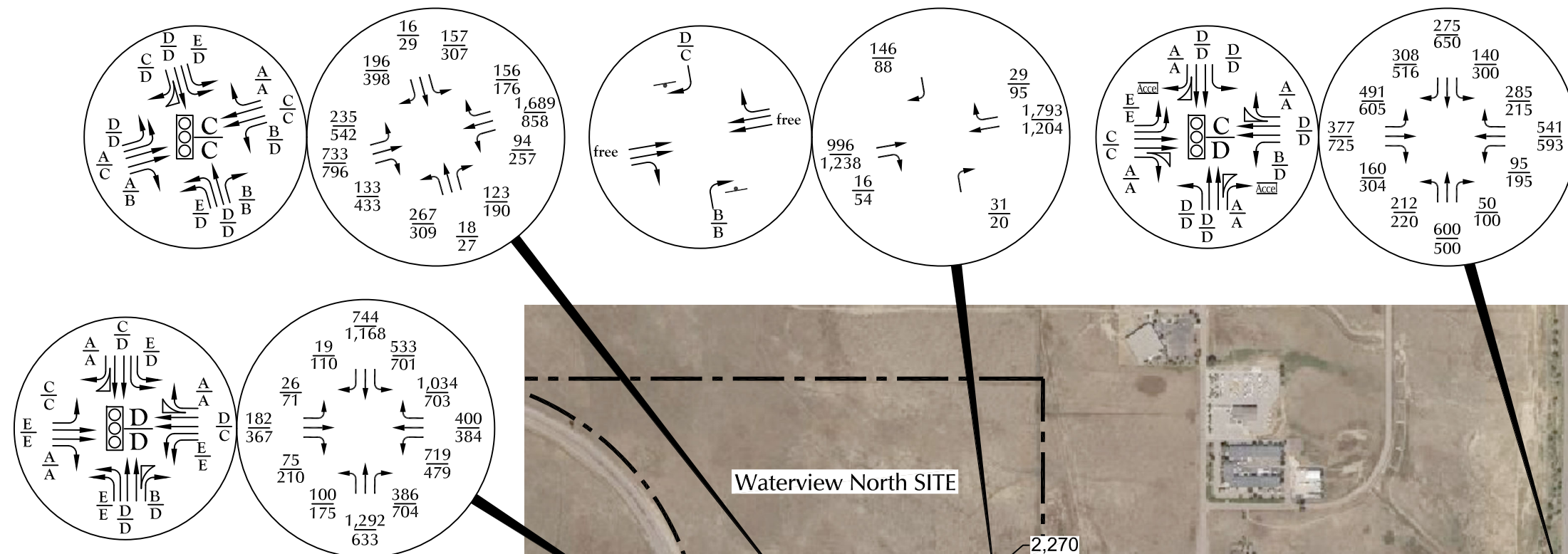


Figure 13

## Short-Term Total Traffic, Lane Geometry, Traffic Control and Level of Service

Trails at Aspen Ridge PUD (LSC #184362)



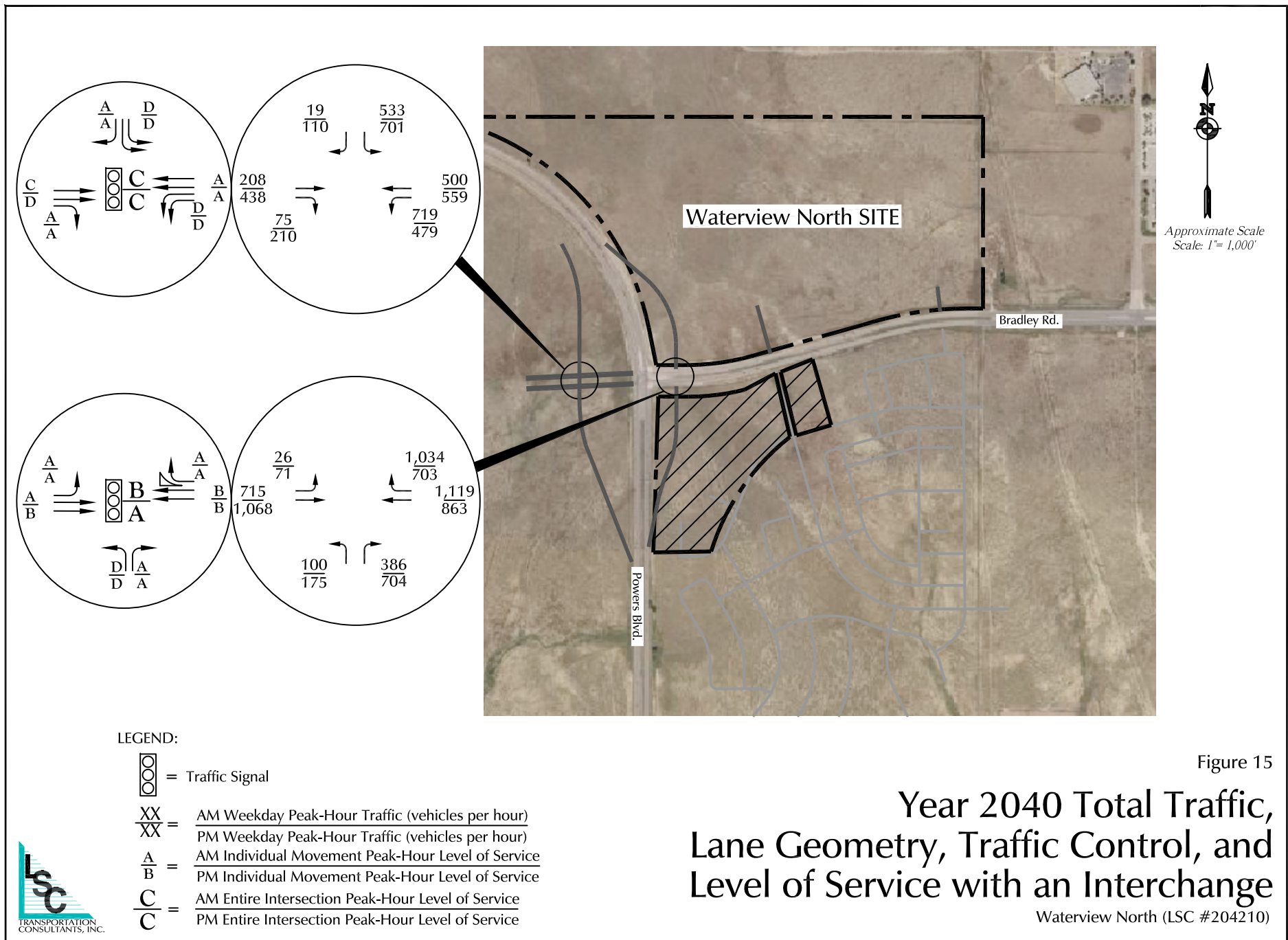


LEGEND:

- = Stop Sign
- = Traffic Signal
- $\frac{XX}{XX}$  =  $\frac{\text{AM Weekday Peak-Hour Traffic (vehicles per hour)}}{\text{PM Weekday Peak-Hour Traffic (vehicles per hour)}}$
- $\frac{A}{B}$  =  $\frac{\text{AM Individual Movement Peak-Hour Level of Service}}{\text{PM Individual Movement Peak-Hour Level of Service}}$
- $\frac{C}{C}$  =  $\frac{\text{AM Entire Intersection Peak-Hour Level of Service}}{\text{PM Entire Intersection Peak-Hour Level of Service}}$
- X,XXX = Average Daily Traffic (vehicles per day)



Figure 14  
**Year 2040 Total Traffic, Lane  
 Geometry, Traffic Control and Level of Service**  
 Waterview North (LSC #204210)

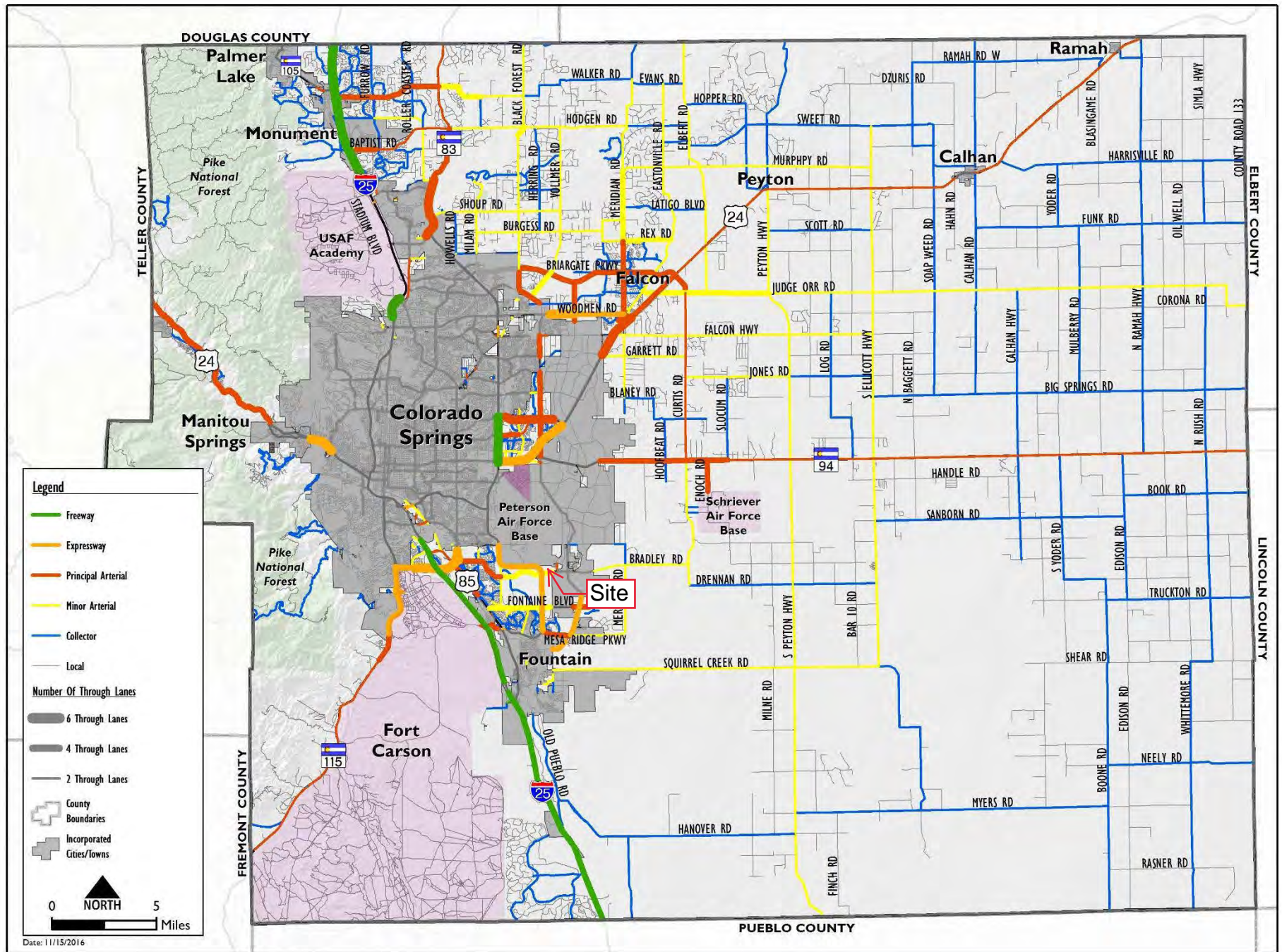


# MTCP Maps

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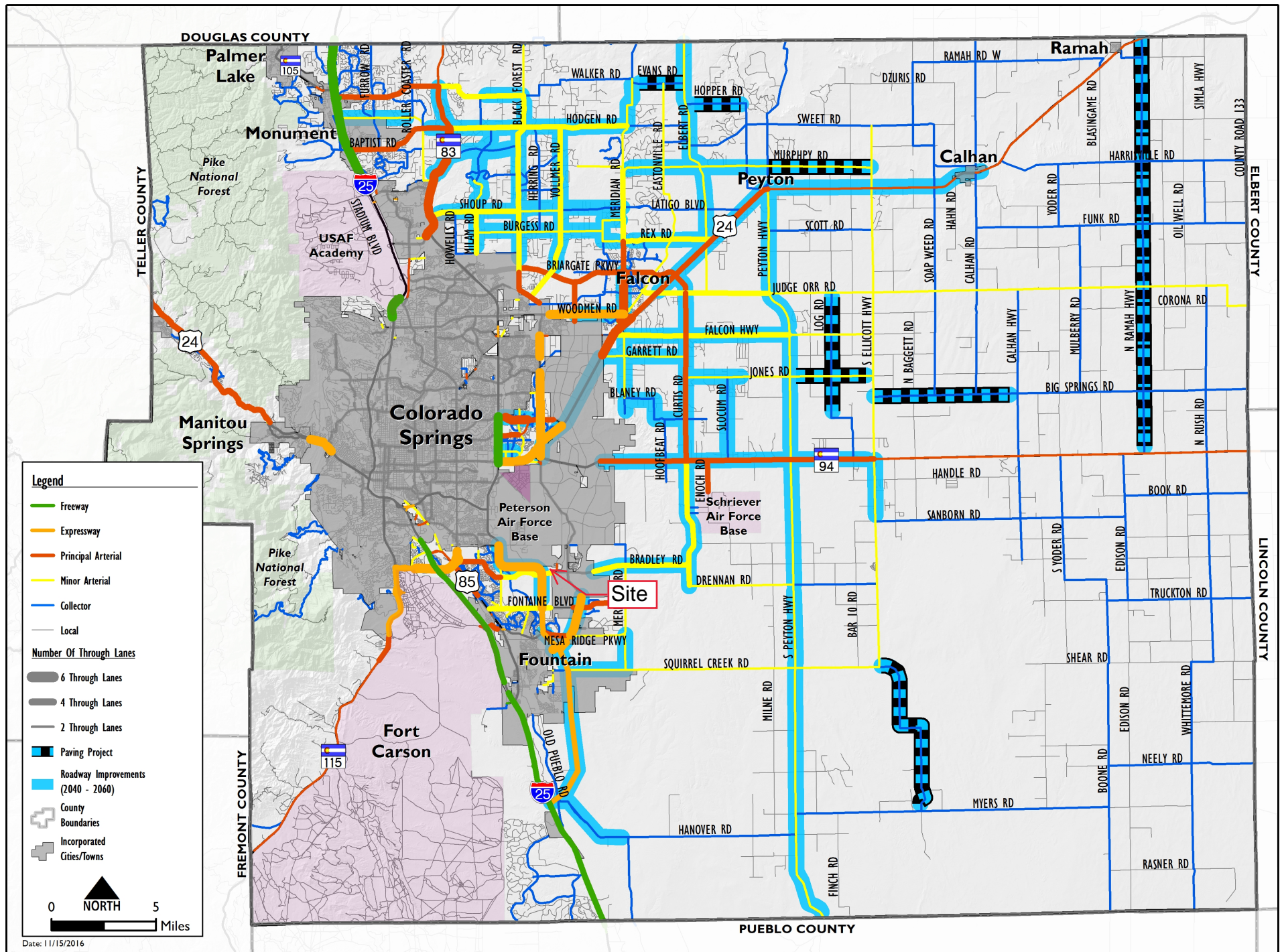




**Map 14: 2040 Roadway Plan (Classification and Lanes)**



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# Approved Deviation Requests

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Development Services Department  
2880 International Circle  
Colorado Springs, Colorado 80910

Phone: 719.520.6300  
Fax: 719.520.6695  
Website www.elpasoco.com

## DEVIATION REVIEW AND DECISION FORM

Procedure # R-FM-051-07  
Issue Date: 12/31/07  
Revision Issued: 00/00/00

DSD FILE NO.:

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### General Property Information:

Address of Subject Property (Street Number/Name): N/A  
Tax Schedule ID(s) #: 5500000135  
Legal Description of Property: W2 SEC 9-15-65, EX PT TO RDS

Subdivision or Project Name: Waterview Sketch Plan

Section of ECM from Which Deviation is Sought: 2.2.5.B.1

Specific Criteria from Which a Deviation is Sought: Intersection spacing along a Principal Arterial  
Proposed Nature and Extent of Deviation: Request for a full-movement, future public street signalized intersection with Bradley Road approximately 1,030 feet east of Powers Boulevard to serve the proposed residential and non-residential Sketch Plan land uses north and south of Bradley Road and east of Powers.

### Applicant Information:

Applicant: CPR Entitlements, LLC Email Address: dse.pak7@gmail.com  
Applicant is: ☐ Owner ☒ Consultant ☐ Contractor  
Mailing Address: 31 North Tejon Street, Suite 500, Colorado Springs State: CO Postal Code: 80903  
Telephone Number: 719-227-7388 Fax Number: 719-227-7392

### Engineer Information:

Engineer: Jeffrey C. Hodsdon, P.E., PTOE Email Address: jchodsdon@lscs.com  
Company Name: LSC Transportation Consultants, Inc.  
Mailing Address: 516 North Tejon Street State: CO Postal Code: 80903  
Registration Number: 31684 State of Registration: Colorado  
Telephone Number: (719) 633-2868 Fax Number: (719) 633-5430

### Explanation of Request (Attached diagrams, figures and other documentation to clarify request):

Section of ECM from Which Deviation is Sought: 2.2.5.B.1  
Specific Criteria from Which a Deviation is Sought: Access spacing along a Principal Arterial

Proposed Nature and Extent of Deviation: Request for a full-movement, future public street signalized intersection with Bradley Road approximately 1,030 feet east of Powers Boulevard to serve the proposed residential and non-residential Sketch Plan land uses north and south of Bradley Road and east of Powers.

Reason for the Requested Deviation: The deviation is requested to provide a future public street intersection and the major access for the proposed Sketch Plan land uses located north and south of Bradley Road and east of Powers Boulevard. The deviation is needed regardless of the exact location of the access because the access would be either less than 1/2-mile from the Powers/Bradley intersection or less than 1/2-mile from the Foreign Trade Zone intersection. The deviation is requested as the property only has public roadway frontage to Bradley Road and Powers Boulevard and no access will be allowed to Powers. Bradley is the only roadway to which these parcels could have direct access.



Also, a full-movement access to Bradley Road was shown on the older approved Sketch Plan.

Comparison of Proposed Deviation to ECM Standard: The requested access would be approximately 2,870 feet west of Foreign Trade Zone Boulevard (exceeds 1/2-mile spacing) and approximately 1,030 feet east of Powers Boulevard, whereas 2,640 feet is the ECM standard.

Applicable Regional or National Standards used as Basis: \_\_\_\_\_

**Application Consideration:**

**CHECK IF APPLICATION MEETS CRITERIA FOR CONSIDERATION**

**JUSTIFICATION**

☐ The ECM standard is inapplicable to a particular situation.

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☒ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.

The parcels northeast and northwest of Powers Boulevard have no access without the proposed access. A future minor connection is planned between Waterview and Bradley Heights to the east; however, this has been planned for connectivity between developments and would not be sufficient access. Also, given the master-planned uses and size of the land area to be served by the access to Bradley, a right-in/right-out access would not suffice. A full-movement access is necessary. A full-movement access between Powers and Foreign Trade Zone Boulevard has been shown on the Waterview Sketch Plan for a number of years. The currently proposed location would be superior to that location previously shown 2,000 feet east of Powers.

☐ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

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**If at least one of the criteria listed above is not met, this application for deviation cannot be considered.**

**Criteria for Approval:**

**PLEASE EXPLAIN HOW EACH OF THE FOLLOWING CRITERIA HAVE BEEN SATISFIED BY THIS REQUEST**

The request for a deviation is not based exclusively on financial considerations.

The request is not based on financial considerations. The request is based on the need to provide a future public street intersection on Bradley Road to serve the parcels northeast and northwest of Powers Boulevard that would have no access without access to Bradley Road. See the above justification paragraph under "Application Consideration" for additional detail.

The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

The intersection spacing would be sufficient to achieve auxiliary left-turn lanes on Bradley Road. The spacing to Powers (west) and Foreign Trade Zone Boulevard (east) will be sufficient to allow this intersection to be signalized. Given the location of land uses to be served in relation to the Powers/Bradley intersection the proposed intersection location would be optimal. Also, the proposed intersection location would be near the north/south dividing line between the proposed commercial and residential development (established as a result of the airport APZ line). This would result in a north/south public street which would serve both the commercial and residential development well. It would provide a buffer between the commercial and residential areas and it would much better serve the

commercial site and make it more viable by moving the full-movement, future signalized intersection to the adjacent northeast corner of the commercial area. The proposed location would be far superior from this perspective. The previous plan showed the first full-movement east of Powers located nearly a quarter-mile to the east of the commercial development area. This, arguably, would not work for commercial development. Commercial/retail development would be most viable when located adjacent to the intersection of Powers and Bradley with a pre-established full-movement, future signalized intersection on Bradley Road at the proposed location. The intersection should be shown at the best location outside the CDOT A-line now.

The deviation will not adversely affect safety or operations.

The intersection would operate at a satisfactory level of service based on short-term and long-term traffic volume projections. The intersection spacing would be sufficient to achieve auxiliary turn lanes and these lanes would accommodate the projected vehicle queues. Good Bradley Road corridor traffic signal progression could be achieved with a future traffic signal at this intersection. The intersection at the proposed location would also provide the option for coordinating the signal at this intersection with the future signal at the Powers/Bradley intersection. Please refer to the attached LSC Traffic Technical Memorandum for additional technical detail and analysis results. The memorandum also addresses the turning movements from Powers onto eastbound Bradley with the relatively short distances to the entry points to the eastbound auxiliary turn lanes at the proposed Waterview intersection.

The deviation will not adversely affect maintenance and its associated cost.

N/A

The deviation will not adversely affect aesthetic appearance.

N/A

**Owner, Applicant and Engineer Declaration:**

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation of condition(s) of approval.

Signature of owner (or authorized representative)

Date

Signature of applicant (if different from owner)

Date

Signature of Engineer

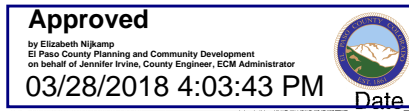
Date

Engineer's Seal





**Review and Recommendation:**  
**APPROVED by the ECM Administrator**



This request has been determined to have met the criteria for approval. A deviation from Section 2.2.5.B.1 of ECM is hereby granted based on the justification provided. Comments:

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\_\_\_\_ Additional comments or information are attached.

**DENIED by the ECM Administrator**

\_\_\_\_ Date

This request has been determined not to have met criteria for approval. A deviation from Section \_\_\_\_\_ of ECM is hereby denied. Comments:

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\_\_\_\_ Additional comments or information are attached.

# Approved Deviation Request

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Right-in/Right-Out Deviation





Development Services Department  
2880 International Circle  
Colorado Springs, Colorado 80910

Phone: 719.520.6300  
Fax: 719.520.6695  
Website www.elpasoco.com

## DEVIATION REVIEW AND DECISION FORM

Procedure # R-FM-051-07  
Issue Date: 12/31/07  
Revision Issued: 00/00/00

DSD FILE NO.:

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### General Property Information:

Address of Subject Property (Street Number/Name): N/A  
Tax Schedule ID(s) #: 5500000135  
Legal Description of Property: W2 SEC 9-15-65, EX PT TO RDS

Subdivision or Project Name: Waterview Sketch Plan

Section of ECM from Which Deviation is Sought: 2.2.5.B.1

Specific Criteria from Which a Deviation is Sought: Intersection spacing along a Principal Arterial

Proposed Nature and Extent of Deviation: Request for right-in/right-out access point to both the westbound and eastbound directions of Bradley Road approximately 2,340 feet east of Powers Boulevard to serve the proposed residential (south side of Bradley) and non-residential (north side of Bradley) Sketch Plan land uses east of Powers.

### Applicant Information:

Applicant: CPR Entitlements, LLC Email Address: dse.pak7@gmail.com  
Applicant is: ☐ Owner ☒ Consultant ☐ Contractor  
Mailing Address: 31 North Tejon St., Suite 500, Colorado Springs State: CO Postal Code: 80903  
Telephone Number: 719-227-7388 Fax Number: 719-227-7392

### Engineer Information:

Engineer: Jeffrey C. Hodsdon, P.E., PTOE Email Address: jchodsdon@lscs.com  
Company Name: LSC Transportation Consultants, Inc.  
Mailing Address: 516 North Tejon Street State: CO Postal Code: 80903  
Registration Number: 31684 State of Registration: Colorado  
Telephone Number: (719) 633-2868 Fax Number: (719) 633-5430

### Explanation of Request (Attached diagrams, figures and other documentation to clarify request):

Section of ECM from Which Deviation is Sought: 2.2.5.B.1  
Specific Criteria from Which a Deviation is Sought: Access spacing along a Principal Arterial

Proposed Nature and Extent of Deviation: Request for right-in/right-out access point to both the westbound and eastbound directions of Bradley Road approximately 2,340 feet east of Powers Boulevard to serve the proposed residential (south side of Bradley) and non-residential (north side of Bradley) Sketch Plan land uses east of Powers.

Reason for the Requested Deviation: The deviation is requested to provide second points of access to the proposed sketch plan land uses located north and south of Bradley Road and east of Powers Boulevard. The primary access would be at the currently proposed full-movement access approximately 1,030 feet east of Powers (please refer to separate deviation request). The deviation is requested as the property only has public roadway frontage to Bradley Road and Powers Boulevard and no access will be allowed to Powers. Bradley is the only roadway to which these parcels could have direct access. The right-in/right-out access point would provide a second point of access for these development areas and would improve circulation for these areas. Given the limited access opportunities to these

sketch plan areas, the right-in/right-out access point would distribute the site-generated right-turn movements to/from Bradley Road at two locations instead of one. This will reduce the turning movements at the proposed full-movement access to the west.

Comparison of Proposed Deviation to ECM Standard: The requested accesses would be approximately 1,560 feet west of Foreign Trade Zone Boulevard, 2,340 feet east of Powers Boulevard, and about 1,315 feet east of the proposed full-movement intersection location. The south side right-in/right out would be 1,135 feet west of a future right-in/right-out access to the Bradley Heights development (City of Colorado Springs).

Applicable Regional or National Standards used as Basis: \_\_\_\_\_

**Application Consideration:**

**CHECK IF APPLICATION MEETS CRITERIA FOR CONSIDERATION**

**JUSTIFICATION**

☐ The ECM standard is inapplicable to a particular situation.

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☒ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.

The parcels northeast and northwest of Powers Boulevard/ Bradley Road have no access without either the proposed full-movement access (separate deviation form) or this proposed access. This proposed access is requested for purposes of providing a second access. A future minor connection is planned between Waterview and Bradley Heights to the east but currently, however, this has been planned for connectivity between developments and is not intended to provide other than a minor connection. Given the master-planned uses, the size of the land area to be served, and essentially access to Bradley Road only, a second point of access (right-in/right-out) to Bradley is needed.

☐ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

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**If at least one of the criteria listed above is not met, this application for deviation cannot be considered.**

**Criteria for Approval:**

**PLEASE EXPLAIN HOW EACH OF THE FOLLOWING CRITERIA HAVE BEEN SATISFIED BY THIS REQUEST**

The request for a deviation is not based exclusively on financial considerations.

The request is not based on financial considerations. The request is based on the need to provide a second access to serve the parcels northeast and northwest of Powers Boulevard that would have no access without access to Bradley Road. The first/primary access would be the proposed full-movement to Bradley Road (separate deviation). See the above justification paragraph under "Application Consideration" for additional detail.

The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

The intersection spacing would be sufficient to achieve auxiliary right-turn lanes on Bradley Road. The deviation is requested as the property only has public roadway frontage to Bradley Road and Powers Boulevard and no access will be allowed to Powers. Bradley is the only roadway to which these parcels could have direct access. The right-in/right-out access points would provide a second point of

El Paso County Procedures Manual

Procedure # R-FM-051-07

Issue Date: 12/31/07

Revision Issued: 00/00/00

DSD File No. \_\_\_\_\_ **SKP 16-002** \_\_\_\_\_

access for these development areas and would improve circulation for these areas. Given the limited access opportunities to these parcels, these right-in/right-out access points would distribute the site-generated right-turn movements to/from Bradley Road at two locations instead of one. This will reduce the turning movements at the proposed full-movement access to the west and potentially at the Foreign Trade Zone/Bradley intersection to the east if a future connection is created between Waterview and Foreign Trade Zone Blvd (right-of-way is not currently available, but a connection could potentially be established with the development of the private property to the east of Waterview).

The deviation will not adversely affect safety or operations.

The intersection would operate at a satisfactory level of service based on short-term and long-term traffic volume projections. The intersection spacing would be sufficient to achieve auxiliary right-turn lanes. The center median on Bradley Road would physically prevent left-turn movements. Future traffic signals at the Bradley/Foreign Trade Zone intersection and at the proposed Waterview full-movement intersection to the west would generate gaps in through traffic on Bradley Road which would be utilized by exiting right-turn movements to turn onto Bradley Road. Please refer to the attached LSC Traffic Technical Memorandum for additional technical detail and analysis results.

The deviation will not adversely affect maintenance and its associated cost.

N/A

The deviation will not adversely affect aesthetic appearance.

N/A

**Owner, Applicant and Engineer Declaration:**

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation or condition(s) of approval.

Signature of owner (or authorized representative)

Date

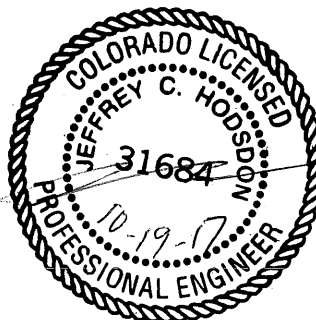
Signature of applicant (if different from owner)

Date

Signature of Engineer

Date

Engineer's Seal



El Paso County Procedures Manual

Procedure # R-FM-051-07

Issue Date: 12/31/07

Revision Issued: 00/00/00

DSD File No. SKP 16-002



**Review and Recommendation:**

**APPROVED by the ECM Administrator**

**Approved**

by Elizabeth Nijkamp  
El Paso County Planning and Community Development  
on behalf of Jennifer Irvine, County Engineer, ECM Administrator



03/28/2018 4:04:26 PM Date

This request has been determined to have met the criteria for approval. A deviation from Section  
2.2.5.B.1 of ECM is hereby granted based on the justification provided. Comments:

The approved RIRO may be closed after a second access has been established to  
the subdivision.

\_\_\_\_ Additional comments or information are attached.

**DENIED by the ECM Administrator**

Date

This request has been determined not to have met criteria for approval. A deviation from Section  
\_\_\_\_ of ECM is hereby denied. Comments:

\_\_\_\_ Additional comments or information are attached.

# Road Impact Fee Advisory Committee Meeting Minutes

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Department of Public Works  
Engineering ~ Highway Division ~ Fleet Services

**ROAD IMPACT FEE ADVISORY COMMITTEE**  
**MEETING MINUTES**

**Date:** April 23, 2019 (1:30 PM – 3:30 PM)

**Where:** Remote meeting

Members Present: Jeff Mark, Jennifer Irvine, Craig Dossey, Ryan Watson, Randy Case, Steve Hicks, Joan Lucia-Treese, Jerry Novak, Nikki Simmons

Others Present: Victoria Chavez, Lori Seago, Jason Alwine, Tim Buschar, Jeff Hodsdon, Matt Dunston, Duncan Bremer, Brian Long

1. Call to order

Mr. Case called the meeting to order at 1:39 PM.

2. Introductions

3. Fee Advisory Committee Approved the Agenda

The Fee Committee unanimously approved the agenda with the date corrected for the meeting notes.

4. Approval of minutes, January 30 Meeting – Vote

Mr. Dossey moved, and Ms. Irvine seconded the motion to approve the January meeting minutes as amended. The vote was unanimous.

5. Eligible Improvements Requests – Discussion/Vote

It was determined that the Furrow Road extension was already included in the fee program as potentially eligible. There may or may not be potentially eligible improvements at the intersection of Furrow and Higby. There may be potentially eligible improvements on Walker Road. However, it is likely that the roundabout as the access to the school is not eligible. As listed improvements, there is no role for the committee at this time. The applicants and staff should work together to develop a preliminary credit agreement. After construction and acceptance of the improvements by EPC, the applicant can apply for credits per the process outlined in the Implementation Document.

6. Signal Request for Bradley Road and Legacy Hill Drive – Discussion/Vote



Mr. Alwine described the Trails at Aspen Ridge Filing 2. As part of the filing is built, it is likely that a signal will be needed on Bradley Road and Legacy Hill Drive. There are many acres of vacant land both north and south of Bradley Roads that may develop. Mr. Alwine presented the percent of traffic from nearby developments that will contribute to the need for the signal at this location. Mr. Dossey moved that the signal meets the criteria in the Implementation Document and recommends that the signal be included as an eligible improvement. Ms. Lucia-Treese seconded the motion and it passed unanimously.

7. Public comments on items not on the agenda  
There were no public comments.

8. Items for Future Agendas  
The committee would like to discuss a format for presentation of improvement requests to the committee, reimbursement requests, bringing credit agreements to the committee as an information item and reevaluating the unit cost prices.

9. Adjourn  
Mr. Case closed the meeting.

# Peak Hour Factor Methodology

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## LSC Peak Hour Factor Calculation Methodology

### Step 1: Determine the peak 15 min for the entire intersection and the overall PHF

The **peak hour factor (PHF)** is the hourly volume during the maximum-volume hour of the day divided by the peak 15-minute flow rate within the peak hour; a measure of traffic demand fluctuations within the peak hour.

The peak hour factor is used in HCM capacity and level of service analysis to account for the variation in traffic volumes during the peak hour. Following is an example of how the peak hour factor is computed and how it might affect the final results of a capacity calculation.

The table below shows flow rates that were measured for four 15-minute time periods for each of the 12 intersection movements. Examination of this table shows that second time period, which begins at 4:15 pm, is the peak 15-minute period of the four that are shown here. The total flow for this time period is 4,220 veh/15 minutes, or 16,880 veh/hr. The average flow rate for the hour is 12,640 veh/hr; this is the sum of the total volumes observed during each of the four 15-minute periods shown below. The peak hour factor can then be computed as follows:

$$\text{PHF} = (\text{average flow rate}) / (4 * \text{Peak 15 minute flow rate})$$

$$= 12,640 / 16,880$$

$$= 0.75$$

Time period	Eastbound			Westbound			Northbound			Southbound			Total
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
4:00 pm	40	55	175	50	50	75	120	815	45	40	700	55	2,220
4:15 pm	50	75	375	55	80	125	215	1,025	20	60	1,975	165	4,220
4:30 pm	30	75	125	45	75	115	20	975	35	55	1,200	145	2,895
4:45 pm	45	60	175	55	85	150	145	1,015	45	50	1,350	130	3,305

You can see that the possible values of PHF can range between 0.25 and 1.00, inclusive. Higher numbers indicate a flatter peak. It is rare that PHF drops much below a value of about 0.70. In this case, the PHF of 0.75 is indicative of a very sharp peak for an urban environment, and is probably more characteristics of small towns and cities than larger urban areas.

[http://hcmguide.com/Case1/popup\\_terms/phf\\_popup.htm](http://hcmguide.com/Case1/popup_terms/phf_popup.htm)

### Step 2 - Calculate the Peak Hour Factors based on the common 15 minute peak interval per the following ITE Journal Article (Next Page)

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# Traffic Volume Adjustments for Impact Analysis

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by James A. Bonneson

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**T**he traffic impact of new development has traditionally been measured with respect to the deleterious effect that additional, site-related traffic has on the adjacent street system. In particular, this measurement is in terms of a reduction in intersection traffic service and the general quality of traffic flow. Once quantified, this impact can then be mitigated via some type of improvement or transportation system management (TSM) action designed to maintain an acceptable level of traffic service. Most commonly an improvement would involve the design and construction of new roadways, intersections, and site driveways. On the other hand, a TSM action program typically includes measures that effectively lessen traffic demand during peak periods.

The common element in both impact measurement and mitigation, as well as in the design of improvements, is the magnitude of the combined background and site-related traffic volumes. Obviously, any error in quantifying these volumes would compromise the accuracy of the impact analysis and could result in either needless or improperly designed improvements.

Currently no uniform guidelines dictate the correct method for properly determining the appropriate traffic volumes to use in the impact analysis. Each jurisdiction has its own impact study guide-

lines regarding the derivation of existing volume levels. Obviously, the implementation of a uniform approach would improve the consistency among traffic analyses and strengthen the reviewing agency's confidence in the study results.

Recognizing the need for suitable guidelines in the derivation of representative traffic demands, this article describes a procedure for quantifying background traffic volumes. In particular, this procedure describes a rational method of accounting for the hourly, daily, and seasonal variability of existing traffic volumes. This approach is founded on the establishment of a reasonable level of confidence in the analysis volumes by minimizing the possibility of their underestimation. Obviously, any underestimation of existing traffic could understate the degree of site impact and could potentially lead to underdesigned or inadequate geometric improvements.

## Existing Traffic Counts

In evaluating the traffic impact of new development, it is customary to take volume surveys at one or more intersections in the site vicinity. As a minimum, these counts are taken at 15-minute intervals during each of the two hours bracketing the peak periods of the day (typically 7:00 a.m. to 9:00 p.m. and

4:00 p.m. to 6:00 p.m.). In most instances, these counts are taken manually because both vehicle classification and turning movements are needed to accurately describe the character of the traffic flow.

The next step in traffic impact analysis is to estimate the peak hour volume of an average day of year by applying appropriate day-of-week and month-of-year adjustment factors. These factors are generally available via the continuous traffic count data compiled and published by most state transportation departments. Generally, adjustment factors associated with the nearest continuous count station having traffic characteristics similar to the study location are used.

## Current Practice and Implications

Recommended practice in the United States is to design roadways and intersections to accommodate the 30th highest hourly volume.<sup>1</sup> This could also be translated into the probability that 99.6% [ $= 1 - 31/8760$ ] of the hours in a year will have volumes less than the 30th highest volume (i.e., a 99.6% level of confidence). In contrast, common procedure for traffic impact studies is to measure the operational efficiency of a roadway or intersection with respect to its ability to serve peak period traffic demand on an average day.

Based on a study of 30 continuous-count stations in Nebraska and Kansas (Table 1), it is estimated that the peak hour volume of the average day represents approximately the 330th highest hour per year (i.e., a 96.2% level of confidence). This implies that there are 330 hours each year that have traffic volumes greater than the peak hour of the average day. Although this may seem like a relatively small number, it becomes more significant when it is realized that these hours would most likely occur during the a.m. and p.m. peak hours. In other words, any analysis based on the peak hour volume of the average day could, in fact, underestimate the actual

vehicular demand during the peak hour of as many as 329 days of the year.

Obviously, some discrepancy exists between the traffic confidence level of the typical impact study (96.2%) and that of a highway design project (99.6%). This discrepancy is significant because quite often the mitigation of site impacts involves the recommendation of specific roadway improvements—improvements that are most likely designed with respect to a 330th highest hour as opposed to the recommended 30th highest hour.

This relationship between design hour volume and system adequacy is best expressed by the following excerpt from the

#### 1965 Highway Capacity Manual:

... the adequacy of a highway cannot be judged by its ability to carry the average volume, but rather must be evaluated in terms of its ability to function properly under specified peak loads.

Many times the only information may be a group of scattered counts ... made at intervals throughout the year on the highway under consideration or on similar highways. In such cases, a method for adjusting the available counts to determine the hourly capacity necessary becomes a matter of paramount importance. A clear understanding of the variations in traffic load that may be expected is essential in this determination. Without this knowledge the application of traffic count data to planning, design, and operation cannot be completely successful.<sup>2</sup>

**Table 1. Variations in Hourly Traffic volumes**

Station	Classification	AADT	30th Highest Hour (%AADT)	Daily Peak Hour (%AADT)	Peak Hour	
					Volume	No. Hours Exceeded
16	Minor arterial	16797	10.38	8.40	1411	246
23	Principal arterial	11410	10.15	8.02	915	298
24	Interstate	81005	10.00	8.09	6553	257
25	Principal arterial	42596	9.90	8.21	3497	216
26	Principal arterial	23607	11.15	8.48	2002	341
28	Principal arterial	32870	9.50	7.60	2498	300
29	Principal arterial	15108	9.90	8.03	1213	255
32	Interstate	7816	11.08	8.61	673	301
36	Interstate	12157	10.15	8.18	994	260
40	Interstate	40732	10.69	8.60	3503	247
42	Minor arterial	3860	9.92	8.04	310	257
44	Collector	1345	10.78	7.74	104	498
46	Interstate	22000	11.57	8.46	1861	412
100	Interstate	38451	10.35	8.49	3264	223
120	Principal arterial	28101	9.64	7.79	2189	273
121	Minor arterial	12976	11.01	8.53	1107	309
123	Minor arterial	4730	15.64	10.49	496	473
551	Freeway	32164	9.40	7.85	2525	217
553	Minor arterial	13363	10.48	8.52	1139	234
555	Collector	4333	13.73	10.13	439	332
558	Principal arterial	19094	10.32	8.05	1537	319
562	Principal arterial	11931	10.56	8.30	990	295
564	Minor arterial	15953	10.11	7.72	1232	377
566	Principal arterial	16793	11.64	8.74	1468	352
568	Minor arterial	18968	9.72	7.99	1516	236
570	Collector	14522	12.09	8.04	1168	631
571	Principal arterial	16906	11.30	8.47	1432	367
572	Principal arterial	16576	9.06	6.75	1119	528
574	Principal arterial	15818	12.91	8.95	1416	482
576	Interstate	22191	11.81	8.96	1988	325
Average			10.83	8.34		329
Standard Deviation			1.38	0.70		104

SOURCE: 1. Continuous Traffic Count Data and Traffic Characteristics on Kansas Highways, Kansas Department of Transportation, 1979.  
2. 1984 Continuous Traffic Count Data and Traffic Characteristics on Nebraska Streets and Highways, Nebraska Department of Roads.

Based on the previous discussion, it seems apparent that existing traffic counts should be adjusted such that analysis hour volumes represent a condition that falls nearer the 30th than 330th highest hour. The exact hour chosen should be a function of the intended use of the impact study document. If its results are only used to qualitatively measure relative site impact, then the counts should only be adjusted for the peak hour of the average day of the year. However, if the study results are used for impact mitigation (e.g., geometric design), then the counts should be adjusted to an hour nearer, if not equal, to the 30th highest hour.

#### Recommended Approach

Once the background traffic counts at the study site have been adjusted to an average day of the year, it is recommended that they be inflated to the peak hour of the peak day of the average week of the year. This can be accomplished by multiplying the estimated average day volume by the percent the peak weekday is of the average annual daily traffic.

As shown in Table 2, the application of this approach suggests that a peak hour traffic count adjusted in this fashion would approximate the 145th highest hour of the year as compared with the 330th hour for the peak hour of the average day. This translates into a 98.3% level of confidence that the analysis hour will not be exceeded. It would appear that this approach offers a reasonable,

conservative compromise between volumes recommended for design and those used for operational analysis.

## Peak Hour Adjustment

Typically, site impact is measured using the various techniques described in the 1985 *Highway Capacity Manual* (HCM).<sup>3</sup> In particular, the operation/design techniques are generally used in the analysis of freeway ramps and weaving sections, while the planning analysis is generally recommended for the analysis of signalized intersections.<sup>4</sup> The difference between the two techniques is the amount of data required and the corresponding level of detail provided by the analysis.

With regard to signalized intersections, the adjustment for the peak 15-minute interval is recommended by the 1985 HCM for operation/design analyses; however, it can also be used in planning analyses, if desired. This option is in recognition of the general planning nature of a traffic impact study and the fact that the associated traffic volumes are usually projections of expected future traffic demand. Hence, the adjustment of peak hour volumes to peak 15-minute flow rates can imply a greater degree of refinement to the analysis process than is reasonable. Moreover, if traffic volumes have already been inflated with regard to the previous adjustments, then the use of a peak hour factor could result in unrealistically high volumes.

The use of a peak hour factor (PHF) is also optional in the analysis of unsignalized intersections. However, in contrast to the planning analysis, it is optional because of the minimal effect that short-term volume fluctuations have on the overall traffic operations. In any case, the same concerns regarding the use of a peak hour adjustment apply here.

## Recommended Approach

Prior to application of any volume adjustment, its implications and the conditions it is intended to represent should be thoroughly understood. This is particularly true of the PHF adjustment. It is entirely possible that the use of a PHF, in addition to any other variational or growth adjustments, could result in volumes so high as to be completely un-

realistic. Accordingly, the general approach recommended in this article is to omit the use of peak hour adjustments in the analysis of intersection efficiency regardless of the technique used (i.e., operation/design or planning). One exception would be for the analysis of existing conditions where the appropriate PHFs can be accurately quantified in accordance with the following discussion.

## Alternative Approach

If it is deemed necessary to measure the traffic impact at signalized intersections in terms of peak flow rates, then traffic volumes must be inflated accordingly. This adjustment by peak hour factor is intended to give a better representation of traffic demand during the peak 15 minutes of the peak hour. This factor is calculated by dividing the hourly flow rate by 4 times the highest 15-minute volume observed on the individual intersection approach. However, considering the nature of the capacity analysis (i.e., sum of critical movements), it is recommended that the PHF be based not on the individual peak 15-minute intervals but, rather, on the peak 15-minute intervals occurring simultaneously on all intersection approaches (i.e., their com-

mon peak interval).

In most instances, the peak 15-minute interval for any one intersection approach also occurs during the common, peak 15-minute interval. Thus, the PHF is identical among both the traditional and the recommended methods. However, it is conceivable that one or more intersection approaches could have common peak 15-minute intervals different from their individual peaks. If so, this would result in the calculation of different PHF values for each approach. In fact, it is quite possible for 1 or more common PHFs to be greater than 1.

Table 3 illustrates the implications of this approach by comparison of it to the PHFs calculated by the traditional method. As indicated by this table, if the individual PHFs are used in the capacity analysis, the critical sum of conflicting movements is 1216 vehicles per hour. Comparatively, if the common PHF is used the critical sum is more realistically estimated at 812 vehicles per hour—a difference of 404 vehicles. In fact, the volume combination comprising the critical sum of 1216 vehicles never actually occurs during the analysis hour and thus represents an unrealistic situation.

It should be noted that the 1985 HCM

**Table 2. Daily Peak Hour Adjusted to Peak Weekday**

Station	Classification	AADT	Daily Peak Hour (%AADT)	Percent Peak Day is of AADT	Adjusted Peak Hour (%AADT)	No. Hours Exceeded
100	Interstate	38451	8.49	117.5	9.98	66
120	Principal arterial	28101	7.79	116.1	9.05	78
121	Minor arterial	12976	8.53	113.3	9.66	152
123	Minor arterial	4730	10.49	131.2	13.76	109
551	Freeway	32164	7.85	115.5	9.06	59
553	Minor arterial	13363	8.52	113.9	9.71	93
555	Collector	4333	10.13	113.7	11.51	196
558	Principal arterial	19094	8.05	116.8	9.41	116
562	Principal arterial	11931	8.30	114.2	9.48	146
564	Minor arterial	15953	7.72	120.6	9.31	102
566	Principal arterial	16793	8.74	118.0	10.32	127
568	Minor arterial	18968	7.99	115.2	9.21	85
570	Collector	14522	8.04	121.8	9.80	245
571	Principal arterial	16906	8.47	111.5	9.45	206
572	Principal arterial	16576	6.75	111.8	7.55	273
574	Principal arterial	15818	8.95	116.9	10.47	257
576	Interstate	22191	8.96	114.6	10.27	154
Average			8.46	116.6	9.88	145
Standard Deviation			0.88	4.7	1.29	68

SOURCE: Continuous Traffic Count Data and Traffic Characteristics on Kansas Highways, Kansas Department of Transportation, 1979.

recognizes this discrepancy in its discussion of the operational analysis methodology for signalized intersections. In fact, it recommends the use of the individual PHFs as a conservative estimate of the common peak 15-minute volumes. Although this approach may be conservative in most instances, the magnitude of this overestimation for any specific location would be unknown to the analyst and, in fact, could vary from zero to more than a 50% increase in critical volumes. Obviously, this degree of uncertainty is not acceptable.

In conclusion, if peak hour factors must be used in the capacity analysis of signalized intersections, it is recommended that the common PHF be used instead of individual peak 15-minute periods. In this manner, the capacity analysis will be most representative of true volume conditions occurring during common intervals of time. In addition, this approach will give the analyst a better

understanding of the nature and magnitude of any conservative adjustments made to the traffic volumes.

### Summary

As suggested at the beginning of this article, a great need exists for a uniform methodology for adjusting traffic volumes associated with site impact analysis. These adjustments must be made to standardize the analysis process and increase the level of confidence that can be placed in the study results.

The approach taken here has been to recommend that the impact study analysis be based on reasonable estimates of background traffic volumes. In particular, existing traffic volumes should be adjusted to represent the peak hour of the peak day of an average week of the year. Moreover, it is suggested that a peak hour factor need not be used for planning-level analyses; however, if peak

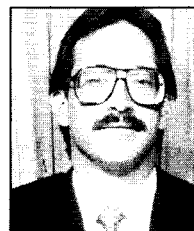
hour adjustments are used, they should be representative of a common, simultaneously occurring 15-minute interval. Regardless of the type of adjustments made, the resulting volumes should reflect the intended use of the impact study: comparative assessment of site impact or mitigation of impact via geometric design.

### References

1. American Association of State Highway and Transportation Officials. *A Policy on Geometric Design of Highways and Streets*. Washington, DC: American Association of State Highway and Transportation Officials, 1984.
2. Highway Research Board. "Highway Capacity Manual." *Special Report 87*. Washington, DC: Highway Research Board, National Research Council, 1965, p. 37.
3. Transportation Research Board. "Highway Capacity Manual." *Special Report 209*. Washington, DC: Transportation Research Board, National Research Council, 1985.
4. Keller, C. Richard, and Mehra, J. *Site Impact Traffic Evaluation Handbook*. Washington, DC: Federal Highway Administration, U.S. Department of Transportation, 1985.

**Table 3. Peak Hour Factor Comparison**

Ending Hour	Approach Volumes				Total Volume	Critical Volume
	Northbound	Southbound	Eastbound	Westbound		
1700	59	74	158	85	376	← Peak
1715	88	81	107	115	391	
1730	117	59	107	106	389	
1745	146	78	88	77	389	
Total	410	292	460	383	1545	870
Based on Individual 15-minute Peaks						
PHF	0.70	0.90	0.73	0.83	0.99	1216
Flow rate	584	324	632	460	1564	
Based on Common 15-minute Peaks						
PHF	1.16	0.90	1.07	0.83	0.99	812
Flow rate	352	324	428	460	1564	



**James A. Bonneson** is a transportation engineer with HDR Infrastructure, Omaha, Nebraska. He has been employed there since 1984. Bonneson received a B.S. and an M.S. in civil engineering from the University of Nebraska-Lincoln.

His research interests have been in the areas of vehicle route optimization, computer simulation, and theory of traffic flow. In addition, he has authored several computer programs, most notable of which is SICAP, a program designed to automate the capacity analysis of signalized intersections based on the 1985 *Highway Capacity Manual* methodology. Bonneson is an associate member of ITE.

## Highway/Transit Bill Passes

At press time, the Senate had just voted to override the President's veto of the Highway/Transit Bill, by a vote of 67 to 33. The House had already voted to override the veto. The bill is now law. Details of the bill will be included in the May issue of *ITE Journal*.



### Step 3: Replace the PHF calculated for Individual Approaches/Turning Movements in Step 2 if the calculated PHF exceeds the value in the following Synchro Users Guide

#### Peak Hour Factor

The traffic volumes are divided by the **Peak Hour Factor** (PHF) to determine the traffic flow rate during the busiest 15-minute period during the hour. For example:

Hourly Flow Rate: 1000 vph

Peak Hour Factor: 0.9

Adjusted Peak Flow Rate:  $1000 / 0.9 = 1111$  vph

The HCM 6<sup>th</sup> Edition Chapter 19 provides suggested default values, that may be used in the absence of field measurements of peak-hour factor (PHF). For intersections with a total entering volume  $\geq 1,000$  veh/h, 0.92 is a reasonable approximation for PHF. For conditions with a total entering volume  $< 1,000$  veh/h, 0.90 is a reasonable estimate for PHF.

If the Analysis Period is set to a value of greater than 15 minutes, the PHF will be set to 1.0 and cannot be changed. The Analysis Period can be modified using the **Network-Settings** command, located in the Options tab.

The default PHF is 0.92 following the guidelines of the HCM 6<sup>th</sup> Edition. The user may change the default or reset existing Peak Hour Factors in the current data set in the **Network-Settings**. The range of PHF in Synchro is 0.25 to 1.00.

Note that 15-minute traffic volumes read from a UTDF Volume file automatically recalculate PHF for each volume period.

If traffic arrivals fit a Poisson distribution, probability suggests using the values in **Table 9-1** for the PHF. This assumes the highest 15-minute period is the 87.5 percentile based on average 15-minute periods of the hour.

**Table 9-1 Suggested Peak Hour Values**

Total Approach Volume (vph)	PHF
2000	0.95
1000	0.93
500	0.92
200	0.87
100	0.83
50	0.78

If the upstream intersection is at capacity for the entire peak hour, use a PHF of 1.0.

# Traffic Counts

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Default Comments

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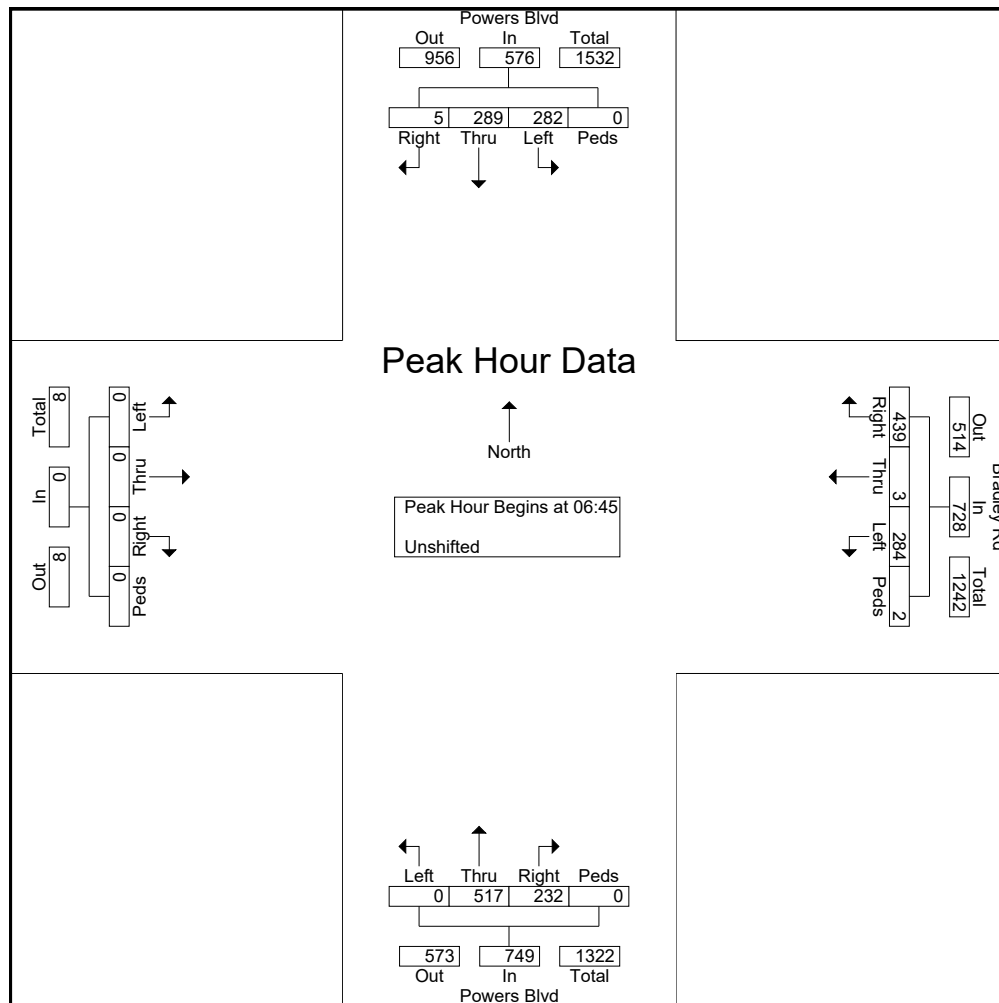
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**Groups Printed- Unshifted**

	<b>Powers Blvd Southbound</b>					<b>Bradley Rd Westbound</b>					<b>Powers Blvd Northbound</b>					<b>Eastbound</b>					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:30	61	54	0	0	115	68	0	71	0	139	0	89	73	0	162	0	0	0	0	0	416
06:45	67	68	0	0	135	80	0	104	0	184	0	110	55	0	165	0	0	0	0	0	484
Total	128	122	0	0	250	148	0	175	0	323	0	199	128	0	327	0	0	0	0	0	900
07:00	67	87	0	0	154	71	0	119	0	190	0	120	58	0	178	0	0	0	0	0	522
07:15	66	56	5	0	127	65	3	111	2	181	0	154	65	0	219	0	0	0	0	0	527
07:30	82	78	0	0	160	68	0	105	0	173	0	133	54	0	187	0	0	0	0	0	520
07:45	63	77	0	0	140	78	0	62	0	140	0	93	54	0	147	0	0	0	0	0	427
Total	278	298	5	0	581	282	3	397	2	684	0	500	231	0	731	0	0	0	0	0	1996
08:00	36	66	0	0	102	89	0	70	0	159	0	97	47	0	144	0	0	0	0	0	405
08:15	50	72	0	0	122	93	0	61	0	154	0	73	37	0	110	0	0	0	0	0	386

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	Powers Blvd Southbound					Bradley Rd Westbound					Powers Blvd Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45																					
06:45	67	68	0	0	135	80	0	104	0	184	0	110	55	0	165	0	0	0	0	0	484
07:00	67	87	0	0	154	71	0	119	0	190	0	120	58	0	178	0	0	0	0	0	522
07:15	66	56	5	0	127	65	3	111	2	181	0	154	65	0	219	0	0	0	0	0	527
07:30	82	78	0	0	160	68	0	105	0	173	0	133	54	0	187	0	0	0	0	0	520
Total Volume	282	289	5	0	576	284	3	439	2	728	0	517	232	0	749	0	0	0	0	0	2053
% App. Total	49	50.2	0.9	0		39	0.4	60.3	0.3		0	69	31	0		0	0	0	0		
PHF	.860	.830	.250	.000	.900	.888	.250	.922	.250	.958	.000	.839	.892	.000	.855	.000	.000	.000	.000	.000	.974



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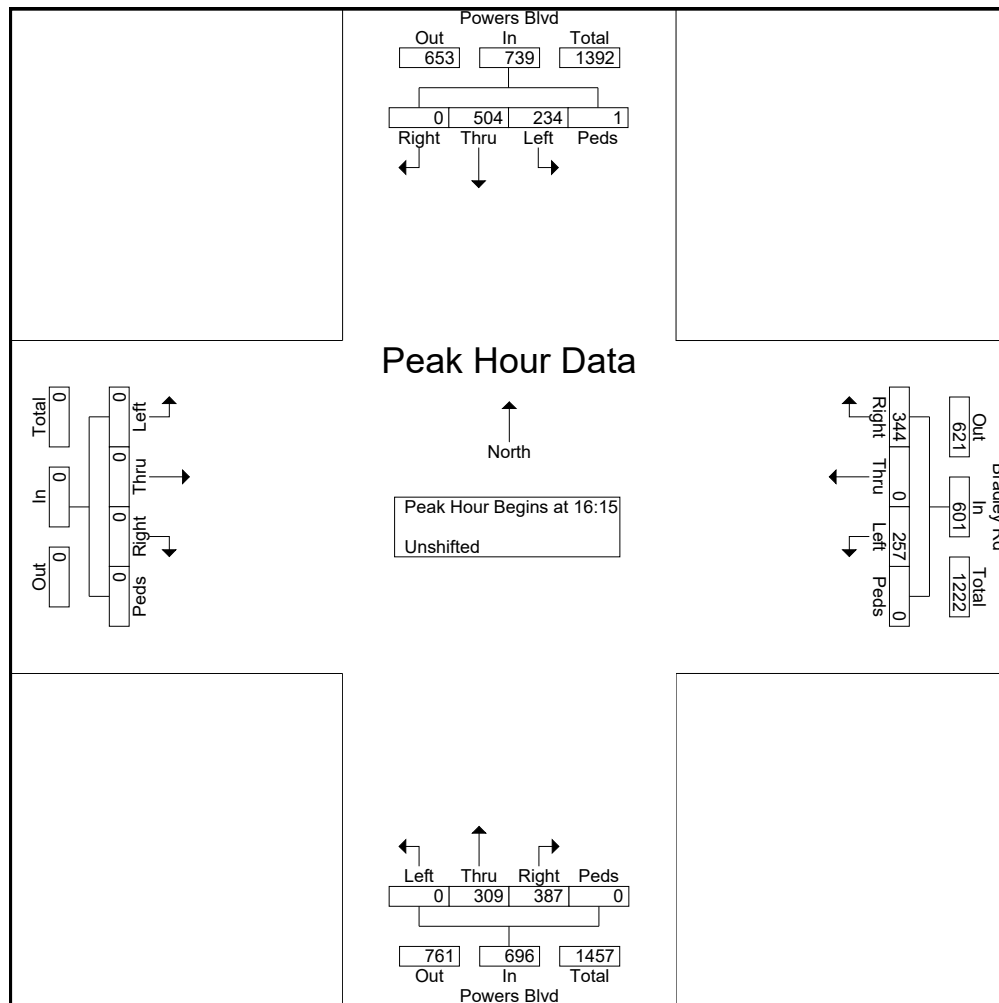
**Groups Printed- Unshifted**

	<b>Powers Blvd Southbound</b>					<b>Bradley Rd Westbound</b>					<b>Powers Blvd Northbound</b>					<b>Eastbound</b>					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
16:00	82	119	0	0	201	55	1	100	0	156	0	75	70	0	145	0	0	0	0	0	502
16:15	66	121	0	0	187	63	0	90	0	153	0	55	115	0	170	0	0	0	0	0	510
16:30	64	122	0	0	186	65	0	95	0	160	0	81	80	0	161	0	0	0	0	0	507
16:45	45	124	0	1	170	64	0	95	0	159	0	66	103	0	169	0	0	0	0	0	498
Total	257	486	0	1	744	247	1	380	0	628	0	277	368	0	645	0	0	0	0	0	2017
17:00	59	137	0	0	196	65	0	64	0	129	0	107	89	0	196	0	0	0	0	0	521
17:15	78	125	0	0	203	52	0	58	0	110	0	77	97	0	174	0	0	0	0	0	487
17:30	55	109	0	0	164	54	0	46	0	100	0	80	78	0	158	0	0	0	0	0	422
17:45	57	116	0	0	173	49	0	52	0	101	0	82	81	0	163	0	0	0	0	0	437
Total	249	487	0	0	736	220	0	220	0	440	0	346	345	0	691	0	0	0	0	0	1867



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	Powers Blvd Southbound					Bradley Rd Westbound					Powers Blvd Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:15																					
16:15	66	121	0	0	187	63	0	90	0	153	0	55	115	0	170	0	0	0	0	0	510
16:30	64	122	0	0	186	65	0	95	0	160	0	81	80	0	161	0	0	0	0	0	507
16:45	45	124	0	1	170	64	0	95	0	159	0	66	103	0	169	0	0	0	0	0	498
17:00	59	137	0	0	196	65	0	64	0	129	0	107	89	0	196	0	0	0	0	0	521
Total Volume	234	504	0	1	739	257	0	344	0	601	0	309	387	0	696	0	0	0	0	0	2036
% App. Total	31.7	68.2	0	0.1		42.8	0	57.2	0		0	44.4	55.6	0		0	0	0	0		
PHF	.886	.920	.000	.250	.943	.988	.000	.905	.000	.939	.000	.722	.841	.000	.888	.000	.000	.000	.000	.000	.977



# LSC Transportation Consultants, Inc.

545 E Pikes Peak Ave, Suite 210

Colorado Springs, CO 80905

719-633-2868

File Name : Marksheffel Rd - Bradley Rd AM

Site Code : 184690

Start Date : 10/16/2018

Page No : 1

## Groups Printed- Unshifted

	Marksheffel Rd Southbound				Bradley Rd Westbound				Marksheffel Rd Northbound				Bradley Rd Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	2	52	59	0	5	78	7	0	12	116	16	0	47	56	6	0	456
06:45	3	48	76	0	7	88	4	0	17	101	21	0	38	54	10	0	467
Total	5	100	135	0	12	166	11	0	29	217	37	0	85	110	16	0	923
07:00	3	36	66	0	12	94	10	0	32	124	31	0	48	69	4	0	529
07:15	6	37	71	0	6	105	6	1	40	91	18	0	65	72	6	0	524
07:30	2	59	72	0	7	71	11	0	16	91	22	0	54	51	8	0	464
07:45	3	49	56	0	4	47	3	0	22	94	9	0	57	59	10	0	413
Total	14	181	265	0	29	317	30	1	110	400	80	0	224	251	28	0	1930
08:00	4	25	48	0	4	54	5	0	14	68	6	0	31	23	8	0	290
08:15	2	43	80	0	9	52	1	0	13	59	2	0	38	30	8	0	337
Grand Total	25	349	528	0	54	589	47	1	166	744	125	0	378	414	60	0	3480
Apprch %	2.8	38.7	58.5	0	7.8	85.2	6.8	0.1	16	71.9	12.1	0	44.4	48.6	7	0	
Total %	0.7	10	15.2	0	1.6	16.9	1.4	0	4.8	21.4	3.6	0	10.9	11.9	1.7	0	

# LSC Transportation Consultants, Inc.

545 E Pikes Peak Ave, Suite 210  
Colorado Springs, CO 80905  
719-633-2868

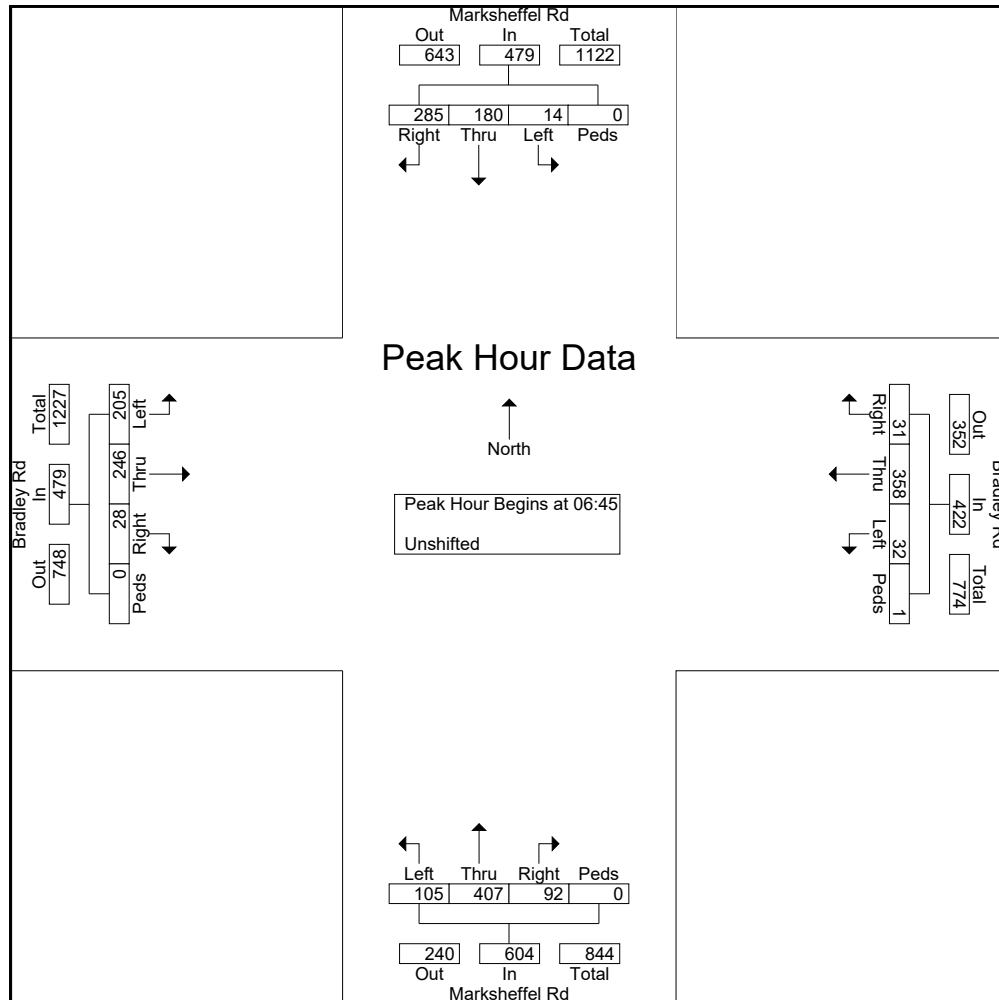
File Name : Marksheffel Rd - Bradley Rd AM

Site Code : 184690

Start Date : 10/16/2018

Page No : 2

	Marksheffel Rd Southbound					Bradley Rd Westbound					Marksheffel Rd Northbound					Bradley Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:45																					
06:45	3	48	76	0	127	7	88	4	0	99	17	101	21	0	139	38	54	10	0	102	467
07:00	3	36	66	0	105	12	94	10	0	116	32	124	31	0	187	48	69	4	0	121	529
07:15	6	37	71	0	114	6	105	6	1	118	40	91	18	0	149	65	72	6	0	143	524
07:30	2	59	72	0	133	7	71	11	0	89	16	91	22	0	129	54	51	8	0	113	464
Total Volume	14	180	285	0	479	32	358	31	1	422	105	407	92	0	604	205	246	28	0	479	1984
% App. Total	2.9	37.6	59.5	0		7.6	84.8	7.3	0.2		17.4	67.4	15.2	0		42.8	51.4	5.8	0		
PHF	.583	.763	.938	.000	.900	.667	.852	.705	.250	.894	.656	.821	.742	.000	.807	.788	.854	.700	.000	.837	.938



# LSC Transportation Consultants, Inc.

545 E Pikes Peak Ave, Suite 210

Colorado Springs, CO 80905

719-633-2868

File Name : Marksheffel Rd - Bradley Rd PM

Site Code : 184960

Start Date : 10/16/2018

Page No : 1

## Groups Printed- Unshifted

	Marksheffel Rd Southbound				Bradley Rd Westbound				Marksheffel Rd Northbound				Bradlet Rd Eastbound				Int. Total
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
16:00	3	82	46	0	14	50	9	0	18	64	8	0	87	63	21	0	465
16:15	5	90	46	1	23	75	4	0	8	57	5	0	77	78	18	0	487
16:30	6	89	51	1	15	59	3	0	11	73	10	0	79	76	16	0	489
16:45	4	98	53	0	8	74	5	0	9	57	9	0	91	67	17	0	492
Total	18	359	196	2	60	258	21	0	46	251	32	0	334	284	72	0	1933
17:00	3	82	60	0	15	81	2	0	10	77	6	0	69	83	10	0	498
17:15	6	96	62	0	13	50	3	0	12	87	8	0	87	68	19	0	511
17:30	4	70	49	0	11	53	6	0	11	65	12	0	71	95	24	0	471
17:45	6	79	31	0	8	37	3	0	13	44	6	0	63	71	16	0	377
Total	19	327	202	0	47	221	14	0	46	273	32	0	290	317	69	0	1857
Grand Total	37	686	398	2	107	479	35	0	92	524	64	0	624	601	141	0	3790
Apprch %	3.3	61.1	35.4	0.2	17.2	77.1	5.6	0	13.5	77.1	9.4	0	45.7	44	10.3	0	
Total %	1	18.1	10.5	0.1	2.8	12.6	0.9	0	2.4	13.8	1.7	0	16.5	15.9	3.7	0	

# LSC Transportation Consultants, Inc.

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Colorado Springs, CO 80905  
719-633-2868

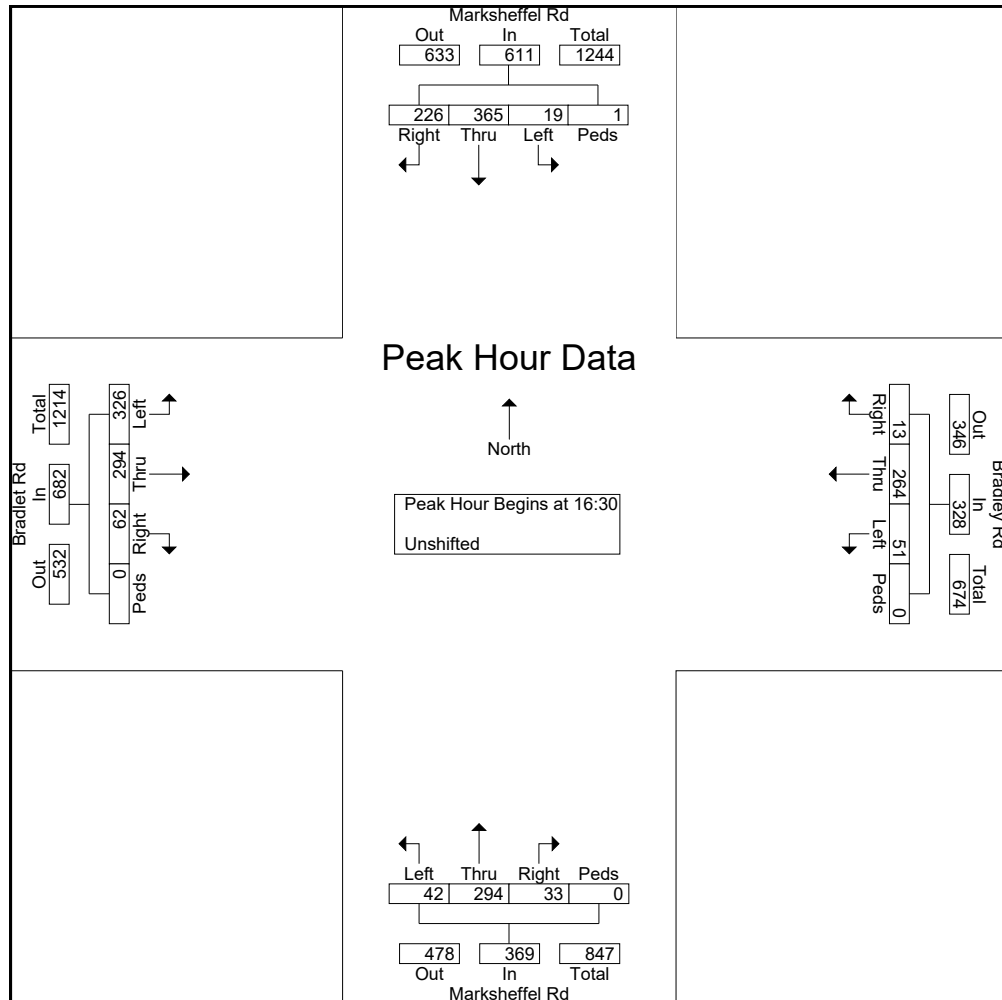
File Name : Marksheffel Rd - Bradley Rd PM

Site Code : 184960

Start Date : 10/16/2018

Page No : 2

	Marksheffel Rd Southbound					Bradley Rd Westbound					Marksheffel Rd Northbound					Bradlet Rd Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:30																					
16:30	6	89	51	1	147	15	59	3	0	77	11	73	10	0	94	79	76	16	0	171	489
16:45	4	98	53	0	155	8	74	5	0	87	9	57	9	0	75	91	67	17	0	175	492
17:00	3	82	60	0	145	15	81	2	0	98	10	77	6	0	93	69	83	10	0	162	498
17:15	6	96	62	0	164	13	50	3	0	66	12	87	8	0	107	87	68	19	0	174	511
Total Volume	19	365	226	1	611	51	264	13	0	328	42	294	33	0	369	326	294	62	0	682	1990
% App. Total	3.1	59.7	37	0.2		15.5	80.5	4	0		11.4	79.7	8.9	0		47.8	43.1	9.1	0		
PHF	.792	.931	.911	.250	.931	.850	.815	.650	.000	.837	.875	.845	.825	.000	.862	.896	.886	.816	.000	.974	.974









# Levels of Service

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Volume  
1: Powers & Bradley Rd.

Existing Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	284	439	517	232	282	289
Future Volume (vph)	284	439	517	232	282	289
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	299	462	562	252	307	314
Shared Lane Traffic (%)						
Lane Group Flow (vph)	299	462	562	252	307	314
Intersection Summary						

Timings  
1: Powers & Bradley Rd.

Existing Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	284	439	517	232	282	289
Future Volume (vph)	284	439	517	232	282	289
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	60.0	60.0	20.0	80.0
Total Split (%)	20.0%	20.0%	60.0%	60.0%	20.0%	80.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None
Act Effect Green (s)	10.8	10.8	15.3	15.3	15.2	35.6
Actuated g/C Ratio	0.19	0.19	0.27	0.27	0.27	0.63
v/c Ratio	0.45	0.68	0.58	0.41	0.65	0.14
Control Delay	23.0	8.5	20.7	5.0	28.6	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	8.5	20.7	5.0	28.6	4.7
LOS	C	A	C	A	C	A
Approach Delay	14.2		15.8			16.5
Approach LOS	B		B			B

Intersection Summary













Cycle Length: 100  
 Actuated Cycle Length: 56.5  
 Natural Cycle: 45  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.68  
 Intersection Signal Delay: 15.5  
 Intersection LOS: B  
 Intersection Capacity Utilization 50.5%  
 ICU Level of Service A  
 Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.



























Volume  
101: Marksheffel Rd & Bradley Rd

Existing Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	205	246	28	32	358	31	105	407	92	14	180	285
Future Volume (vph)	205	246	28	32	358	31	105	407	92	14	180	285
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.92	0.92	0.92	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	236	283	32	35	393	34	114	442	100	16	207	328
Shared Lane Traffic (%)												
Lane Group Flow (vph)	236	283	32	35	393	34	114	442	100	16	207	328
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

Existing Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	205	246	28	32	358	31	105	407	92	14	180	285
Future Volume (vph)	205	246	28	32	358	31	105	407	92	14	180	285
Turn Type	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases		4			8			2			6	
Permitted Phases	4		Free	8		Free	2		Free	6		Free
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	40.0	40.0		40.0	40.0		50.0	50.0		50.0	50.0	
Total Split (%)	44.4%	44.4%		44.4%	44.4%		55.6%	55.6%		55.6%	55.6%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)	25.1	25.1	80.7	25.1	25.1	80.7	45.5	45.5	80.7	45.5	45.5	80.7
Actuated g/C Ratio	0.31	0.31	1.00	0.31	0.31	1.00	0.56	0.56	1.00	0.56	0.56	1.00
v/c Ratio	0.86	0.26	0.02	0.10	0.36	0.02	0.17	0.22	0.06	0.03	0.10	0.21
Control Delay	54.4	20.6	0.0	19.1	21.7	0.0	11.6	10.5	0.1	11.0	9.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.4	20.6	0.0	19.1	21.7	0.0	11.6	10.5	0.1	11.0	9.9	0.3
LOS	D	C	A	B	C	A	B	B	A	B	A	A
Approach Delay		33.9			19.9			9.1			4.2	
Approach LOS		C			B			A			A	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 80.7

Natural Cycle: 45

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 16.3

Intersection LOS: B

Intersection Capacity Utilization 52.5%

ICU Level of Service A







Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd


















Volume  
1: Powers & Bradley Rd.

Existing Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	257	344	309	387	234	504
Future Volume (vph)	257	344	309	387	234	504
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.89	0.89	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	279	374	347	435	249	536
Shared Lane Traffic (%)						
Lane Group Flow (vph)	279	374	347	435	249	536
Intersection Summary						

Timings  
1: Powers & Bradley Rd.

Existing Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 			 
Traffic Volume (vph)	257	344	309	387	234	504
Future Volume (vph)	257	344	309	387	234	504
Turn Type	Prot	Perm	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phase	8	8	2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	20.0	20.0	61.0	61.0	19.0	80.0
Total Split (%)	20.0%	20.0%	61.0%	61.0%	19.0%	80.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	None	None	None	None
Act Effect Green (s)	9.9	9.9	11.1	11.1	14.1	30.2
Actuated g/C Ratio	0.20	0.20	0.22	0.22	0.28	0.60
v/c Ratio	0.41	0.61	0.44	0.63	0.50	0.25
Control Delay	19.9	7.4	19.1	7.0	20.8	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.9	7.4	19.1	7.0	20.8	5.3
LOS	B	A	B	A	C	A
Approach Delay	12.8		12.4			10.2
Approach LOS	B		B			B

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 50.2  
 Natural Cycle: 45  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.63  
 Intersection Signal Delay: 11.7  
 Intersection LOS: B  
 Intersection Capacity Utilization 45.3%  
 ICU Level of Service A  
 Analysis Period (min) 15













Splits and Phases: 1: Powers & Bradley Rd.





























Volume  
101: Marksheffel Rd & Bradley Rd

Existing Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	326	294	62	51	264	13	42	294	33	19	365	226
Future Volume (vph)	326	294	62	51	264	13	42	294	33	19	365	226
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	354	320	67	59	303	15	49	342	38	20	392	243
Shared Lane Traffic (%)												
Lane Group Flow (vph)	354	320	67	59	303	15	49	342	38	20	392	243
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

Existing Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	326	294	62	51	264	13	42	294	33	19	365	226
Future Volume (vph)	326	294	62	51	264	13	42	294	33	19	365	226
Turn Type	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases		4			8			2			6	
Permitted Phases	4		Free	8		Free	2		Free	6		Free
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	42.0	42.0		42.0	42.0		48.0	48.0		48.0	48.0	
Total Split (%)	46.7%	46.7%		46.7%	46.7%		53.3%	53.3%		53.3%	53.3%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)	31.8	31.8	85.1	31.8	31.8	85.1	43.3	43.3	85.1	43.3	43.3	85.1
Actuated g/C Ratio	0.37	0.37	1.00	0.37	0.37	1.00	0.51	0.51	1.00	0.51	0.51	1.00
v/c Ratio	0.90	0.24	0.04	0.15	0.23	0.01	0.10	0.19	0.02	0.04	0.22	0.15
Control Delay	52.8	18.4	0.0	18.1	18.3	0.0	13.5	12.8	0.0	12.8	13.0	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.8	18.4	0.0	18.1	18.3	0.0	13.5	12.8	0.0	12.8	13.0	0.2
LOS	D	B	A	B	B	A	B	B	A	B	B	A
Approach Delay		33.2			17.5			11.7			8.2	
Approach LOS		C			B			B			A	

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 85.1

Natural Cycle: 55

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 18.9

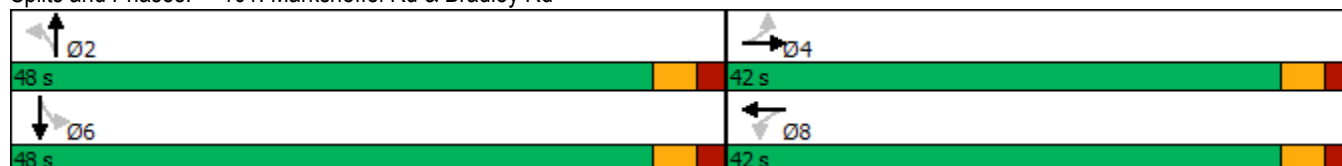
Intersection LOS: B

Intersection Capacity Utilization 55.4%

ICU Level of Service B






Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd















Volume  
1: Powers & Bradley Rd.

Short-Term Background Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	429	644	543	287	356	304
Future Volume (vph)	429	644	543	287	356	304
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	452	678	590	312	387	330
Shared Lane Traffic (%)						
Lane Group Flow (vph)	452	678	590	312	387	330
Intersection Summary						

Timings  
1: Powers & Bradley Rd.

Short-Term Background Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	429	644	543	287	356	304
Future Volume (vph)	429	644	543	287	356	304
Turn Type	Prot	Free	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	25.0		54.0	54.0	21.0	75.0
Total Split (%)	25.0%		54.0%	54.0%	21.0%	75.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0		-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0		4.0	4.0	4.0	4.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		None	None	None	None
Act Effect Green (s)	14.5	62.9	19.0	19.0	17.2	40.3
Actuated g/C Ratio	0.23	1.00	0.30	0.30	0.27	0.64
v/c Ratio	0.57	0.43	0.55	0.45	0.80	0.15
Control Delay	25.2	0.8	20.6	4.6	38.8	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.2	0.8	20.6	4.6	38.8	4.9
LOS	C	A	C	A	D	A
Approach Delay	10.6		15.1			23.2
Approach LOS	B		B			C

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 62.9  
 Natural Cycle: 45  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.80  
 Intersection Signal Delay: 15.3  
 Intersection LOS: B  
 Intersection Capacity Utilization 57.0%  
 ICU Level of Service B  
 Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.



Volume  
2: Legacy Hill Dr & Bradley Rd.

Short-Term Background Traffic  
AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Volume (vph)	559	84	40	759	314	89
Future Volume (vph)	559	84	40	759	314	89
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.94	0.85	0.85	0.95	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	595	99	47	799	369	105
Shared Lane Traffic (%)						
Lane Group Flow (vph)	595	99	47	799	369	105
Intersection Summary						

Timings  
2: Legacy Hill Dr & Bradley Rd.

Short-Term Background Traffic  
AM Peak Hour

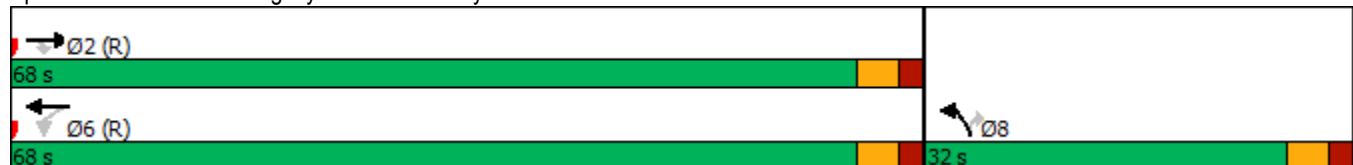
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘	↑
Traffic Volume (vph)	559	84	40	759	314	89
Future Volume (vph)	559	84	40	759	314	89
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	68.0	68.0	68.0	68.0	32.0	32.0
Total Split (%)	68.0%	68.0%	68.0%	68.0%	32.0%	32.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effect Green (s)	66.8	66.8	66.8	66.8	25.2	25.2
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.25	0.25
v/c Ratio	0.25	0.09	0.09	0.34	0.83	0.22
Control Delay	7.3	1.6	7.3	8.0	51.5	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	1.6	7.3	8.0	51.5	6.8
LOS	A	A	A	A	D	A
Approach Delay	6.5			7.9	41.6	
Approach LOS	A			A	D	

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 40  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 15.4  
 Intersection Capacity Utilization 47.0%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service A

Splits and Phases: 2: Legacy Hill Dr & Bradley Rd.

















Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	629	19	0	799	0	33
Future Vol, veh/h	629	19	0	799	0	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	500	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	85	85	95	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	669	22	0	841	0	39
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	335
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	661
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	661
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		10.8		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	661	-	-	-		
HCM Lane V/C Ratio	0.059	-	-	-		
HCM Control Delay (s)	10.8	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		

Volume  
101: Marksheffel Rd & Bradley Rd

Short-Term Background Traffic  
AM Peak Hour

























												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	302	276	46	34	382	33	116	428	97	15	189	329
Future Volume (vph)	302	276	46	34	382	33	116	428	97	15	189	329
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.92	0.92	0.92	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	347	317	53	37	420	36	126	465	105	17	217	378
Shared Lane Traffic (%)												
Lane Group Flow (vph)	347	317	53	37	420	36	126	465	105	17	217	378
Intersection Summary												

# Timings

## 101: Marksheffel Rd & Bradley Rd

# Short-Term Background Traffic

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	302	276	46	34	382	33	116	428	97	15	189	329
Future Volume (vph)	302	276	46	34	382	33	116	428	97	15	189	329
Turn Type	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases		4			8			2			6	
Permitted Phases	4		Free	8		Free	2		Free	6		Free
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	50.0	50.0		50.0	50.0		40.0	40.0		40.0	40.0	
Total Split (%)	55.6%	55.6%		55.6%	55.6%		44.4%	44.4%		44.4%	44.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)	34.3	34.3	80.0	34.3	34.3	80.0	35.6	35.6	80.0	35.6	35.6	80.0
Actuated g/C Ratio	0.43	0.43	1.00	0.43	0.43	1.00	0.44	0.44	1.00	0.44	0.44	1.00
v/c Ratio	0.90	0.21	0.03	0.08	0.28	0.02	0.25	0.30	0.07	0.04	0.14	0.24
Control Delay	47.7	13.9	0.0	12.7	14.6	0.0	18.6	16.7	0.1	17.1	15.7	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.7	13.9	0.0	12.7	14.6	0.0	18.6	16.7	0.1	17.1	15.7	0.4
LOS	D	B	A	B	B	A	B	B	A	B	B	A
Approach Delay		29.2			13.4			14.6			6.3	
Approach LOS		C			B			B			A	

## Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 80

Natural Cycle: 55

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.90

Intersection Signal Delay: 16.5





Intersection LOS: B

Intersection Capacity Utilization 59.1%

ICU Level of Service B






Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd

	
40 s	50 s
	
40 s	50 s


Volume  
1: Powers & Bradley Rd.

Short-Term Background Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	357	483	325	554	452	530
Future Volume (vph)	357	483	325	554	452	530
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.89	0.89	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	388	525	365	622	481	564
Shared Lane Traffic (%)						
Lane Group Flow (vph)	388	525	365	622	481	564
Intersection Summary						

Timings  
1: Powers & Bradley Rd.

Short-Term Background Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰↰	↰	↕↕	↰	↰	↕↕
Traffic Volume (vph)	357	483	325	554	452	530
Future Volume (vph)	357	483	325	554	452	530
Turn Type	Prot	Free	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	25.0		49.0	49.0	26.0	75.0
Total Split (%)	25.0%		49.0%	49.0%	26.0%	75.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		None	None	None	None
Act Effect Green (s)	12.8	66.0	16.4	16.4	21.5	43.0
Actuated g/C Ratio	0.19	1.00	0.25	0.25	0.33	0.65
v/c Ratio	0.59	0.33	0.41	0.77	0.84	0.24
Control Delay	29.0	0.6	21.9	10.4	39.0	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.0	0.6	21.9	10.4	39.0	5.2
LOS	C	A	C	B	D	A
Approach Delay	12.7		14.7			20.8
Approach LOS	B		B			C

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 66  
 Natural Cycle: 60  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.84  
 Intersection Signal Delay: 16.2  
 Intersection LOS: B  
 Intersection Capacity Utilization 67.7%  
 ICU Level of Service C  
 Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.



Volume  
2: Legacy Hill Dr & Bradley Rd.

Short-Term Background Traffic  
PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Volume (vph)	720	286	137	632	208	59
Future Volume (vph)	720	286	137	632	208	59
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.86	0.85	0.85	0.92	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	837	336	161	687	245	69
Shared Lane Traffic (%)						
Lane Group Flow (vph)	837	336	161	687	245	69
Intersection Summary						



Timings  
2: Legacy Hill Dr & Bradley Rd.

Short-Term Background Traffic  
PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘	↑
Traffic Volume (vph)	720	286	137	632	208	59
Future Volume (vph)	720	286	137	632	208	59
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	8	
Permitted Phases		2	6			8
Detector Phase	2	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	70.0	70.0	70.0	70.0	30.0	30.0
Total Split (%)	70.0%	70.0%	70.0%	70.0%	30.0%	30.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effect Green (s)	71.1	71.1	71.1	71.1	18.9	18.9
Actuated g/C Ratio	0.71	0.71	0.71	0.71	0.19	0.19
v/c Ratio	0.33	0.27	0.38	0.27	0.73	0.19
Control Delay	6.4	1.3	10.1	6.0	50.9	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.4	1.3	10.1	6.0	50.9	9.0
LOS	A	A	B	A	D	A
Approach Delay	4.9			6.8	41.7	
Approach LOS	A			A	D	

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 100  
 Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 45  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.73  
 Intersection Signal Delay: 10.6  
 Intersection Capacity Utilization 51.5%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service A













Splits and Phases: 2: Legacy Hill Dr & Bradley Rd.



Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	712	67	0	769	0	22
Future Vol, veh/h	712	67	0	769	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	500	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	85	85	92	85	85
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	828	79	0	836	0	26
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	414
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	587
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	587
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.4	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	587	-	-	-		
HCM Lane V/C Ratio	0.044	-	-	-		
HCM Control Delay (s)	11.4	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	-		

Volume  
101: Marksheffel Rd & Bradley Rd

Short-Term Background Traffic  
PM Peak Hour

























												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	401	321	77	54	297	14	64	309	35	20	384	336
Future Volume (vph)	401	321	77	54	297	14	64	309	35	20	384	336
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	436	349	84	62	341	16	74	359	41	22	413	361
Shared Lane Traffic (%)												
Lane Group Flow (vph)	436	349	84	62	341	16	74	359	41	22	413	361
Intersection Summary												

# Timings

## 101: Marksheffel Rd & Bradley Rd

# Short-Term Background Traffic

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	401	321	77	54	297	14	64	309	35	20	384	336
Future Volume (vph)	401	321	77	54	297	14	64	309	35	20	384	336
Turn Type	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases		4			8			2			6	
Permitted Phases	4		Free	8		Free	2		Free	6		Free
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	48.0	48.0		48.0	48.0		42.0	42.0		42.0	42.0	
Total Split (%)	53.3%	53.3%		53.3%	53.3%		46.7%	46.7%		46.7%	46.7%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)	39.7	39.7	86.9	39.7	39.7	86.9	37.2	37.2	86.9	37.2	37.2	86.9
Actuated g/C Ratio	0.46	0.46	1.00	0.46	0.46	1.00	0.43	0.43	1.00	0.43	0.43	1.00
v/c Ratio	0.94	0.22	0.05	0.14	0.21	0.01	0.19	0.24	0.03	0.05	0.27	0.23
Control Delay	54.5	14.3	0.1	14.2	14.3	0.0	18.7	17.1	0.0	16.6	17.5	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.5	14.3	0.1	14.2	14.3	0.0	18.7	17.1	0.0	16.6	17.5	0.3
LOS	D	B	A	B	B	A	B	B	A	B	B	A
Approach Delay		33.1			13.7			15.9			9.7	
Approach LOS		C			B			B			A	

## Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 86.9

Natural Cycle: 60

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.94

Intersection Signal Delay: 19.5





Intersection LOS: B

Intersection Capacity Utilization 61.3%

ICU Level of Service B







Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd

 Ø2	 Ø4
42 s	48 s
 Ø6	 Ø8
42 s	48 s












Volume  
1: Powers & Bradley Rd.

Short-Term Total Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	585	846	533	419	479	298
Future Volume (vph)	585	846	533	419	479	298
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	616	891	579	455	521	324
Shared Lane Traffic (%)						
Lane Group Flow (vph)	616	891	579	455	521	324
Intersection Summary						

Timings  
1: Powers & Bradley Rd.

Short-Term Total Traffic  
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	585	846	533	419	479	298
Future Volume (vph)	585	846	533	419	479	298
Turn Type	Prot	Free	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	20.0		60.0	60.0	20.0	80.0
Total Split (%)	20.0%		60.0%	60.0%	20.0%	80.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		None	None	None	None
Act Effect Green (s)	15.1	63.0	17.8	17.8	15.1	37.9
Actuated g/C Ratio	0.24	1.00	0.28	0.28	0.24	0.60
v/c Ratio	0.75	0.56	0.58	0.59	0.64	0.15
Control Delay	30.5	1.5	21.6	5.4	26.4	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	1.5	21.6	5.4	26.4	5.6
LOS	C	A	C	A	C	A
Approach Delay	13.3		14.5			18.4
Approach LOS	B		B			B

Intersection Summary

Cycle Length: 100  
 Actuated Cycle Length: 63  
 Natural Cycle: 50  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.75  
 Intersection Signal Delay: 15.0  
 Intersection LOS: B  
 Intersection Capacity Utilization 57.6%  
 ICU Level of Service B  
 Analysis Period (min) 15













Splits and Phases: 1: Powers & Bradley Rd.





























Volume  
2: Legacy Hill Dr & Bradley Rd.

Short-Term Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	259	549	89	42	894	79	329	4	95	138	1	207
Future Volume (vph)	259	549	89	42	894	79	329	4	95	138	1	207
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.85	0.94	0.85	0.85	0.95	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	305	584	105	49	941	93	387	5	112	162	1	244
Shared Lane Traffic (%)												
Lane Group Flow (vph)	305	584	105	49	941	93	387	5	112	162	1	244
Intersection Summary												

# Timings 2: Legacy Hill Dr & Bradley Rd.

Short-Term Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	259	549	89	42	894	79	329	4	95	138	1	207
Future Volume (vph)	259	549	89	42	894	79	329	4	95	138	1	207
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
Total Split (s)	15.0	45.0	45.0	10.0	40.0	40.0	22.0	23.0	23.0	22.0	23.0	23.0
Total Split (%)	15.0%	45.0%	45.0%	10.0%	40.0%	40.0%	22.0%	23.0%	23.0%	22.0%	23.0%	23.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	12.9	48.3	48.3	45.4	39.4	39.4	31.5	15.5	15.5	22.9	10.7	10.7
Actuated g/C Ratio	0.13	0.48	0.48	0.45	0.39	0.39	0.32	0.16	0.16	0.23	0.11	0.11
v/c Ratio	0.69	0.34	0.13	0.12	0.68	0.13	0.88	0.02	0.31	0.44	0.01	0.78
Control Delay	51.0	18.2	2.4	12.4	29.0	2.1	50.9	34.2	7.0	28.3	35.0	32.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.0	18.2	2.4	12.4	29.0	2.1	50.9	34.2	7.0	28.3	35.0	32.2
LOS	D	B	A	B	C	A	D	C	A	C	C	C
Approach Delay		26.6			25.9			41.0			30.7	
Approach LOS		C			C			D			C	

## Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 37 (37%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 29.3

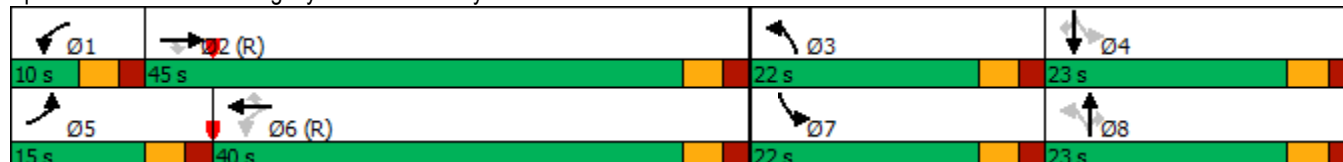
Intersection LOS: C

Intersection Capacity Utilization 69.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Legacy Hill Dr & Bradley Rd.















## Volume

## Short-Term Total Traffic

## 3: Blackmeer Dr/Waterview North RIRO Access &amp; Bradley Rd.

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	763	19	0	865	29	0	0	33	0	0	150
Future Volume (vph)	0	763	19	0	865	29	0	0	33	0	0	150
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.85	0.94	0.85	0.85	0.95	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	812	22	0	911	34	0	0	39	0	0	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	812	22	0	911	34	0	0	39	0	0	176
Intersection Summary												













HCM 6th TWSC  
3: Blackmeer Dr/Waterview North RIRO Access & Bradley Rd.

Short-Term Total Traffic  
AM Peak Hour

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗			↗			↗
Traffic Vol, veh/h	0	763	19	0	865	29	0	0	33	0	0	150
Future Vol, veh/h	0	763	19	0	865	29	0	0	33	0	0	150
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	-	-	500	-	-	500	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	94	85	85	95	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	812	22	0	911	34	0	0	39	0	0	176
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	406	-	-	456
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	594	0	0	551
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	594	-	-	551
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0			11.5			14.6		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1						
Capacity (veh/h)	594	-	-	-	-	551						
HCM Lane V/C Ratio	0.065	-	-	-	-	0.32						
HCM Control Delay (s)	11.5	-	-	-	-	14.6						
HCM Lane LOS	B	-	-	-	-	B						
HCM 95th %tile Q(veh)	0.2	-	-	-	-	1.4						






























Volume  
101: Marksheffel Rd & Bradley Rd

Short-Term Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	392	296	70	34	397	33	142	428	97	15	189	381
Future Volume (vph)	392	296	70	34	397	33	142	428	97	15	189	381
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.92	0.92	0.92	0.87	0.87	0.87
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	451	340	80	37	436	36	154	465	105	17	217	438
Shared Lane Traffic (%)												
Lane Group Flow (vph)	451	340	80	37	436	36	154	465	105	17	217	438
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

Short-Term Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 			 			 	
Traffic Volume (vph)	392	296	70	34	397	33	142	428	97	15	189	381
Future Volume (vph)	392	296	70	34	397	33	142	428	97	15	189	381
Turn Type	Prot	NA	Free	pm+pt	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free	8		Free	2		Free	6		Free
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	11.0	21.0		10.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	17.0	50.0		10.0	43.0		40.0	40.0		40.0	40.0	
Total Split (%)	17.0%	50.0%		10.0%	43.0%		40.0%	40.0%		40.0%	40.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)	12.0	25.9	76.8	19.7	14.7	76.8	35.0	35.0	76.8	35.0	35.0	76.8
Actuated g/C Ratio	0.16	0.34	1.00	0.26	0.19	1.00	0.46	0.46	1.00	0.46	0.46	1.00
v/c Ratio	0.84	0.29	0.05	0.12	0.64	0.02	0.29	0.29	0.07	0.04	0.13	0.28
Control Delay	48.0	20.5	0.1	15.0	33.2	0.0	15.9	14.1	0.1	13.3	13.0	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.0	20.5	0.1	15.0	33.2	0.0	15.9	14.1	0.1	13.3	13.0	0.4
LOS	D	C	A	B	C	A	B	B	A	B	B	A
Approach Delay		32.9			29.6			12.5			4.8	
Approach LOS		C			C			B			A	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 76.8

Natural Cycle: 55

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 20.1

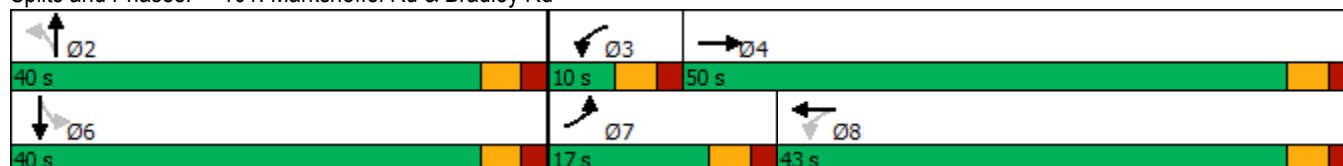
Intersection LOS: C

Intersection Capacity Utilization 54.0%

ICU Level of Service A

Analysis Period (min) 15







Splits and Phases: 101: Marksheffel Rd & Bradley Rd
















Volume  
1: Powers & Bradley Rd.

Short-Term Total Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Volume (vph)	619	724	304	814	749	495
Future Volume (vph)	619	724	304	814	749	495
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.89	0.89	0.94	0.94
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Adj. Flow (vph)	673	787	342	915	797	527
Shared Lane Traffic (%)						
Lane Group Flow (vph)	673	787	342	915	797	527
Intersection Summary						

Timings  
1: Powers & Bradley Rd.

Short-Term Total Traffic  
PM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	619	724	304	814	749	495
Future Volume (vph)	619	724	304	814	749	495
Turn Type	Prot	Free	NA	Perm	Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Detector Phase	8		2	2	1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0
Minimum Split (s)	9.0		9.0	9.0	9.0	9.0
Total Split (s)	27.0		42.0	42.0	31.0	73.0
Total Split (%)	27.0%		42.0%	42.0%	31.0%	73.0%
Yellow Time (s)	3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None		None	None	None	None
Act Effect Green (s)	21.4	98.6	37.0	37.0	25.2	67.2
Actuated g/C Ratio	0.22	1.00	0.38	0.38	0.26	0.68
v/c Ratio	0.90	0.50	0.26	1.00	0.91	0.22
Control Delay	54.8	1.1	22.3	46.0	51.5	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.8	1.1	22.3	46.0	51.5	6.2
LOS	D	A	C	D	D	A
Approach Delay	25.9		39.6			33.5
Approach LOS	C		D			C

Intersection Summary













Cycle Length: 100  
 Actuated Cycle Length: 98.6  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.00  
 Intersection Signal Delay: 32.6  
 Intersection LOS: C  
 Intersection Capacity Utilization 80.1%  
 ICU Level of Service D  
 Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd.



























Volume  
2: Legacy Hill Dr & Bradley Rd.

Short-Term Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	584	677	301	143	682	137	217	6	63	217	8	445
Future Volume (vph)	584	677	301	143	682	137	217	6	63	217	8	445
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.85	0.86	0.85	0.85	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	687	787	354	168	741	161	255	7	74	255	9	524
Shared Lane Traffic (%)												
Lane Group Flow (vph)	687	787	354	168	741	161	255	7	74	255	9	524
Intersection Summary												

# Timings 2: Legacy Hill Dr & Bradley Rd.

Short-Term Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	584	677	301	143	682	137	217	6	63	217	8	445
Future Volume (vph)	584	677	301	143	682	137	217	6	63	217	8	445
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6			8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0	10.0	23.0	23.0
Total Split (s)	28.0	47.0	47.0	10.0	29.0	29.0	27.0	21.0	21.0	22.0	16.0	16.0
Total Split (%)	28.0%	47.0%	47.0%	10.0%	29.0%	29.0%	27.0%	21.0%	21.0%	22.0%	16.0%	16.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	22.4	42.5	42.5	31.1	25.6	25.6	18.6	13.9	13.9	20.2	13.4	13.4
Actuated g/C Ratio	0.22	0.42	0.42	0.31	0.26	0.26	0.19	0.14	0.14	0.20	0.13	0.13
v/c Ratio	0.89	0.52	0.40	0.63	0.82	0.30	0.78	0.03	0.20	0.71	0.04	0.93
Control Delay	53.2	23.0	3.5	31.4	44.3	4.8	54.6	35.8	1.2	51.8	40.0	35.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.2	23.0	3.5	31.4	44.3	4.8	54.6	35.8	1.2	51.8	40.0	35.2
LOS	D	C	A	C	D	A	D	D	A	D	D	D
Approach Delay		30.5			36.4			42.4			40.7	
Approach LOS		C			D			D			D	

## Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 100

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 35.1

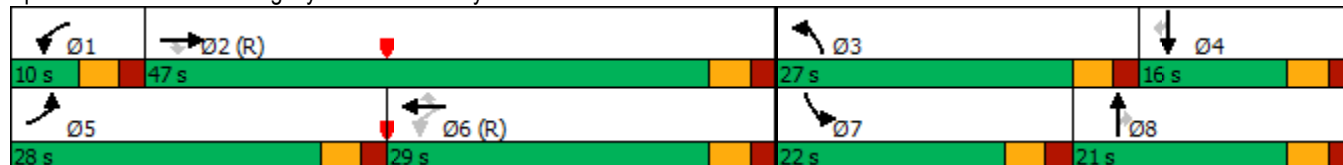
Intersection LOS: D

Intersection Capacity Utilization 70.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Legacy Hill Dr & Bradley Rd.















## Volume

## 3: Blackmeer Dr/Waterview North RIRO Access &amp; Bradley Rd.

## Short-Term Total Traffic

PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	889	67	0	871	95	0	0	22	0	0	91
Future Volume (vph)	0	889	67	0	871	95	0	0	22	0	0	91
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.85	0.86	0.85	0.85	0.92	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1034	79	0	947	112	0	0	26	0	0	107
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1034	79	0	947	112	0	0	26	0	0	107
Intersection Summary												

HCM 6th TWSC  
3: Blackmeer Dr/Waterview North RIRO Access & Bradley Rd.













Short-Term Total Traffic  
PM Peak Hour

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗			↗			↗
Traffic Vol, veh/h	0	889	67	0	871	95	0	0	22	0	0	91
Future Vol, veh/h	0	889	67	0	871	95	0	0	22	0	0	91
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	-	-	500	-	-	500	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	86	85	85	92	85	85	85	85	85	85	85
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1034	79	0	947	112	0	0	26	0	0	107
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	517	-	-	474
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	503	0	0	537
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	503	-	-	537
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0			12.5			13.4		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1						
Capacity (veh/h)	503	-	-	-	-	537						
HCM Lane V/C Ratio	0.051	-	-	-	-	0.199						
HCM Control Delay (s)	12.5	-	-	-	-	13.4						
HCM Lane LOS	B	-	-	-	-	B						
HCM 95th %tile Q(veh)	0.2	-	-	-	-	0.7						

































Volume  
101: Marksheffel Rd & Bradley Rd

Short-Term Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	501	350	125	54	328	14	109	309	35	20	384	457
Future Volume (vph)	501	350	125	54	328	14	109	309	35	20	384	457
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.92	0.92	0.87	0.87	0.87	0.86	0.86	0.86	0.93	0.93	0.93
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	545	380	136	62	377	16	127	359	41	22	413	491
Shared Lane Traffic (%)												
Lane Group Flow (vph)	545	380	136	62	377	16	127	359	41	22	413	491
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

Short-Term Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	 	 			 			 		 	 	
Traffic Volume (vph)	501	350	125	54	328	14	109	309	35	20	384	457
Future Volume (vph)	501	350	125	54	328	14	109	309	35	20	384	457
Turn Type	Prot	NA	Free	pm+pt	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases			Free	8		Free	2		Free	6		Free
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	20.0	50.0		10.0	40.0		40.0	40.0		40.0	40.0	
Total Split (%)	20.0%	50.0%		10.0%	40.0%		40.0%	40.0%		40.0%	40.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)	15.0	25.6	78.6	18.5	13.5	78.6	35.0	35.0	78.6	35.0	35.0	78.6
Actuated g/C Ratio	0.19	0.33	1.00	0.24	0.17	1.00	0.45	0.45	1.00	0.45	0.45	1.00
v/c Ratio	0.83	0.33	0.09	0.22	0.62	0.01	0.31	0.23	0.03	0.05	0.26	0.31
Control Delay	43.9	21.6	0.1	16.7	34.8	0.0	17.4	14.3	0.0	13.8	14.6	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.9	21.6	0.1	16.7	34.8	0.0	17.4	14.3	0.0	13.8	14.6	0.5
LOS	D	C	A	B	C	A	B	B	A	B	B	A
Approach Delay		30.3			31.1			14.0			7.1	
Approach LOS		C			C			B			A	

Intersection Summary

Cycle Length: 100

Actuated Cycle Length: 78.6

Natural Cycle: 60

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 20.3

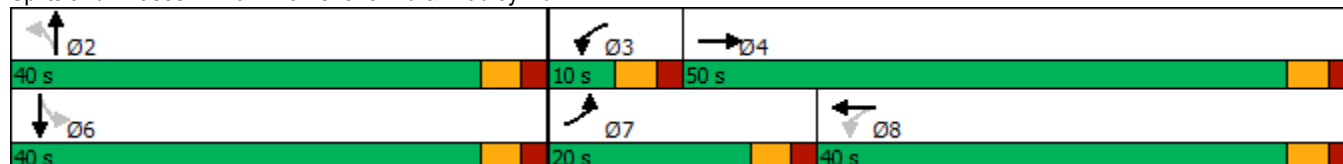
Intersection LOS: C

Intersection Capacity Utilization 56.7%

ICU Level of Service B













Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd



























Volume  
1: Powers & Bradley Rd

2040 Background Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	26	142	75	535	354	896	100	1309	246	448	755	19
Future Volume (vph)	26	142	75	535	354	896	100	1309	246	448	755	19
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	27	149	79	552	365	924	103	1349	254	462	778	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	149	79	552	365	924	103	1349	254	462	778	20
Intersection Summary												

Timings  
1: Powers & Bradley Rd

2040 Background Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	142	75	535	354	896	100	1309	246	448	755	19
Future Volume (vph)	26	142	75	535	354	896	100	1309	246	448	755	19
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	10.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0		9.0	9.0		9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	15.0	20.0		32.0	37.0		15.0	55.0	55.0	23.0	63.0	63.0
Total Split (%)	11.5%	15.4%		24.6%	28.5%		11.5%	42.3%	42.3%	17.7%	48.5%	48.5%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-2.0	-1.0		-1.0	-2.0	0.0	-2.0	-2.0	-1.0
Total Lost Time (s)	4.0	4.0		3.0	4.0		4.0	3.0	5.0	3.0	3.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	None	None	C-Max	None	None
Act Effect Green (s)	20.2	12.3	130.0	26.7	34.5	130.0	10.2	52.0	50.0	26.0	66.8	65.8
Actuated g/C Ratio	0.16	0.09	1.00	0.21	0.27	1.00	0.08	0.40	0.38	0.20	0.51	0.51
v/c Ratio	0.13	0.45	0.05	0.78	0.39	0.58	0.38	0.95	0.35	0.67	0.43	0.02
Control Delay	32.1	59.7	0.1	55.4	38.5	2.8	60.8	53.2	9.6	54.5	21.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.1	59.7	0.1	55.4	38.5	2.8	60.8	53.2	9.6	54.5	21.4	0.1
LOS	C	E	A	E	D	A	E	D	A	D	C	A
Approach Delay		38.3			25.7			47.1			33.2	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 125 (96%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 35.4

Intersection LOS: D

Intersection Capacity Utilization 85.9%

ICU Level of Service E













Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd



























Volume  
2: Legacy Dr & Bradley Rd

2040 Background Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	5	754	77	38	1571	57	214	5	86	12	5	2
Future Volume (vph)	5	754	77	38	1571	57	214	5	86	12	5	2
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.97	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	5	794	81	40	1620	60	225	5	91	13	5	2
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	794	81	40	1620	60	225	5	91	13	5	2
Intersection Summary												

# Timings 2: Legacy Dr & Bradley Rd

2040 Background Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	754	77	38	1571	57	214	5	86	12	5	2
Future Volume (vph)	5	754	77	38	1571	57	214	5	86	12	5	2
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6			8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	15.0	70.0	70.0	10.0	65.0	65.0	30.0	20.0	20.0	30.0	20.0	20.0
Total Split (%)	11.5%	53.8%	53.8%	7.7%	50.0%	50.0%	23.1%	15.4%	15.4%	23.1%	15.4%	15.4%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	7.5	95.2	95.2	101.4	101.4	101.4	15.3	13.0	13.0	7.0	7.0	7.0
Actuated g/C Ratio	0.06	0.73	0.73	0.78	0.78	0.78	0.12	0.10	0.10	0.05	0.05	0.05
v/c Ratio	0.03	0.31	0.07	0.08	0.59	0.05	0.56	0.03	0.32	0.07	0.05	0.01
Control Delay	32.4	2.8	0.2	6.4	9.2	0.5	59.2	52.0	4.2	58.9	59.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	2.8	0.2	6.4	9.2	0.5	59.2	52.0	4.2	58.9	59.2	0.0
LOS	C	A	A	A	A	A	E	D	A	E	E	A
Approach Delay		2.7			8.9			43.5			53.1	
Approach LOS		A			A			D			D	

## Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 102 (78%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.59

Intersection Signal Delay: 11.1

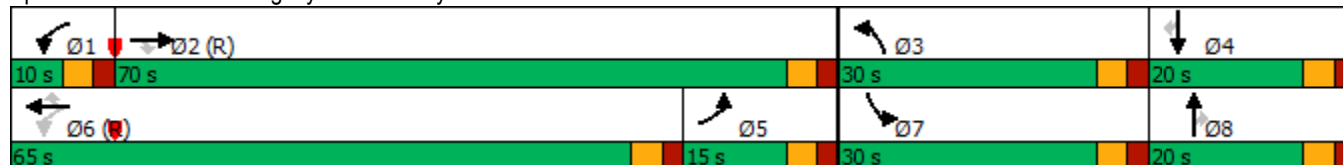
Intersection LOS: B

Intersection Capacity Utilization 63.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Legacy Dr & Bradley Rd





Volume  
3: Blackmer St & Bradley Rd













2040 Background Traffic  
AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Volume (vph)	835	16	0	1666	0	31
Future Volume (vph)	835	16	0	1666	0	31
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.98	0.95	0.95	0.97	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	852	17	0	1718	0	33
Shared Lane Traffic (%)						
Lane Group Flow (vph)	852	17	0	1718	0	33
Intersection Summary						

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	835	16	0	1666	0	31
Future Vol, veh/h	835	16	0	1666	0	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	98	95	95	97	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	852	17	0	1718	0	33
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	426
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	577
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	577
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		11.6	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	577	-	-	-		
HCM Lane V/C Ratio	0.057	-	-	-		
HCM Control Delay (s)	11.6	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.2	-	-	-		

























Volume  
101: Marksheffel Rd & Bradley Rd

2040 Background Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	394	347	127	95	502	285	163	600	50	140	275	241
Future Volume (vph)	394	347	127	95	502	285	163	600	50	140	275	241
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	415	365	134	100	528	300	172	632	53	147	289	254
Shared Lane Traffic (%)												
Lane Group Flow (vph)	415	365	134	100	528	300	172	632	53	147	289	254
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

2040 Background Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	394	347	127	95	502	285	163	600	50	140	275	241
Future Volume (vph)	394	347	127	95	502	285	163	600	50	140	275	241
Turn Type	Prot	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			Free	6		Free	8		Free	4		Free
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		5.0	4.0		5.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0		10.0	21.0		10.0	21.0	
Total Split (s)	27.0	64.4		10.0	47.4		15.0	40.6		15.0	40.6	
Total Split (%)	20.8%	49.5%		7.7%	36.5%		11.5%	31.2%		11.5%	31.2%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max		None	C-Max		None	Max		None	Max	
Act Effect Green (s)	19.9	59.4	130.0	49.5	44.5	130.0	45.8	35.9	130.0	45.4	35.7	130.0
Actuated g/C Ratio	0.15	0.46	1.00	0.38	0.34	1.00	0.35	0.28	1.00	0.35	0.27	1.00
v/c Ratio	0.79	0.23	0.08	0.25	0.44	0.19	0.43	0.65	0.03	0.60	0.30	0.16
Control Delay	64.5	21.8	0.1	19.4	34.8	0.3	31.3	45.2	0.0	37.6	38.3	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.5	21.8	0.1	19.4	34.8	0.3	31.3	45.2	0.0	37.6	38.3	0.2
LOS	E	C	A	B	C	A	C	D	A	D	D	A
Approach Delay		38.0			22.0			39.6			24.1	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.79

Intersection Signal Delay: 31.2

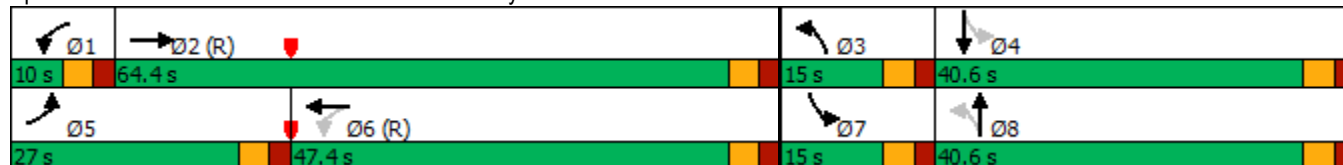
Intersection LOS: C

Intersection Capacity Utilization 66.1%

ICU Level of Service C













Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd



























Volume  
1: Powers & Bradley Rd

2040 Background Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	71	285	210	178	305	525	175	667	406	466	1231	110
Future Volume (vph)	71	285	210	178	305	525	175	667	406	466	1231	110
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	75	300	221	184	314	541	180	688	419	480	1269	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	300	221	184	314	541	180	688	419	480	1269	113
Intersection Summary												

Timings  
1: Powers & Bradley Rd

2040 Background Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	285	210	178	305	525	175	667	406	466	1231	110
Future Volume (vph)	71	285	210	178	305	525	175	667	406	466	1231	110
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0		9.0	9.0		9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	10.0	28.0		32.0	50.0		15.0	44.0	44.0	26.0	55.0	55.0
Total Split (%)	7.7%	21.5%		24.6%	38.5%		11.5%	33.8%	33.8%	20.0%	42.3%	42.3%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	0.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	5.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	Max	Max	C-Max	Max	Max
Act Effect Green (s)	23.3	17.3	130.0	13.3	26.6	130.0	13.1	40.0	39.0	43.4	70.3	70.3
Actuated g/C Ratio	0.18	0.13	1.00	0.10	0.20	1.00	0.10	0.31	0.30	0.33	0.54	0.54
v/c Ratio	0.34	0.64	0.14	0.52	0.43	0.34	0.52	0.63	0.55	0.42	0.66	0.12
Control Delay	40.4	59.5	0.2	54.5	44.5	1.0	60.6	41.8	6.1	36.0	24.9	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.4	59.5	0.2	54.5	44.5	1.0	60.6	41.8	6.1	36.0	24.9	1.7
LOS	D	E	A	D	D	A	E	D	A	D	C	A
Approach Delay		35.1			23.6			32.8			26.4	
Approach LOS		D			C			C			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 1 (1%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.66

Intersection Signal Delay: 28.6

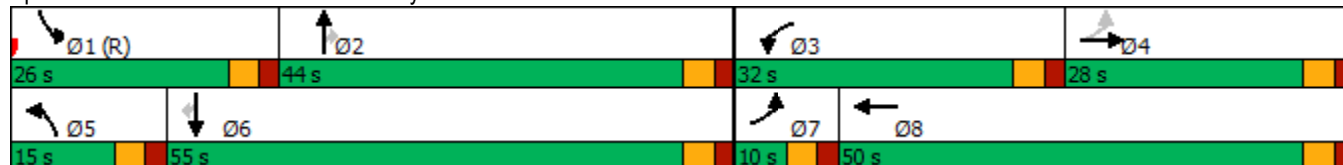
Intersection LOS: C

Intersection Capacity Utilization 65.3%

ICU Level of Service C













Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd



Volume  
2: Legacy Dr & Bradley Rd

























2040 Background Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	2	872	283	130	844	12	158	5	56	52	5	5
Future Volume (vph)	2	872	283	130	844	12	158	5	56	52	5	5
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	2	918	298	137	888	13	166	5	59	55	5	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	2	918	298	137	888	13	166	5	59	55	5	5
Intersection Summary												



# Timings 2: Legacy Dr & Bradley Rd

2040 Background Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	872	283	130	844	12	158	5	56	52	5	5
Future Volume (vph)	2	872	283	130	844	12	158	5	56	52	5	5
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	20.0	73.0	73.0	17.0	70.0	70.0	17.0	24.0	24.0	16.0	23.0	23.0
Total Split (%)	15.4%	56.2%	56.2%	13.1%	53.8%	53.8%	13.1%	18.5%	18.5%	12.3%	17.7%	17.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	6.6	85.8	85.8	100.7	100.7	100.7	19.0	9.0	9.0	11.3	7.0	7.0
Actuated g/C Ratio	0.05	0.66	0.66	0.77	0.77	0.77	0.15	0.07	0.07	0.09	0.05	0.05
v/c Ratio	0.01	0.39	0.26	0.26	0.32	0.01	0.37	0.04	0.24	0.18	0.05	0.02
Control Delay	51.5	19.5	8.0	8.1	5.7	0.0	50.7	55.8	2.4	50.2	59.2	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	51.5	19.5	8.0	8.1	5.7	0.0	50.7	55.8	2.4	50.2	59.2	0.2
LOS	D	B	A	A	A	A	D	E	A	D	E	A
Approach Delay		16.8			6.0			38.4			47.1	
Approach LOS		B			A			D			D	

## Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 67 (52%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 15.1

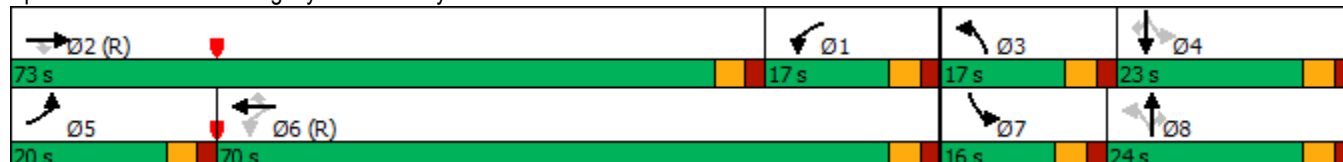
Intersection LOS: B

Intersection Capacity Utilization 52.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 2: Legacy Dr & Bradley Rd



Volume  
3: Blackmer St & Bradley Rd













2040 Background Traffic  
PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Volume (vph)	926	54	0	986	0	20
Future Volume (vph)	926	54	0	986	0	20
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Adj. Flow (vph)	975	57	0	1038	0	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	975	57	0	1038	0	21
Intersection Summary						

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↑↑		↗
Traffic Vol, veh/h	926	54	0	986	0	20
Future Vol, veh/h	926	54	0	986	0	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	975	57	0	1038	0	21
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	488
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.32
Pot Cap-1 Maneuver	-	-	0	-	0	526
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	526
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		12.1		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	526	-	-	-		
HCM Lane V/C Ratio	0.04	-	-	-		
HCM Control Delay (s)	12.1	-	-	-		
HCM Lane LOS	B	-	-	-		
HCM 95th %tile Q(veh)	0.1	-	-	-		

























Volume  
101: Marksheffel Rd & Bradley Rd

2040 Background Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	470	646	206	195	520	215	133	500	100	300	650	363
Future Volume (vph)	470	646	206	195	520	215	133	500	100	300	650	363
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	495	680	217	205	547	226	140	526	105	316	684	382
Shared Lane Traffic (%)												
Lane Group Flow (vph)	495	680	217	205	547	226	140	526	105	316	684	382
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

2040 Background Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	470	646	206	195	520	215	133	500	100	300	650	363
Future Volume (vph)	470	646	206	195	520	215	133	500	100	300	650	363
Turn Type	Prot	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			Free	6		Free	8		Free	4		Free
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		5.0	4.0		5.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0		10.0	21.0		10.0	21.0	
Total Split (s)	35.0	55.0		15.0	35.0		30.0	30.0		30.0	30.0	
Total Split (%)	26.9%	42.3%		11.5%	26.9%		23.1%	23.1%		23.1%	23.1%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max		None	C-Max		None	Max		None	Max	
Act Effect Green (s)	23.9	50.1	130.0	46.0	36.1	130.0	40.9	28.6	130.0	55.0	37.8	130.0
Actuated g/C Ratio	0.18	0.39	1.00	0.35	0.28	1.00	0.31	0.22	1.00	0.42	0.29	1.00
v/c Ratio	0.78	0.50	0.14	0.62	0.56	0.14	0.51	0.68	0.07	0.81	0.67	0.24
Control Delay	59.7	32.0	0.2	31.3	43.5	0.2	31.5	52.3	0.1	44.1	45.0	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	59.7	32.0	0.2	31.3	43.5	0.2	31.5	52.3	0.1	44.1	45.0	0.4
LOS	E	C	A	C	D	A	C	D	A	D	D	A
Approach Delay		36.9			30.9			41.4			32.4	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 35.0

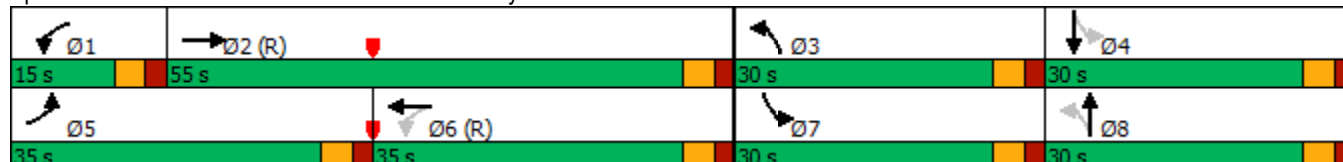
Intersection LOS: D

Intersection Capacity Utilization 75.8%

ICU Level of Service D













Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd



























Volume  
1: Powers & Bradley Rd

2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	26	182	75	719	400	1034	100	1292	386	533	744	19
Future Volume (vph)	26	182	75	719	400	1034	100	1292	386	533	744	19
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	27	192	79	741	412	1066	103	1332	398	549	767	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	192	79	741	412	1066	103	1332	398	549	767	20
Intersection Summary												

Timings  
1: Powers & Bradley Rd

2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	182	75	719	400	1034	100	1292	386	533	744	19
Future Volume (vph)	26	182	75	719	400	1034	100	1292	386	533	744	19
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	10.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	15.0		9.0	9.0		9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	14.0	19.0		32.0	37.0		15.0	54.0	54.0	25.0	64.0	64.0
Total Split (%)	10.8%	14.6%		24.6%	28.5%		11.5%	41.5%	41.5%	19.2%	49.2%	49.2%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-2.0	-1.0		-1.0	-2.0	0.0	-2.0	-2.0	-1.0
Total Lost Time (s)	4.0	4.0		3.0	4.0		4.0	3.0	5.0	3.0	3.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	None	None	C-Max	None	None
Act Effect Green (s)	21.1	13.2	130.0	29.0	37.7	130.0	9.9	51.0	49.0	23.8	63.9	62.9
Actuated g/C Ratio	0.16	0.10	1.00	0.22	0.29	1.00	0.08	0.39	0.38	0.18	0.49	0.48
v/c Ratio	0.13	0.53	0.05	0.97	0.40	0.67	0.39	0.96	0.52	0.88	0.44	0.02
Control Delay	31.2	60.9	0.1	79.7	41.6	5.4	61.5	55.0	11.6	67.7	22.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.2	60.9	0.1	79.7	41.6	5.4	61.5	55.0	11.6	67.7	22.9	0.1
LOS	C	E	A	E	D	A	E	D	B	E	C	A
Approach Delay		42.1			36.9			45.9			41.0	
Approach LOS		D			D			D			D	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 125 (96%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 90

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 41.1

Intersection LOS: D

Intersection Capacity Utilization 93.1%

ICU Level of Service F

Analysis Period (min) 15













Splits and Phases: 1: Powers & Bradley Rd





























Volume  
2: Legacy Dr & Bradley Rd

2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	235	733	133	94	1689	156	267	18	123	157	16	196
Future Volume (vph)	235	733	133	94	1689	156	267	18	123	157	16	196
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.97	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	247	772	140	99	1741	164	281	19	129	165	17	206
Shared Lane Traffic (%)												
Lane Group Flow (vph)	247	772	140	99	1741	164	281	19	129	165	17	206
Intersection Summary												

# Timings 2: Legacy Dr & Bradley Rd

2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	733	133	94	1689	156	267	18	123	157	16	196
Future Volume (vph)	235	733	133	94	1689	156	267	18	123	157	16	196
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6			8			4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	16.0	70.0	70.0	10.0	64.0	64.0	30.0	20.0	20.0	30.0	20.0	20.0
Total Split (%)	12.3%	53.8%	53.8%	7.7%	49.2%	49.2%	23.1%	15.4%	15.4%	23.1%	15.4%	15.4%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	12.0	77.7	77.7	74.9	74.9	74.9	16.9	14.5	14.5	12.6	10.2	10.2
Actuated g/C Ratio	0.09	0.60	0.60	0.58	0.58	0.58	0.13	0.11	0.11	0.10	0.08	0.08
v/c Ratio	0.78	0.37	0.14	0.26	0.85	0.17	0.63	0.09	0.43	0.50	0.12	0.70
Control Delay	49.5	7.0	0.6	15.8	29.4	6.7	59.8	49.9	10.2	60.5	54.8	23.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	49.5	7.0	0.6	15.8	29.4	6.7	59.8	49.9	10.2	60.5	54.8	23.6
LOS	D	A	A	B	C	A	E	D	B	E	D	C
Approach Delay		15.3			26.9			44.4			40.7	
Approach LOS		B			C			D			D	

## Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 102 (78%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 70

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 26.7

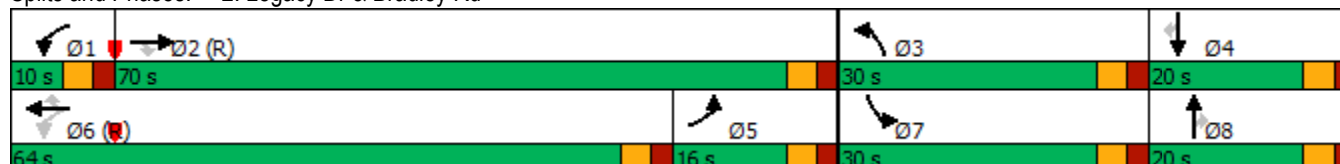
Intersection LOS: C

Intersection Capacity Utilization 77.7%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 2: Legacy Dr & Bradley Rd















## Volume

2040 Total Traffic

## 3: Blackmer St/Waterview North RIRO Access &amp; Bradley Rd

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	996	16	0	1793	29	0	0	31	0	0	146
Future Volume (vph)	0	996	16	0	1793	29	0	0	31	0	0	146
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.92	0.95	0.95	0.95	0.97	0.92	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1048	17	0	1848	32	0	0	33	0	0	154
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1048	17	0	1848	32	0	0	33	0	0	154
Intersection Summary												

Intersection

Int Delay, s/veh 1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑		↑↑	↑			↑			↑
Traffic Vol, veh/h	0	996	16	0	1793	29	0	0	31	0	0	146
Future Vol, veh/h	0	996	16	0	1793	29	0	0	31	0	0	146
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	-	-	0	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	95	95	95	97	92	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1048	17	0	1848	32	0	0	33	0	0	154

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	-	0	0	-	-	0	-	-	524	-	-	924
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	*676	0	0	271
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %		-	-		-	-			1			
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	*676	-	-	271
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	10.6	34.4
HCM LOS			B	D













Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	676	-	-	-	-	271
HCM Lane V/C Ratio	0.048	-	-	-	-	0.567
HCM Control Delay (s)	10.6	-	-	-	-	34.4
HCM Lane LOS	B	-	-	-	-	D
HCM 95th %tile Q(veh)	0.2	-	-	-	-	3.2

Notes

~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

























Volume  
101: Marksheffel Rd & Bradley Rd

2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	491	377	160	95	541	285	212	600	50	140	275	308
Future Volume (vph)	491	377	160	95	541	285	212	600	50	140	275	308
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	517	397	168	100	569	300	223	632	53	147	289	324
Shared Lane Traffic (%)												
Lane Group Flow (vph)	517	397	168	100	569	300	223	632	53	147	289	324
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	491	377	160	95	541	285	212	600	50	140	275	308
Future Volume (vph)	491	377	160	95	541	285	212	600	50	140	275	308
Turn Type	Prot	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			Free	6		Free	8		Free	4		Free
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		5.0	4.0		5.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0		10.0	21.0		10.0	21.0	
Total Split (s)	27.0	64.4		10.0	47.4		15.0	40.6		15.0	40.6	
Total Split (%)	20.8%	49.5%		7.7%	36.5%		11.5%	31.2%		11.5%	31.2%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max		None	C-Max		None	Max		None	Max	
Act Effect Green (s)	21.6	59.4	130.0	47.8	42.8	130.0	45.9	35.9	130.0	45.3	35.6	130.0
Actuated g/C Ratio	0.17	0.46	1.00	0.37	0.33	1.00	0.35	0.28	1.00	0.35	0.27	1.00
v/c Ratio	0.91	0.25	0.11	0.26	0.49	0.19	0.56	0.65	0.03	0.60	0.30	0.20
Control Delay	73.9	22.1	0.1	19.8	36.7	0.3	35.4	45.2	0.0	37.6	38.4	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.9	22.1	0.1	19.8	36.7	0.3	35.4	45.2	0.0	37.6	38.4	0.3
LOS	E	C	A	B	D	A	D	D	A	D	D	A
Approach Delay		43.4			23.7			40.2			22.0	
Approach LOS		D			C			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 33.1

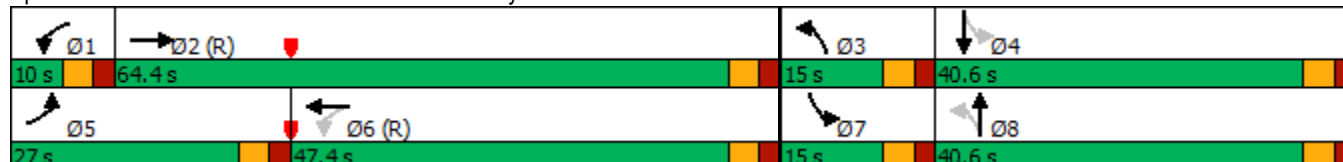
Intersection LOS: C

Intersection Capacity Utilization 70.0%

ICU Level of Service C













Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd



Volume  
1: Powers & Bradley Rd

























2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	71	367	210	479	384	703	175	633	704	701	1168	110
Future Volume (vph)	71	367	210	479	384	703	175	633	704	701	1168	110
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	75	386	221	494	396	725	180	653	726	723	1204	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	386	221	494	396	725	180	653	726	723	1204	113
Intersection Summary												



Timings  
1: Powers & Bradley Rd

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	367	210	479	384	703	175	633	704	701	1168	110
Future Volume (vph)	71	367	210	479	384	703	175	633	704	701	1168	110
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			2			6
Detector Phase	7	4		3	8		5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	9.0		9.0	9.0		9.0	9.0	9.0	9.0	9.0	9.0
Total Split (s)	10.0	26.0		34.0	50.0		15.0	40.0	40.0	30.0	55.0	55.0
Total Split (%)	7.7%	20.0%		26.2%	38.5%		11.5%	30.8%	30.8%	23.1%	42.3%	42.3%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	0.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	5.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None		None	None		None	Max	Max	C-Max	Max	Max
Act Effect Green (s)	25.7	19.7	130.0	24.8	40.5	130.0	11.8	36.0	35.0	33.5	57.7	57.7
Actuated g/C Ratio	0.20	0.15	1.00	0.19	0.31	1.00	0.09	0.28	0.27	0.26	0.44	0.44
v/c Ratio	0.33	0.72	0.14	0.76	0.36	0.46	0.58	0.67	0.99	0.82	0.77	0.14
Control Delay	31.5	60.5	0.2	57.2	29.4	1.3	64.4	45.6	50.8	54.7	35.9	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.5	60.5	0.2	57.2	29.4	1.3	64.4	45.6	50.8	54.7	35.9	2.2
LOS	C	E	A	E	C	A	E	D	D	D	D	A
Approach Delay		37.8			25.3			50.2			40.7	
Approach LOS		D			C			D			D	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 1 (1%), Referenced to phase 1:SBL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 38.6

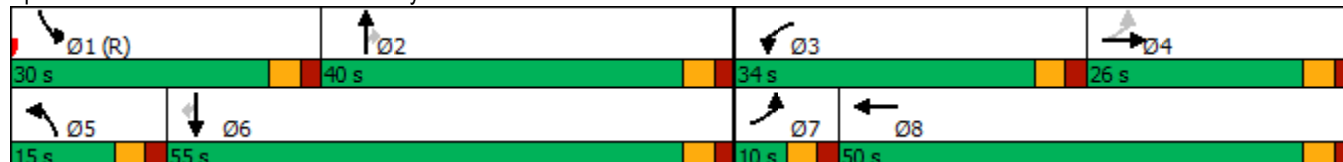
Intersection LOS: D

Intersection Capacity Utilization 84.6%

ICU Level of Service E













Analysis Period (min) 15

Splits and Phases: 1: Powers & Bradley Rd



























Volume  
2: Legacy Dr & Bradley Rd

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	542	796	433	257	858	176	309	27	190	307	29	398
Future Volume (vph)	542	796	433	257	858	176	309	27	190	307	29	398
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	571	838	456	271	903	185	325	28	200	323	31	419
Shared Lane Traffic (%)												
Lane Group Flow (vph)	571	838	456	271	903	185	325	28	200	323	31	419
Intersection Summary												

# Timings 2: Legacy Dr & Bradley Rd

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	542	796	433	257	858	176	309	27	190	307	29	398
Future Volume (vph)	542	796	433	257	858	176	309	27	190	307	29	398
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2	6		6	8		8	4		4
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	4
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	25.0	73.0	73.0	17.0	65.0	65.0	17.0	24.0	24.0	16.0	23.0	23.0
Total Split (%)	19.2%	56.2%	56.2%	13.1%	50.0%	50.0%	13.1%	18.5%	18.5%	12.3%	17.7%	17.7%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
Act Effect Green (s)	24.7	73.2	73.2	61.5	61.5	61.5	28.8	15.8	15.8	26.8	14.8	14.8
Actuated g/C Ratio	0.19	0.56	0.56	0.47	0.47	0.47	0.22	0.12	0.12	0.21	0.11	0.11
v/c Ratio	0.87	0.42	0.42	0.66	0.54	0.22	0.50	0.12	0.54	0.52	0.15	0.89
Control Delay	52.0	28.5	10.5	41.4	25.9	3.3	43.2	49.7	12.3	43.7	51.1	35.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.0	28.5	10.5	41.4	25.9	3.3	43.2	49.7	12.3	43.7	51.1	35.5
LOS	D	C	B	D	C	A	D	D	B	D	D	D
Approach Delay		31.3			25.9			32.4			39.6	
Approach LOS		C			C			C			D	

## Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 67 (52%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 31.2

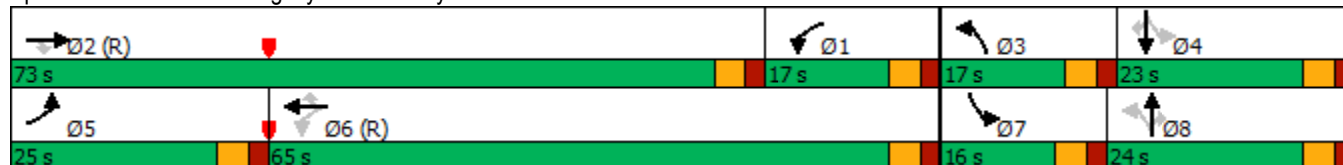
Intersection LOS: C

Intersection Capacity Utilization 67.2%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Legacy Dr & Bradley Rd















## Volume

2040 Total Traffic

## 3: Blackmer St/Waterview North RIRO Access &amp; Bradley Rd













PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	1238	54	0	1204	95	0	0	20	0	0	88
Future Volume (vph)	0	1238	54	0	1204	95	0	0	20	0	0	88
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	1303	57	0	1267	100	0	0	21	0	0	93
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1303	57	0	1267	100	0	0	21	0	0	93
Intersection Summary												

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑	↗			↗			↗
Traffic Vol, veh/h	0	1238	54	0	1204	95	0	0	20	0	0	88
Future Vol, veh/h	0	1238	54	0	1204	95	0	0	20	0	0	88
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	-	-	235	-	-	0	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1303	57	0	1267	100	0	0	21	0	0	93
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	0	-	-	652	-	-	634
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	6.94	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.32	-	-	3.32
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	411	0	0	422
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %			-			-						
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	411	-	-	422
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0			14.2			15.9		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1						
Capacity (veh/h)	411	-	-	-	-	422						
HCM Lane V/C Ratio	0.051	-	-	-	-	0.22						
HCM Control Delay (s)	14.2	-	-	-	-	15.9						
HCM Lane LOS	B	-	-	-	-	C						
HCM 95th %tile Q(veh)	0.2	-	-	-	-	0.8						

























Volume  
101: Marksheffel Rd & Bradley Rd

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	605	725	304	195	593	215	220	500	100	300	650	516
Future Volume (vph)	605	725	304	195	593	215	220	500	100	300	650	516
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	637	763	320	205	624	226	232	526	105	316	684	543
Shared Lane Traffic (%)												
Lane Group Flow (vph)	637	763	320	205	624	226	232	526	105	316	684	543
Intersection Summary												

Timings  
101: Marksheffel Rd & Bradley Rd

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	605	725	304	195	593	215	220	500	100	300	650	516
Future Volume (vph)	605	725	304	195	593	215	220	500	100	300	650	516
Turn Type	Prot	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free	pm+pt	NA	Free
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			Free	6		Free	8		Free	4		Free
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		5.0	4.0		5.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0		10.0	21.0		10.0	21.0	
Total Split (s)	35.0	55.0		15.0	35.0		30.0	30.0		30.0	30.0	
Total Split (%)	26.9%	42.3%		11.5%	26.9%		23.1%	23.1%		23.1%	23.1%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	C-Max		None	C-Max		None	Max		None	Max	
Act Effect Green (s)	27.8	50.0	130.0	42.2	32.2	130.0	46.5	28.6	130.0	53.5	32.1	130.0
Actuated g/C Ratio	0.21	0.38	1.00	0.32	0.25	1.00	0.36	0.22	1.00	0.41	0.25	1.00
v/c Ratio	0.87	0.56	0.20	0.68	0.71	0.14	0.74	0.68	0.07	0.81	0.78	0.34
Control Delay	62.5	33.3	0.3	35.7	50.4	0.2	42.9	52.3	0.1	45.1	53.7	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	62.5	33.3	0.3	35.7	50.4	0.2	42.9	52.3	0.1	45.1	53.7	0.6
LOS	E	C	A	D	D	A	D	D	A	D	D	A
Approach Delay		38.0			36.8			43.4			33.2	
Approach LOS		D			D			D			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 37.2

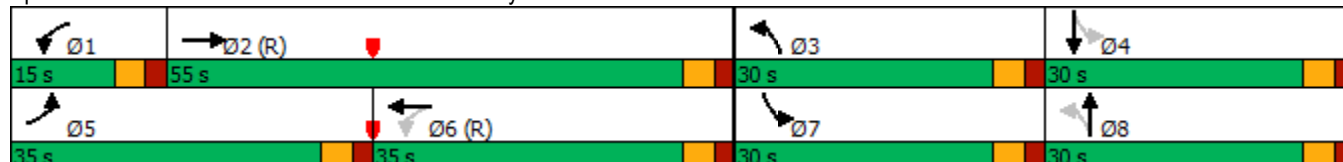
Intersection LOS: D

Intersection Capacity Utilization 80.8%

ICU Level of Service D

Analysis Period (min) 15













Splits and Phases: 101: Marksheffel Rd & Bradley Rd





Volume  
1: Powers NB Ramp & Bradley Rd













2040 Total Traffic  
AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	26	715	0	0	1119	1034	100	0	386	0	0	0
Future Volume (vph)	26	715	0	0	1119	1034	100	0	386	0	0	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	27	753	0	0	1178	1088	105	0	406	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	27	753	0	0	1178	1088	105	0	406	0	0	0
Intersection Summary												

# Timings

## 1: Powers NB Ramp & Bradley Rd

2040 Total Traffic  
AM Peak Hour

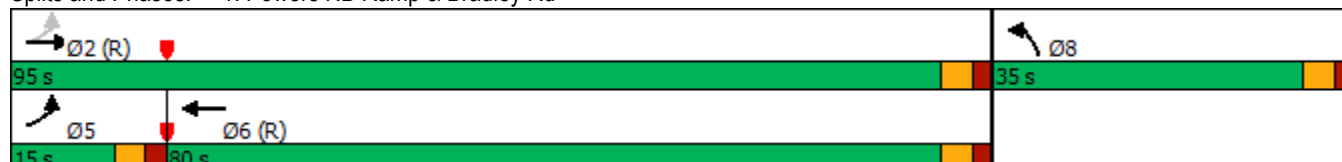
						
Lane Group	EBL	EBT	WBT	WBR	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	26	715	1119	1034	100	386
Future Volume (vph)	26	715	1119	1034	100	386
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	5	2	6		8	
Permitted Phases	2			Free		Free
Detector Phase	5	2	6		8	
Switch Phase						
Minimum Initial (s)	4.0	10.0	4.0		20.0	
Minimum Split (s)	9.0	15.0	9.0		25.0	
Total Split (s)	15.0	95.0	80.0		35.0	
Total Split (%)	11.5%	73.1%	61.5%		26.9%	
Yellow Time (s)	3.0	3.0	3.0		3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0		-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Max	C-Max		None	
Act Effect Green (s)	101.0	101.0	94.3	130.0	21.0	130.0
Actuated g/C Ratio	0.78	0.78	0.73	1.00	0.16	1.00
v/c Ratio	0.08	0.27	0.46	0.69	0.37	0.26
Control Delay	2.7	7.3	15.3	6.1	52.8	0.4
Queue Delay	0.0	0.0	0.3	0.0	0.0	0.0
Total Delay	2.7	7.3	15.6	6.1	52.8	0.4
LOS	A	A	B	A	D	A
Approach Delay		7.1	11.0			
Approach LOS		A	B			

### Intersection Summary

Cycle Length: 130  
 Actuated Cycle Length: 130  
 Offset: 25 (19%), Referenced to phase 2:EBTL and 6:WBT, Start of Green  
 Natural Cycle: 60  
 Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.69  
 Intersection Signal Delay: 10.2  
 Intersection Capacity Utilization 60.9%  
 Analysis Period (min) 15

Intersection LOS: B  
 ICU Level of Service B

Splits and Phases: 1: Powers NB Ramp & Bradley Rd















## Volume

## 26: Bradley Rd &amp; Powers SB Ramp

2040 Total Traffic

AM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	208	75	719	500	0	0	0	0	533	0	19
Future Volume (vph)	0	208	75	719	500	0	0	0	0	533	0	19
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	219	79	757	526	0	0	0	0	561	0	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	219	79	757	526	0	0	0	0	561	0	20
Intersection Summary												

Timings  
26: Bradley Rd & Powers SB Ramp

2040 Total Traffic  
AM Peak Hour

	→	↘	↙	←	↘	↙
Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Configurations	↑↑	↑	↘↙	↑↑	↘↙	↑
Traffic Volume (vph)	208	75	719	500	533	19
Future Volume (vph)	208	75	719	500	533	19
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases		2				4
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.0	23.0	10.0	23.0	23.0	23.0
Total Split (s)	45.0	45.0	40.0	85.0	45.0	45.0
Total Split (%)	34.6%	34.6%	30.8%	65.4%	34.6%	34.6%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Max	Max	Max	Max	Max	Max
Act Effect Green (s)	40.0	40.0	35.0	80.0	40.0	40.0
Actuated g/C Ratio	0.31	0.31	0.27	0.62	0.31	0.31
v/c Ratio	0.20	0.15	0.82	0.24	0.53	0.04
Control Delay	33.8	7.5	44.9	7.8	39.5	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.8	7.5	44.9	7.8	39.5	0.2
LOS	C	A	D	A	D	A
Approach Delay	26.9			29.7		
Approach LOS	C			C		

Intersection Summary

Cycle Length: 130  
 Actuated Cycle Length: 130  
 Offset: 67 (52%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 65  
 Control Type: Pretimed  
 Maximum v/c Ratio: 0.82  
 Intersection Signal Delay: 31.6  
 Intersection Capacity Utilization 60.9%  
 Analysis Period (min) 15













Intersection LOS: C  
 ICU Level of Service B

Splits and Phases: 26: Bradley Rd & Powers SB Ramp















Volume  
1: Powers NB Ramp & Bradley Rd

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	71	1068	0	0	863	703	175	0	704	0	0	0
Future Volume (vph)	71	1068	0	0	863	703	175	0	704	0	0	0
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	75	1124	0	0	908	740	184	0	741	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	1124	0	0	908	740	184	0	741	0	0	0
Intersection Summary												

# Timings 1: Powers NB Ramp & Bradley Rd

2040 Total Traffic  
PM Peak Hour

						
Lane Group	EBL	EBT	WBT	WBR	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	71	1068	863	703	175	704
Future Volume (vph)	71	1068	863	703	175	704
Turn Type	pm+pt	NA	NA	Free	Prot	Free
Protected Phases	5	2	6		8	
Permitted Phases	2			Free		Free
Detector Phase	5	2	6		8	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	
Minimum Split (s)	9.0	9.0	9.0		9.0	
Total Split (s)	15.0	100.0	85.0		30.0	
Total Split (%)	11.5%	76.9%	65.4%		23.1%	
Yellow Time (s)	3.0	3.0	3.0		3.0	
All-Red Time (s)	2.0	2.0	2.0		2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0		-1.0	
Total Lost Time (s)	4.0	4.0	4.0		4.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	None	C-Max	C-Max		Max	
Act Effect Green (s)	96.0	96.0	86.2	130.0	26.0	130.0
Actuated g/C Ratio	0.74	0.74	0.66	1.00	0.20	1.00
v/c Ratio	0.17	0.43	0.39	0.47	0.52	0.47
Control Delay	9.6	11.0	10.3	1.3	52.5	1.0
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	9.6	11.1	10.3	1.3	52.5	1.0
LOS	A	B	B	A	D	A
Approach Delay		11.0	6.3			
Approach LOS		B	A			

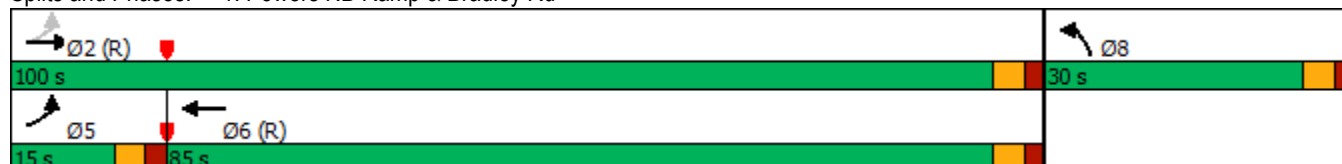
## Intersection Summary

Cycle Length: 130  
Actuated Cycle Length: 130  
Offset: 47 (36%), Referenced to phase 2:EBTL and 6:WBT, Start of Green  
Natural Cycle: 40  
Control Type: Actuated-Coordinated  
Maximum v/c Ratio: 0.52  
Intersection Signal Delay: 9.0  
Intersection Capacity Utilization 59.2%  
Analysis Period (min) 15

Intersection LOS: A













ICU Level of Service B

Splits and Phases: 1: Powers NB Ramp & Bradley Rd



Volume  
26: Bradley Rd & Powers SB Ramp

2040 Total Traffic  
PM Peak Hour

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Volume (vph)	0	438	210	479	559	0	0	0	0	701	0	110
Future Volume (vph)	0	438	210	479	559	0	0	0	0	701	0	110
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Adj. Flow (vph)	0	461	221	504	588	0	0	0	0	738	0	116
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	461	221	504	588	0	0	0	0	738	0	116
Intersection Summary												



# Timings

## 26: Bradley Rd & Powers SB Ramp

2040 Total Traffic

PM Peak Hour

	→	↘	↙	←	↘	↙
Lane Group	EBT	EBR	WBL	WBT	SBL	SBR
Lane Configurations	↑↑	↑	↘↙	↑↑	↘↙	↑
Traffic Volume (vph)	438	210	479	559	701	110
Future Volume (vph)	438	210	479	559	701	110
Turn Type	NA	Perm	Prot	NA	Prot	Perm
Protected Phases	2		1	6	4	
Permitted Phases		2				4
Detector Phase	2	2	1	6	4	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.0	23.0	10.0	23.0	23.0	23.0
Total Split (s)	40.0	40.0	45.0	85.0	45.0	45.0
Total Split (%)	30.8%	30.8%	34.6%	65.4%	34.6%	34.6%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Max	Max	Max	Max	Max	Max
Act Effect Green (s)	35.0	35.0	40.0	80.0	40.0	40.0
Actuated g/C Ratio	0.27	0.27	0.31	0.62	0.31	0.31
v/c Ratio	0.48	0.38	0.48	0.27	0.70	0.20
Control Delay	42.0	6.6	44.6	7.7	43.9	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.0	6.6	44.6	7.7	43.9	6.6
LOS	D	A	D	A	D	A
Approach Delay	30.5			24.7		
Approach LOS	C			C		

### Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 67 (52%), Referenced to phase 2:EBT and 6:WBT, Start of Green

Natural Cycle: 60

Control Type: Pretimed

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 30.8

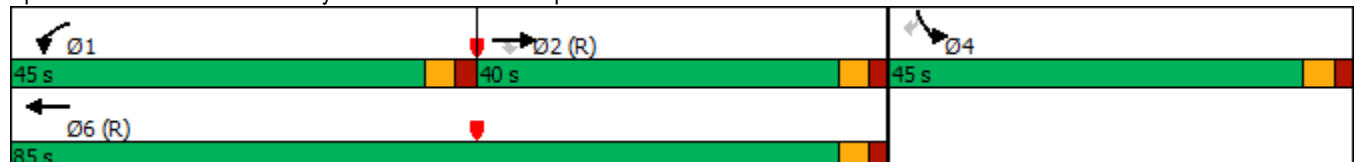
Intersection LOS: C

Intersection Capacity Utilization 59.2%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 26: Bradley Rd & Powers SB Ramp



# Queuing Reports

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## Queuing and Blocking Report

## Intersection: 1: Powers &amp; Bradley Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	NB
Directions Served	L	T	T	L	L	T	T	L	L	T	T	R
Maximum Queue (ft)	65	165	145	508	531	234	225	101	390	755	759	272
Average Queue (ft)	19	98	53	357	369	108	125	28	156	537	549	15
95th Queue (ft)	51	153	118	513	531	184	190	69	574	917	924	186
Link Distance (ft)		969	969			921	921			4071	4071	4071
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	500			625	625			750	750			
Storage Blk Time (%)				0	0					10		
Queuing Penalty (veh)				0	0					10		

## Intersection: 1: Powers &amp; Bradley Rd

Movement	SB	SB	SB	SB
Directions Served	L	L	T	T
Maximum Queue (ft)	600	618	639	582
Average Queue (ft)	380	399	290	278
95th Queue (ft)	649	666	980	917
Link Distance (ft)			2274	2274
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	670	670		
Storage Blk Time (%)	2	8	0	
Queuing Penalty (veh)	7	28	2	

## Queuing and Blocking Report

## Intersection: 2: Legacy Dr &amp; Bradley Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	R	L	T	T	R	L	L	T
Maximum Queue (ft)	142	147	158	147	51	275	810	855	225	187	246	59
Average Queue (ft)	64	81	42	56	5	112	452	568	118	74	130	20
95th Queue (ft)	123	135	108	110	31	277	826	936	277	151	207	53
Link Distance (ft)		921	921	921	921		1235	1235				442
Upstream Blk Time (%)							0	1				
Queuing Penalty (veh)							2	9				
Storage Bay Dist (ft)	250					250			200	300	300	
Storage Blk Time (%)						0	20	35	0		0	
Queuing Penalty (veh)						0	19	54	0		0	

## Intersection: 2: Legacy Dr &amp; Bradley Rd

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	L	T	R
Maximum Queue (ft)	33	187	144	52	207
Average Queue (ft)	2	101	29	18	109
95th Queue (ft)	21	169	100	46	184
Link Distance (ft)		269	269	269	269
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	300				
Storage Blk Time (%)					
Queuing Penalty (veh)					

## Intersection: 3: Blackmer St/Waterview North RIRO Access &amp; Bradley Rd

Movement	WB	WB	NB	SB
Directions Served	T	T	R	R
Maximum Queue (ft)	73	75	55	348
Average Queue (ft)	7	12	18	165
95th Queue (ft)	82	112	44	340
Link Distance (ft)	894	894	236	347
Upstream Blk Time (%)				11
Queuing Penalty (veh)				0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

## Queuing and Blocking Report

## Intersection: 1: Powers &amp; Bradley Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	T	L	L	T	T	L	L	T	T	L
Maximum Queue (ft)	109	220	213	264	261	152	171	127	133	303	324	388
Average Queue (ft)	46	141	114	173	185	76	84	58	73	192	211	240
95th Queue (ft)	88	206	186	252	255	126	133	108	117	261	280	362
Link Distance (ft)		968	968			921	921			4063	4063	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	500			625	625			750	750			670
Storage Blk Time (%)												
Queuing Penalty (veh)												

## Intersection: 1: Powers &amp; Bradley Rd

Movement	SB	SB	SB
Directions Served	L	T	T
Maximum Queue (ft)	412	412	418
Average Queue (ft)	259	280	289
95th Queue (ft)	377	412	416
Link Distance (ft)		2266	2266
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	670		
Storage Blk Time (%)			
Queuing Penalty (veh)			

## Queuing and Blocking Report

## Intersection: 2: Legacy Dr &amp; Bradley Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	L	T	T	R	L	T	T	R	L	L	T
Maximum Queue (ft)	275	388	409	402	416	274	320	332	225	312	324	446
Average Queue (ft)	229	256	248	263	123	160	180	205	85	110	172	40
95th Queue (ft)	303	364	391	397	355	266	271	269	207	247	294	174
Link Distance (ft)		921	921	921	921		1235	1235				592
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250					250			200	300	300	
Storage Blk Time (%)	1	4				1	2	8	0	0	2	0
Queuing Penalty (veh)	4	11				3	5	15	0	0	5	0

## Intersection: 2: Legacy Dr &amp; Bradley Rd

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	L	T	R
Maximum Queue (ft)	56	283	282	117	320
Average Queue (ft)	8	144	103	37	260
95th Queue (ft)	40	240	217	85	357
Link Distance (ft)		268	268	268	268
Upstream Blk Time (%)		1	0		67
Queuing Penalty (veh)		0	0		0
Storage Bay Dist (ft)	300				
Storage Blk Time (%)					
Queuing Penalty (veh)					

## Intersection: 3: Blackmer St/Waterview North RIRO Access &amp; Bradley Rd

Movement	NB	SB
Directions Served	R	R
Maximum Queue (ft)	64	94
Average Queue (ft)	17	41
95th Queue (ft)	41	78
Link Distance (ft)	236	347
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

## Additional Attachments

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Figure 19 Long-Term Bradley Road Lane Recommendations figure from the *Springs at Waterview East Preliminary Plan Traffic Impact Study*





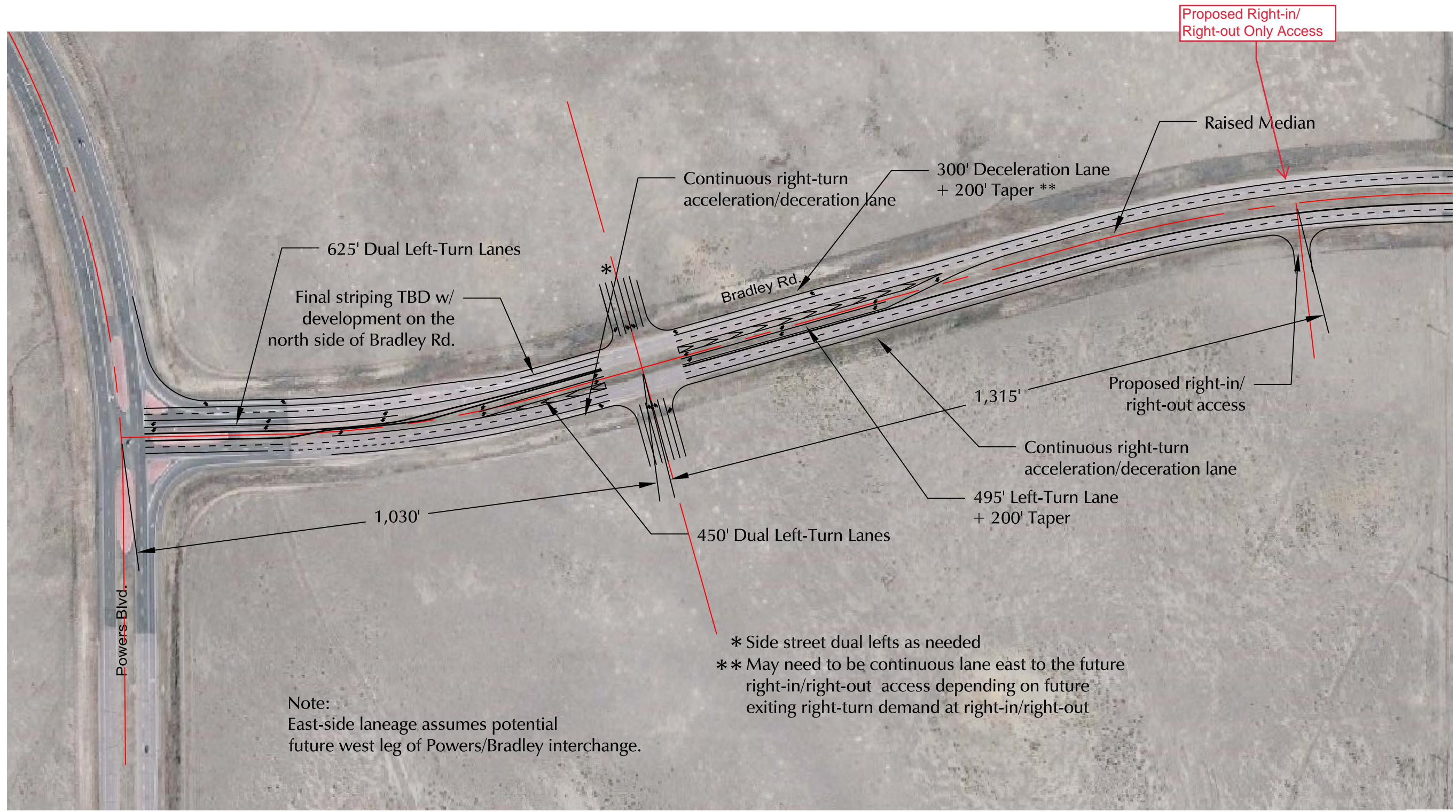
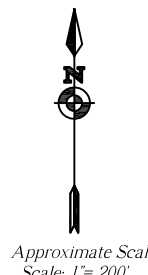


Figure 19

# Long-Term Bradley Road Lane Recommendations

Springs at Waterview East (LSC #184360)

