

1. Provide proposed classification of all proposed internal roadways with this preliminary application.
2. Provide trigger points for the construction of all required future improvements including but not limited to turn lanes, signals, widenings, and openings or closings of accesses. Identify the responsible party, cost estimates and escrow amounts.
 - State whether or not any improvements affected by the project are reimbursable under the current MTCP.
 - State whether the MTCP or other approved corridor study call for the construction of improvements in the immediate area.
 - List ECM criteria for stacking, storage, and taper for every affected auxiliary lane and access and state whether this access can be met. If it cannot be met state the required modification so that it can be met.
3. State what the current applicable Transportation Impact Fees are and what option the developer will be selecting for payment. If the site is in a special district, so state and summarize the applicable fees.
4. Provide recommendations for the proposed roundabout geometry. (What is the minimum size for the Roundabout center island?) **Review 2 clarification. Include analysis/recommendations in the report.**

Resolved
08/06/2018


ON CONSULTANTS, INC.
 10000 Lakes Peak Avenue, Suite 210
 Colorado Springs, CO 80903
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Resolved
08/06/2018

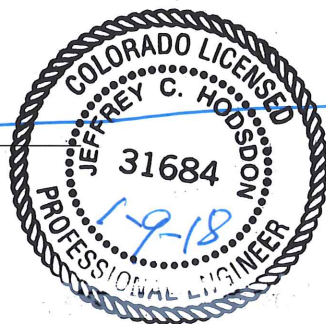
Unresolved. The TIS associated with the Sketch Plan was approved as is since it is a bigger picture analysis of the overall development. The TIS associated with the preliminary plans needs to provide detailed recommendation to include trigger points as requested above that are specific to the preliminary plan application for Springs at Waterview East. Please call if you need clarification. Provide a table of the improvements similar to the TIS prepared for Flying Horse North which identified the improvements, when the improvement needs to be constructed and who will be responsible for the improvement.

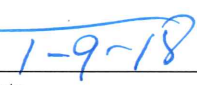
Traffic Engineer's Statement

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.



 Jeffrey C. Hodsdon, P.E. #31684

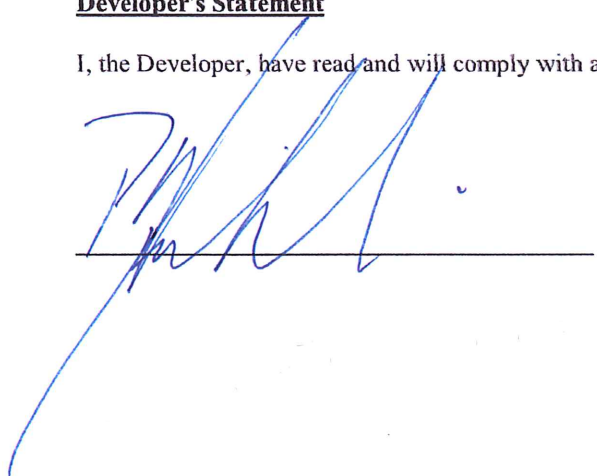


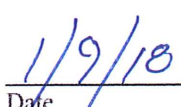


 Date

Developer's Statement

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





 Date

Resolved
08/06/2018



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January 9, 2018

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

RE: Waterview Sketch Plan
Updated Master Traffic Impact Study
Springs at Waterview East Preliminary Plan
PCD Project No. SKP 16-002
El Paso County, Colorado
LSC #164691

Dear Charles:

In response to your request, LSC Transportation Consultants, Inc. has completed this updated master traffic impact study (TIS) for the Waterview Sketch Plan Amendment. The sketch plan location is shown in Figure 1. The sketch plan amendment involves two separate areas of the previous sketch plan. As shown on Figure 1, the western portion of the sketch plan area to be developed is located south of Powers Boulevard west and east of Grinnell Boulevard and the eastern portion to be developed is located north and south of Bradley Road and east of Powers Boulevard. The Bluestem Prairie Open Space and vacant Waterview Sketch Plan land use parcels are located between these two areas. The county *Major Transportation Corridors Plan (MTCP)* shows a future new section of Bradley Road between Goldfield Drive and Powers Boulevard. The Waterview parcel northwest of the Powers/Bradley intersection is located on the north side of this future Bradley Road alignment.

Site access to the western portion is proposed to Goldfield Drive, to a three-quarter movement (left-in/right-in/right-out-only) access to Grinnell Boulevard, and to a right-in/right-out-only access to Bradley Road. Site access to the eastern portion of the sketch plan is proposed to Bradley Road east and west of Powers.

This is an update to the LSC Master Traffic Impact Study (TIS) for the Waterview Sketch Plan dated July 28, 2014.

REPORT CONTENTS

This updated traffic impact report presents the anticipated traffic impacts of the proposed development on the adjacent roadways and the roadway system improvements needed to mitigate the traffic impacts. The report contains the following:

- 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 two sketch plan areas
- 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
- A traffic signal progression analysis for Bradley Road east of Powers Boulevard
- Recommendations for intersection laneage, traffic control, and street classifications

LAND USE AND ACCESS

Figure 2 shows the Waterview Sketch Plan Amendment areas. The amendment involves west and east areas. The specific areas included in the study are shown in the red border on the figures. These include areas of amendment as well as sketch plan areas not proposed for amendment but not yet developed. Figure 2 also shows the areas of the sketch plan that have changed since completion of the *Waterview Sketch Plan Amendment Updated Master Traffic Impact Study* dated July 28, 2014 and a technical memorandum to accompany two deviation requests dated February 6, 2015. This report replaces both prior reports.

West Area

West of Grinnell Boulevard

No changes are proposed to the land use and access shown in the 2014 report and memorandum for the parcels located south of Powers Boulevard, north of Bradley Road, and west of Grinnell Boulevard. These parcels are planned to be developed for multi-family uses. Access to these parcels is proposed via an extension of Goldfield Drive west of Grinnell Boulevard, a potential right-in/right-out-only access to Grinnell Boulevard between Powers Boulevard and Goldfield Drive and a potential right-in/right-out on Bradley Road west of Grinnell. A connection would be provided to the Hassell property to the north.

East of Grinnell Boulevard

Previously planned commercial and multi-family residential development parcels southeast of Grinnell and Goldfield have been replaced with one single-family residential (Springs at Waterviews) site on the current Sketch Plan Amendment. The commercial parcel southeast of Powers/Grinnell will remain as is on the Sketch Plan. Access to these planned developments is proposed from Goldfield Drive. Also, as shown in the 2014 report and reflected on the approved Sketch Plan, a three-quarter movement (left-in/right-in/right-out-only) access to Grinnell Boulevard is planned for the commercial parcel located northeast of the intersection of Grinnell Boulevard and Goldfield Drive. The access location is 725 feet north of Goldfield Drive (centerline spacing). The County Engineer approval of this access point included the requirement for a written agreement that would require the developer to install a traffic signal at this intersection in the unlikely event that one becomes warranted/necessary.

Parcel 5 was previously planned to contain multi-family housing and Parcel 6 was previously planned to be developed with commercial uses. These two parcels are now planned to be combined and developed with 100 lots for single-family homes. Primary access to these parcels would be to Escanaba Drive. An additional three-quarter movement access to Bradley Road has been approved about 505 feet east of Grinnell Boulevard (DEV17006, attached). There is an existing access at this location for a pump station. The pump station access would be reconfigured to provide access from a new north/south internal street.

Parcel 7 is planned to be developed with commercial uses. As shown in the 2014 report, Parcel 7 was assumed to contain two restaurants, a gas station with a convenience store, a bank, and about 122,000 square feet of retail floor space. In addition to the proposed three-quarter access to Grinnell, access to this parcel would be via two full-movement access points to Cudahy Drive. The first access is about 400 feet south of Dancing Sun Way and the second access would form the west leg of the intersection of Cudahy/Dancing Sun Way. **Due to intersection spacing limitations, there can be no access to Goldfield.**

Since completion of the 2014 report the residential areas of the Painted Sky at Waterview have been almost entirely built out. At the time the updated traffic counts were conducted there were about 15 lots with homes either under construction (or recently constructed and unoccupied) in the northeast corner of that development.

East Area

West of Powers Boulevard

Parcel 16 is a vacant commercial development parcel of about 30 acres. Access would not be to Powers Boulevard, but rather would need to be to the future Bradley Road connection between Goldfield and Powers. No changes are proposed to Parcel 16.

East of Powers Boulevard

No changes are proposed to general land use for Parcels 14 and 15, which are located east of Powers Boulevard and north of Bradley Road. Parcel 14 is planned to be developed for industrial/warehouse land uses. Parcel 15 is planned to be developed for commercial uses.

Parcel 17 is planned for commercial uses. The southernmost area may potentially be used for a community recreation center.

Parcel 18 is the site of the proposed future Springs at Waterview East development with single-family residential and commercial land uses. The 2014 study assumed a land use of 785 lots for single-family homes for this parcel based on a density of 4.5 dwellings per acre. Since completion of that report a conceptual site plan has been prepared. It is now planned to be developed with 865 single-family homes. Parcel 18 also contains a potential future school site.

The 2014 study showed primary access to these parcels via a full-movement site intersection to Bradley Road about 2,000 feet east of Powers Boulevard and an additional right-in/right-out-only access to Bradley Road about 800 feet east of Powers Boulevard. The 2015 technical memorandum presented a proposed revision to these access points to show the full-movement access 800 feet east of Powers Boulevard and the right-in/right-out switched to the location 2,000 feet east of Powers Boulevard. Based on comments received from the Colorado Department of Transportation (CDOT) and a more recent meeting with CDOT, the proposed location of the full-movement access point is now being proposed at a location about 1,030 feet east of Powers Boulevard. The right-in/right-out access point is now proposed at a location about 1,300 feet east of the full-movement access. Figure 3 shows the proposed access spacing.

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)*. East of Grinnell Boulevard to Goldfield Drive, Bradley Road has been upgraded to a two-lane Urban Residential Collector rural cross section. West of Grinnell Boulevard, Bradley Road is a four-lane roadway with a 40-mph posted speed limit and has a raised median, left-turn lanes, and rural paved shoulders.
- **Grinnell Boulevard** is shown as a Minor Arterial on the 2016 DRAFT 2040 *El Paso County MTCP Update*. Grinnell Boulevard extends south from Powers Boulevard to Fontaine Boulevard and has a 40-mph posted speed limit (50 mph south of Bradley). The roadway is a median-divided, four-lane facility (plus auxiliary turn lanes) south of Bradley Road. North of Bradley, the roadway transitions to an interim two-lane roadway with auxiliary turn lanes at the Goldfield Drive intersection and the Powers intersection.
- **Goldfield Drive** has been constructed within the Painted Sky at Waterview development between Grinnell Boulevard and Bradley Road. The Grinnell Boulevard/Goldfield Drive intersection is currently unsignalized. Right-turn and left-turn deceleration lanes have been constructed on Grinnell Boulevard at the intersection. Goldfield Drive is classified as a Non-Residential Collector for the first 700 feet east of Grinnell. Between this point and Bradley to the southeast it is classified as a Residential Collector.

Existing Traffic Conditions

Figure 4w shows the existing traffic volumes at the Powers Boulevard/Grinnell Boulevard, Grinnell Boulevard/Goldfield Drive, and Bradley Road/Grinnell Boulevard intersections. The traffic volumes are based on the attached traffic counts conducted by LSC in August and September 2016. Figure 4e shows the existing traffic volumes at the Powers Boulevard/Bradley Road intersection. The traffic volumes are from the attached traffic counts conducted by LSC in October 2016.

Figures 4w and 4e also show the existing lane geometries and traffic controls at the analyzed intersections. The Powers Boulevard/Grinnell Boulevard and Powers/Bradley intersections are traffic signal controlled. The Goldfield Drive/Grinnell Boulevard intersection is Stop-sign controlled but is planned to be signalized in the future. The Bradley Road/Grinnell Boulevard intersection is all-way, Stop-sign controlled.

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
	Control Delay (seconds per vehicle)	
A	less than 10 sec	less than 10 sec
B	10-20 sec	10-15 sec
C	20-35 sec	15-25 sec
D	35-55 sec	25-35 sec
E	55-80 sec	35-50 sec
F	greater than 80 sec	greater than 50 sec

The intersection of Goldfield/Grinnell has been analyzed to determine the existing levels of service based on the unsignalized method of analysis procedures from the *Highway Capacity Manual (HCM), 6th Edition* by the Transportation Research Board. The traffic signal-controlled Powers/Grinnell and Powers/Bradley intersections have been analyzed using Synchro. The intersection of Bradley Road/Grinnell Boulevard is currently all-way Stop-sign controlled. The HCM procedure for all-way Stop-sign-controlled intersections is limited to three approach lanes. As the southbound approach at Bradley/Grinnell currently has four approach lanes, it was analyzed using Synchro/

SimTraffic. The simulation was run five times and the average stop delay per vehicle for each lane was averaged over the five runs and compared to the control delay listed in Table 1. Figures 4w and 4e show the level of service analysis results. The analyzed intersections are currently operating at satisfactory levels of service. The level of service reports are attached.

SHORT-TERM (2017) BACKGROUND TRAFFIC

Background traffic is the traffic estimated to be on the adjacent roadways without consideration of the proposed development traffic. Background traffic includes the through traffic and the traffic generated by adjacent developments but assumes zero traffic generated by the future sketch plan amendment development areas. Figures 5w and 5e show the estimated 2017 background traffic volumes for the western and eastern portions of the sketch plan area, respectively. These volumes assume buildout of Painted Sky at Waterview Filings No. 1 through Filing No. 7. In August and September 2016 when the traffic counts were conducted at the nearby intersections, there were about 15 lots with homes either under construction (or recently constructed and unoccupied) in the northeast corner of that development. The 2017 background traffic volumes were developed by first applying a three-percent-per-year growth rate to non-Painted Sky at Waterview traffic on the adjacent roadways and intersections. Estimates of traffic to be generated by completion of the Painted Sky at Waterview Filing Nos. 3 through 7 were then added to the baseline non-Waterview traffic on the adjacent street system.

2040 BACKGROUND TRAFFIC

The background traffic volumes for the year 2040 are shown on Figures 6w and 6e for the western and eastern portions of the sketch plan area, respectively. The 2040 background traffic volumes were based in part on the forecasted traffic volumes from the *El Paso County MTCP 2040 Transportation Model*. Recent adjustments to the prior volumes have been made based on 2040 projected volumes for Bradley Road shown in the DRAFT 2016 MTCP Update and volumes estimated as part of the Marksheffel South Corridor Preservation Plan Study. Background traffic volumes also include traffic volumes from properties west of Powers north of the Grinnell intersection including the Hassell property. Appendix Table 1 shows the land uses and trip generation estimate assumed for the Hassell property. It has been assumed that if the level of traffic shown is realized, there would be some level of secondary access connection on the north end of these properties.

TRIP GENERATION

The traffic volumes to be generated by the parcels within the sketch plan amendment areas have been estimated using the nationally published trip generation rates from *Trip Generation, 9th Edition*, by the Institute of Transportation Engineers (ITE). Table 2 shows the average weekday and weekday morning and afternoon peak hour. The results of the weekday trip generation estimate for the sketch plan areas are shown in Table 2.

The 2014 study assumed the traffic to be generated by 54 lots for single-family homes in Filing 7 of Painted Sky at Waterview to be “site-generated traffic.” As these lots have all now been

approved and mostly constructed, the additional traffic due to the completion of the remaining 15 homes is included as background traffic in this report.

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, 2nd Edition, June 2004*, by ITE.

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. Table 3 shows the short-term and long-term directional distributions of primary generated traffic by parcel. 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. Pass-by trips were assigned based primarily on the existing traffic volumes on the major streets adjacent to the site. Figure 7w shows the pass-by distribution estimates for Parcel 7 on the west side of the development. Figure 7e shows the pass-by distribution estimates for Parcels 15 and 17 on the east side of the development.

When the distribution percentages (from Table 3 and Figures 7w and 7e) are applied to the trip generation estimates (from Table 2), the resulting site-generated traffic volumes can be determined. Site-generated traffic includes the areas proposed for the sketch plan amendment only. Undeveloped lots previously approved for Painted Sky at Waterview have been included in the background traffic. Figure 8w shows the short-term site-generated traffic volume estimates at the intersections within the western area of the Sketch Plan. Figure 8e shows the short-term site-generated traffic volume at key intersections within the eastern portion of the sketch plan area.

Figure 9w shows the long-term site-generated traffic volume estimates at key intersections within the western area of the sketch plan. Figure 9e shows the long-term site-generated traffic volume estimates at key intersections within the eastern portion of the sketch plan area.

2017 TOTAL TRAFFIC

Figure 10w shows the 2017 total traffic volumes at the key intersections in the western portion of the sketch plan area. These traffic volumes are the sum of the 2017 background traffic volumes (from Figure 5w) plus the short-term site-generated traffic volumes (from Figure 8w). Figure 10e shows the 2017 total traffic volumes at the key intersections in the eastern portion of the sketch plan area. These traffic volumes are the sum of the 2017 background traffic volumes (from Figure 5e) plus the short-term site-generated traffic volumes (from Figure 8e). These volumes have been used in the short-term traffic analysis.

2040 TOTAL TRAFFIC

Figure 11w shows the 2040 total traffic volumes at the key intersections in the western portion of the sketch plan area. These traffic volumes are the sum of the 2040 background traffic volumes (from Figure 6w) plus the long-term site-generated traffic volumes (from Figure 9w). Figure 11e shows the 2040 total traffic volumes at the key intersections in the eastern portion of the sketch plan area. These traffic volumes are the sum of the 2040 background traffic volumes (from Figure 6e) plus the long-term site-generated traffic volumes (from Figure 9e).

PROJECTED LEVELS OF SERVICE

The intersections of Grinnell Boulevard/Powers Boulevard, Bradley Road/Powers Boulevard, Grinnell Boulevard/Goldfield Drive, Goldfield Drive/Cudahy Drive, the proposed three-quarter movement access point to Grinnell Boulevard, and the proposed access points to Bradley Road have been analyzed to determine the projected levels of service for the 2017 background, 2017 total, 2040 background, 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, respectively. Figures 4w/e, 5w/e, 6w/e, 10w/e, and 11w/e show the level of service analysis results. The level of service reports are attached.

West Intersections

The intersection of Powers/Grinnell is projected to operate at a satisfactory level of service as a signalized intersection based on projected 2017 and 2040 total traffic volumes.

All movements at the proposed three-quarter-movement access point to Grinnell Boulevard are projected to operate at an acceptable level of service based on projected 2017 and 2040 total traffic volumes.

The westbound left-turn movement at the intersection of Goldfield Drive/Grinnell Boulevard is projected to operate at LOS D during the morning peak hour and LOS E during the afternoon peak hour based on projected 2017 total traffic volumes. This intersection is planned to be signalized once warrants are met. Once signalized, this intersection would operate at an acceptable level of service.

All movements at the intersection of Goldfield/Esplanade are projected to operate at an acceptable level of service based on projected 2017 and 2040 total traffic volumes.

East Intersections

The intersection of Powers/Bradley is currently signalized and is operating at a satisfactory level of service based on 2017 total traffic volumes. By 2040 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.

The intersection of Marksheffel/Bradley is projected to continue to operate at an overall satisfactory level of movements at this intersection at LOS E during peak hours. **Resolved**
08/06/2018
Clarify. There is no southbound right-turn at the RI/RO. Unresolved.

The proposed full-movement intersection to Bradley Road is projected to operate at a satisfactory level of service as a signalized intersection based on projected 2017 and 2040 total traffic volumes. By 2040, some of the movements at this intersection are projected to operate at LOS E during peak hours. A modern roundabout could also be considered for this intersection, although the effect on Bradley Road signal progression would need to be evaluated.

The proposed right-in/right-out-only access to Bradley Road is projected to operate at a satisfactory level of service based on projected 2017 total traffic volumes. By 2040, the southbound right-turn movement at this access is shown by SimTraffic simulation analysis to operate at LOS E during the afternoon peak hour. However, LOS D or better could be achieved by reducing the southbound right-turn volume through site design (shifting traffic demand to the signalized intersection to the east) or using an alternate design for laneage between the access and Powers. This could be addressed at the time of site development.

QUEUING ANALYSIS

A queuing analysis was performed using Synchro/SimTraffic to determine the maximum vehicle queue lengths that can be expected in the vicinity of the site. The 2040 total peak-hour traffic volumes, lane geometry, and signal timings were entered in the model and the simulation was run five times. The queuing reports are attached.

The projected northbound left-turn queue on Grinnell approaching Powers is 307 feet during the morning peak hour and 288 feet during the afternoon peak hour.

The projected southbound left-turn queue on Grinnell approaching the proposed three-quarter movement site access is 97 feet during the morning peak hour and 128 feet during the afternoon peak hour.

TRAFFIC SIGNAL WARRANT ANALYSIS

The full-movement access to Bradley Road just east of Powers Boulevard was analyzed to determine when a Four-Hour Vehicular Volume Traffic Signal Warrant threshold would be reached or exceeded based on the projected peak-hour traffic volumes. This analysis using the peak hours is intended to provide an indication that a warrant may be met or is close to being met. In order for a Four-Hour Traffic Signal Warrant to be satisfied, the volume threshold would need to be met for two additional hours of the day. For example, the four-hour warrant would be satisfied

with the volume thresholds met for two hours in the morning (instead of the one-hour peak), one hour during the afternoon peak period, and an hour during the mid-afternoon.

The analysis was based on the 70% Factor Four-Hour Vehicular Volume Warrant with two or more lanes on both the major and minor approaches (assuming dual northbound left-turn lanes). For this warrant the lower threshold minor approach volume of 80 vehicles per hour is applicable once the major street traffic is above 875 vehicles per hour. The existing morning and afternoon peak-hour volumes on Bradley Road currently exceeds 875 vehicles per hour. The minor approach was assumed to include only the northbound left-turn movements. Figure 4 shows the projected short-term site-generated traffic volumes at this intersection due to the residential portion of the development (Zone 17) and due to the commercial portion of the development (Zone 18). As shown on Figure 4, the residential portion of the development is projected to generated about 322 vehicles per hour during the morning peak hour and 214 vehicles per hour during the afternoon peak hour. Based on these volumes it is anticipated that the minor approach volume threshold would be met based on both the morning and afternoon peak hour once 37 percent of the single-family homes within Zone 18 are occupied. The threshold may be met sooner if all or a portion the commercial development within Zone 17 is constructed.

TRAFFIC SIGNAL PARTICIPATION

The individual Waterview developments located west of Powers will contribute (via escrow) toward the cost of the planned future traffic signal at the intersection of Grinnell/Goldfield based on the formula used previously. The amounts will be determined with final plat submittals.

The individual Waterview developments located east of Powers will contribute (via escrow) toward the cost of the planned future traffic signal at the intersection of Bradley Road/proposed Waterview full-movement access. The amounts will be determined with final plat submittals.

Also, regarding the planned three-quarter movement access to Grinnell Boulevard for the future commercial site located southeast of Powers/Grinnell (the prior County-Engineer-approved access location is 725 feet north of Goldfield Drive - centerline spacing), the County Engineer approval of this access point included the requirement for a written agreement that would require the developer to install a traffic signal at this intersection in the unlikely event that one becomes warranted/necessary. This will be addressed with the Preliminary Plan/final plat for this commercial site.

TRAFFIC SIGNAL PROGRESSION ANALYSIS

LSC has completed an analysis of the traffic signal progression along Bradley Road assuming the proposed signalized, full-movement access location 1,030 feet east of Powers. This analysis includes the potential extension of Bradley Road to the east, which would introduce east and west straight through movement across Powers. Until such time as Bradley is extended west of Powers (which would be in the future on an as-needed basis) there would be no straight through movements/progression bands across Powers to consider.

Two separate analyses have been completed. The first considers progression of vehicles through the Powers/Bradley and Bradley/site access intersections only. The second analysis presents a Bradley Road arterial progression from Powers through Marksheffel.

First Analysis

The first analysis looks at the potential for good efficiency with the coordination of vehicle movement through the Powers/Bradley and Bradley/site access intersections only. This has been analyzed should the County and CDOT decide to have CDOT coordinate these two signals together with the City separately operating Bradley signals to the east at Foreign Trade Zone/Bradley and Marksheffel/Bradley.

The progression bands through these two signals are shown in two related exhibits. The time/space diagram in Exhibit 1A shows the first component—progression bands for through movements east and west across Powers and through the proposed access. As shown by the bands the east/west through green time across Powers would likely be limited even if a future fourth and west leg of the Powers/Bradley intersection is added. The signal green time will likely be more heavily allocated to the priority north/south through movements on Powers and the southbound left turn. Exhibit 1B shows the second component—the “route” progression bands to/from Powers north of Bradley. The diagram shows the “route” band for the heavy southbound left turn from Powers followed by the eastbound movement through the proposed Waterview intersection (at 1,030 feet east of Powers). The westbound band is not restricted by the Powers intersection as in the westbound direction traffic has a free right onto northbound Powers.

As shown, good progression could be achieved east/west straight through both intersections. Good coordination also would be possible for the southbound left followed by the straight through at the Waterview signal. This is a site-specific situation given the significantly lower volumes projected for Bradley (if ever extended) west of Powers (compared to Bradley east of Powers) and the projected heavy southbound left from Powers followed by the eastbound through movement at the proposed Waterview signalized intersection. Effective coordination would be possible due to the relatively close proximity of the two signals.

Second Analysis

The second analysis presents a Bradley Road arterial progression that includes a future signal at the proposed Waterview full-movement access as well as a future signal at the Foreign Trade Zone/Bradley intersection and the existing signal at the Bradley/Marksheffel intersection. This analysis is shown in Exhibit 2A. This analysis assumes a 50-mile-per-hour (mph) progression speed and a 130-second cycle. Good progression bands are shown. Eastbound would have a progression efficiency of 33 percent. Westbound would have a progression efficiency of 27 percent due to the limited westbound through green at the Marksheffel intersection. The westbound through movement is shown limited because of the combination of projected volumes on “competing” approaches and left turning movements. These include a projected future heavy opposing eastbound left-turn movement volume and north/south through and left volumes on Marksheffel.

Exhibit 2A shows Bradley progression bands without including the Powers Boulevard intersection. The reason is the east/west through green time across Powers would likely be limited even if a future fourth and west leg of the Powers/Bradley intersection is added. The signal green time will likely be heavily allocated to the priority north/south movements on Powers. The southbound left-turn movements especially and the eastbound left-turn movements will also require significant green allocation to serve the projected volumes. Exhibit 2B shows the progression analysis from Exhibit 2A, but with the Powers intersection added. For this analysis, the southbound left turn at the Powers intersection was set to be included as part of the eastbound bands on Bradley Road and the offset was positioned to show how the southbound left turn could be coordinated with the signals to the east along Bradley Road. Alternatively, the analysis showing through bands across Powers are shown in Exhibit 2C. Powers could be considered a break point in the east/west through progression as achieving a wide through bandwidth across Powers is not realistic or expected by motorists.

CONCEPTUAL LANE EXHIBIT (EAST SIDE)

Figures 12 and 13 present to-scale conceptual lane exhibits. These exhibits have been prepared to depict the recommended short- and long-term auxiliary turn lane and center median configuration at the west Waterview access point and between this intersection and Powers.

Figure 12 shows the short-term recommended laneage. This assumes no fourth leg of the Powers/Bradley intersection and the Waterview parcel northeast of Bradley and Powers not yet developed. It assumes development southeast of Bradley and Powers and the proposed Waterview access 1,030 feet east of Powers extended south of Bradley (but not yet north of Bradley).

Figure 13 shows the long-term recommended laneage at buildout of the Sketch Plan. Although the lanes on the west side of Powers are not shown on the figure, the lanes on the east leg have been drawn assuming the possible future west leg of Powers/Bradley in place. This has been included so that sufficient width is reserved in case a west leg of Bradley/Powers is ever built. If needed in the future, Bradley Road between Goldfield and Powers is planned to be a two-lane Collector street. Figure 13 shows multiple east/west through lanes on the east leg of the Bradley/Powers intersection in case multiple through lanes on the eastbound and westbound intersection approaches to Powers are needed for signalized intersection capacity. There would be a transition/reduction to two through lanes on Bradley west of the intersection.

POWERS NORTHBOUND TO BRADLEY ROAD RIGHT-TURN MOVEMENT

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. Figures 12 and 13 show 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. Once the Waterview parcel on the north side of Bradley Road begins to develop, the eastbound left-turn lane would be added on Bradley Road to the west of the proposed Waterview intersection in the median section between Powers and this intersection. Motorists traveling to the north-side Waterview development from northbound Powers would turn right onto Bradley Road then left at the Waterview intersection 1,030 feet east of Powers. For the foreseeable future, with Powers/Bradley remaining a T-intersection, there will be no traffic

conflicts for motorists wanting to complete the sequential maneuvers to enter the Waterview north-side parcel (except for the period of time during the southbound-to-eastbound left-turn signal phase). If such a motorist arrives at the northbound approach to Powers/Bradley during the period of the southbound left-turn green phase, some motorists may choose to pause and wait for most of the traffic arriving from the southbound Powers left turn to pass before maneuvering to the left in order to enter the downstream eastbound left-turn lanes. The operations (and if necessary, any design details) of this northbound right turn can be evaluated at the time of development of the north-side Waterview parcel and the creation of the fourth/north leg of the full-movement access intersection.

SIGHT DISTANCE

Intersection/Access Sight Distance Analysis

Figure 14 shows the sight distance analysis for the Bradley Road access points east of Powers Boulevard.

CONCEPTUAL LANE EXHIBIT (WEST SIDE)

Long-Term Recommendations

Street improvements in the Waterview Sketch Plan area include upgrades of Grinnell Boulevard to a four-lane Minor Arterial with right-turn and left-turn lanes at the intersections. Figures 15 and 16 show the anticipated short-term and long-term intersection lane geometry and traffic controls adjacent to the future commercial site. These include the spacing of the approved Grinnell three-quarter movement site access north to Powers Boulevard and south to Goldfield Drive and the recommended lengths for northbound right-turn deceleration lanes and southbound left-turn lanes on Grinnell. These are based on an assumed 40-mph posted speed limit between Bradley and Powers. The analysis assumes Powers Boulevard is widened to three through lanes in each direction.

The spacing of the planned future three-quarter-movement access to the future commercial center previously approved by deviation is shown 985 feet south of Powers Boulevard. The exact location and resulting spacing from Powers Boulevard could be adjusted in the future with the Preliminary Plan for this parcel as needed to address CDOT concerns regarding the spacing from the future Powers Grinnell ramp interchange intersection. An adjustment to the access location may not be necessary because the conceptual Powers/Grinnell interchange southbound (actually eastbound) on-ramp alignment may need to be updated with a shift to the north. Such a shift may achieve the CDOT-Access-Code-prescribed 550-foot spacing between the future ramp intersection and the future three-quarter-movement access.

Regarding the potential future segment of Bradley Road between Powers Boulevard and Goldfield Drive, a BOCC resolution approved a 90-foot right-of-way Collector for this segment. Although the current DRAFT 2016 MTCP Update shows this segment with a classification of "Minor Arterial," it is shown as a two-lane Minor Arterial. Therefore, the street cross section/laneage and right-of-way are likely intended to match the resolution although the MTCP update proposes an

arterial classification rather than a collector. LSC would suggest clarification in this Sketch Plan Amendment to the effect that if Bradley is classified as an arterial, that access spacing and type to the Sketch-Plan-designated commercial parcel northwest of Powers/Bradley be consistent with that approved with the BOCC resolution or allowable under the Collector classification designated with the resolution. Note: Two through lanes eastbound/westbound are shown at the intersection with Powers, however the intent is four through lanes at the intersection would transition to two through lanes just west of Powers.

DEVIATION REQUEST FORMS

East of Powers Boulevard

Two El Paso County deviation request forms for the two Waterview Sketch Plan access points to Bradley Road east of Powers have been prepared to accompany this report. This report supports the currently proposed Sketch Plan Amendment by presenting and analyzing the proposed change to the access plan shown on the approved 2014 Waterview Sketch Plan Amendment (and the traffic impact analysis by LSC dated July 24, 2014). The two deviation forms are required as the proposed access spacing is shorter than the one-half mile prescribed by the ECM. This report and accompanying deviation forms **supersede** the February 6, 2015 Technical Memorandum entitled *Waterview Sketch Plan – Bradley Road Access*.

The number of Waterview planned access points to Bradley Road would remain the same at two, but the full-movement access is now proposed to be located 1,030 feet east of Powers and the right-in/right-out access would be switched to the location 2,350 feet east of Powers (centerline spacing). The deviation forms present the reasons and justification for the access point spacing as currently requested and summarize the technical findings developed in this report.

APPROVED ACCESS DEVIATIONS

Two west-area three-quarter movement intersections have been approved by staff. These include one on Bradley Road east of Grinnell Boulevard and one on Grinnell Boulevard between Powers Boulevard and one on Goldfield Drive (on the east side of Grinnell).

The three-quarter movement access to Bradley Road will be about 505 feet east of Grinnell Boulevard for the currently proposed residential subdivision northeast of Grinnell/Bradley. This deviation was recently approved by the County Engineer (DEV17006).

The three-quarter movement (left-in/right-in/right-out-only) access to Grinnell Boulevard is planned to serve the future commercial parcel located northeast of the intersection of Grinnell Boulevard and Goldfield Drive. The county-approved access location is 725 feet north of Goldfield Drive (centerline spacing). The County Engineer approval of this access point included the requirement for a written agreement that would require the developer to install a traffic signal at this intersection in the unlikely event that one becomes warranted/necessary.

The exact location and resulting spacing from Powers Boulevard could be adjusted in the future with the Preliminary Plan for this parcel as needed to address CDOT concerns regarding the spacing from the future Powers/Grinnell ramp interchange intersection. An adjustment may not be necessary because the conceptual Powers/Grinnell interchange southbound (actually eastbound) on-ramp may need to be shifted north as it appears to pass through developed properties.

INTERNAL STREET CLASSIFICATIONS

The street classifications for the Springs at Waterview East streets will be confirmed with the plat submittals, however the main entry drive extending south from the proposed full-movement access to Bradley to the proposed roundabout and southwest along the commercial parcel would be classified as Urban Non-Residential Collector streets. The main street through the project extending southeast from the roundabout to the adjacent property to the east will be an Urban Residential Collector. All other streets are expected to be classified as Urban Local or Urban Local Low Volume. The local-level street classifications will be detailed with the plat submittals.

Please contact me if you

The preliminary plan and the TIS does not match with regards to the section south of the roundabout. * * *

arding this report


Sincerely,

08/06/2018

LSC TRANSPORTATION CONSULTANTS, INC.

Submit the recommendations with the TIS associated with the Preliminary Plan. **Unresolved. submit an exhibit**

By


Jeffrey C. Hodsdon, P.E. PTOE
Principal

Resolved
08/06/2018

JCH:KDF:bjwb

- Enclosures: Tables 2 and 3
Figures 1-16
Approved Deviation (DEV17006)
Appendix Table 1
Exhibits 1A-1B, 2A-2C
Traffic Count Reports
Level of Services Reports

**Table 3
Trip Distribution
Waterview Sketch Plan Amendment**

Parcel	Use	% Directional Distribution														
		North Powers	South Powers	West Bradley	South Grinnell	South Goldfield	West Goldfield	North Marksheffel	East Bradley	South Marksheffel	North Federal Trade Zone	South Bradley Heights	Southeast Retail	Northeast Retail	West Retail	P16 Retail
Short Term																
1-4	W Multi-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
5	W Multi-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
6	W Commercial	24	5	29	20	15	0	4	1	0	0	0	0	0	2	0
7	W Commercial	24	5	29	20	15	0	4	1	0	0	0	0	0	2	0
8	W Single-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
10	W Single-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
10	W Single-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
10	W Single-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
10	W Single-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
11	W Single-Family	28	1	37	24	5	0	2	0	0	0	0	1	1	1	0
14	E Office/Industrial	27	25	8	4	0	0	28	2	5	1	0	0	0	0	0
15	E Commercial	15	42	10	5	0	0	10	5	10	1	0	0	2	0	0
16	E Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	E Commercial	15	42	10	5	0	0	12	5	10	1	0	0	0	0	0
18	E Single-Family	30	29	10	1	0	0	20	4	4	0	0	1	0	1	0
Long Term																
1-4	W Multi-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
5	W Multi-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
6	W Commercial	19	6	19	19	15	1	5	5	5	2	2	0	0	2	0
7	W Commercial	19	6	19	19	15	1	5	5	5	2	2	0	0	2	0
8	W Single-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
10	W Single-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
10	W Single-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
10	W Single-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
10	W Single-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
11	W Single-Family	32.5	1	24	21	8	0	4	3	1	1	1	1	1	1	0.5
14	E Office/Industrial	23	25	6	2	0	0	30	5	4	2	3	0	0	0	0
15	E Commercial	7	26	8	3	0	0	16	15	15	3	5	0	2	0	0
16	E Commercial	7	26	8	3	0	0	16	15	15	3	5	0	0	0	2
17	E Commercial	9	26	8	3	0	0	16	15	15	3	5	0	0	0	0
18	E Single-Family	24.5	26	7	0	0	0	23	8	4	2	2	1	1	1	0.5

Source: LSC Transportation Consultants, Inc.



Approximate Scale
Scale: 1" = 3,000'



Figure 1

Vicinity Map

Waterview Sketch Plan Amendment (LSC #164691)



Provide detailed analysis of the commercial access points shown on the preliminary plan for sight distance, auxiliary lane requirements, etc., whether they meets criteria and include recommendations.

Resolved
08/06/2018

Proposed Full Movement Access

Proposed Right-In/
Right-Out Only Access



Approximate Scale
Scale: 1" = 600'

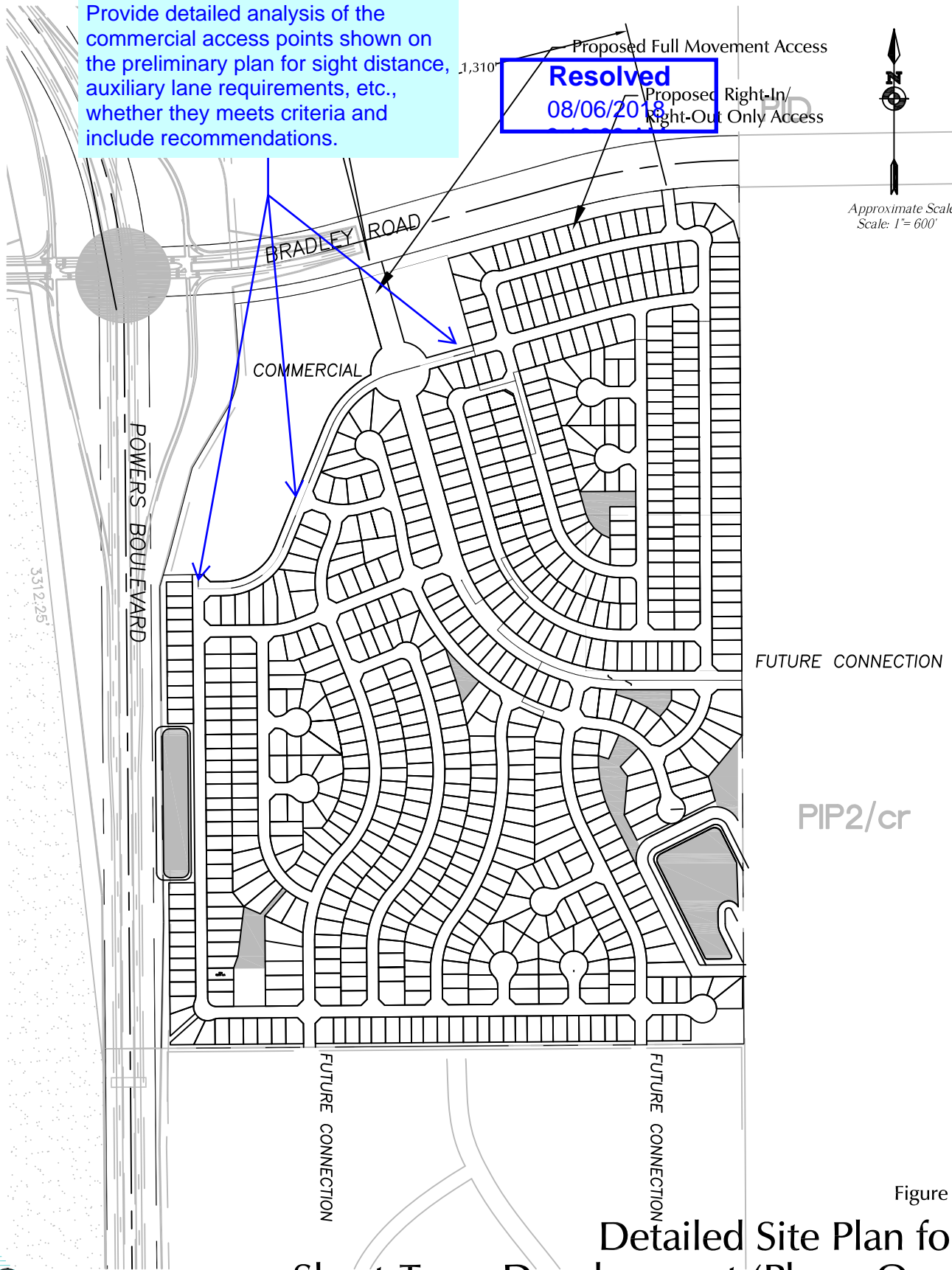


Figure 3

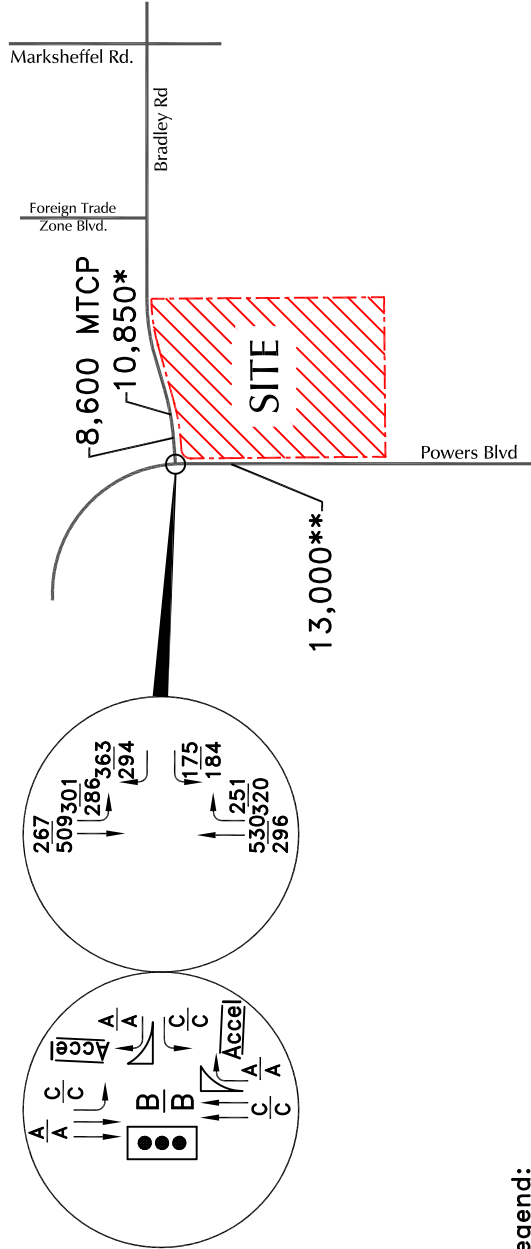
Detailed Site Plan for Short-Term Development (Phase One)

Springs at Waterview East (LSC #164691)





Approximate Scale
Scale: 1" = 3,000'



Legend:

↑ - Stop sign



- Traffic Signal

XX/XX - Weekday peak-hour traffic (vehicles per hour) counts by LSC October 2016

X,XXX - Average weekday traffic (vehicles per day) **2015 AADT CDOT

$\frac{B}{C}$ - Individual movement peak-hour Level of Service

$\frac{B}{B}$ - Entire intersection peak-hour Level of Service (weighted average of all movements)

*Estimate by LSC

Figure 4e

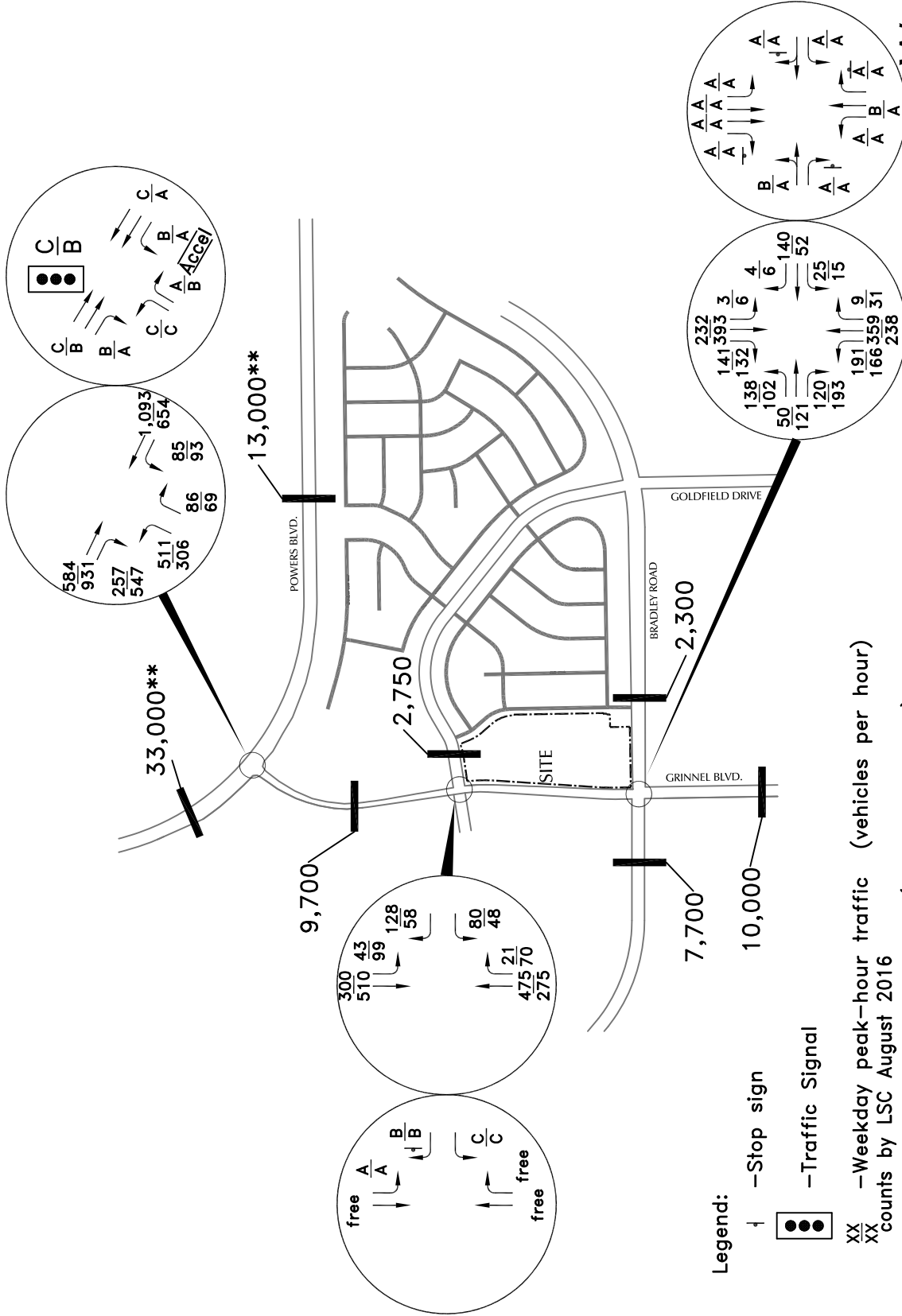
East Area Existing Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview Sketch Plan Amendment (LSC #164691)



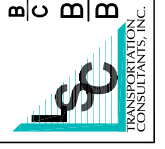


Approximate Scale
Scale: 1" = 1,200'



West Area Existing Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview Sketch Plan Amendment (LSC #164691)





Approximate Scale
Scale: 1" = 3,000'

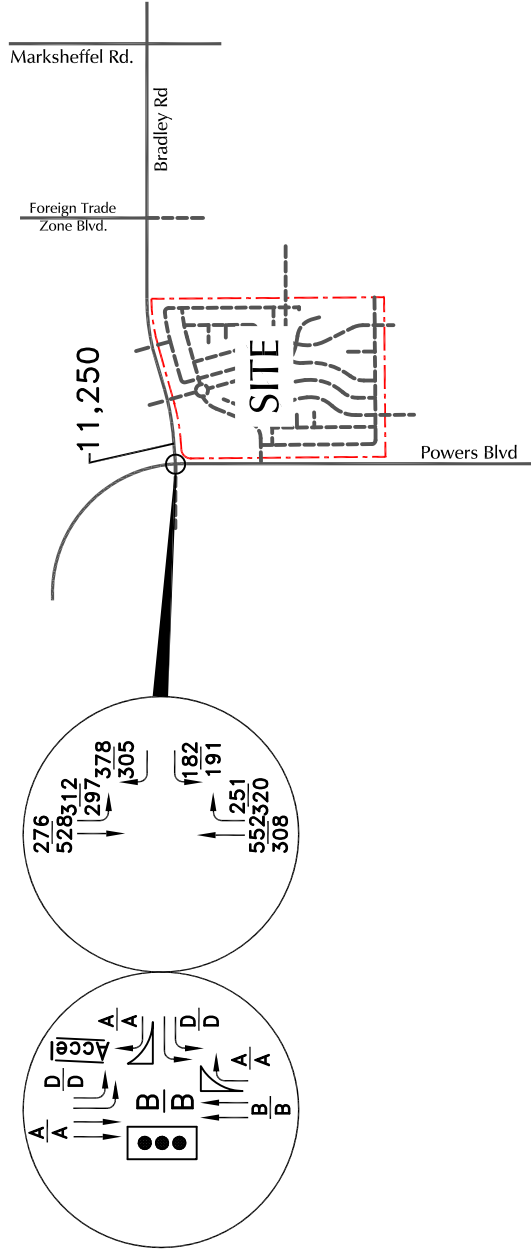
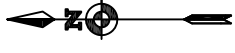


Figure 5e

East Area Year 2017 Background Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview Sketch Plan Amendment (LSC #164691)





Approximate Scale
Scale: 1" = 1,200'

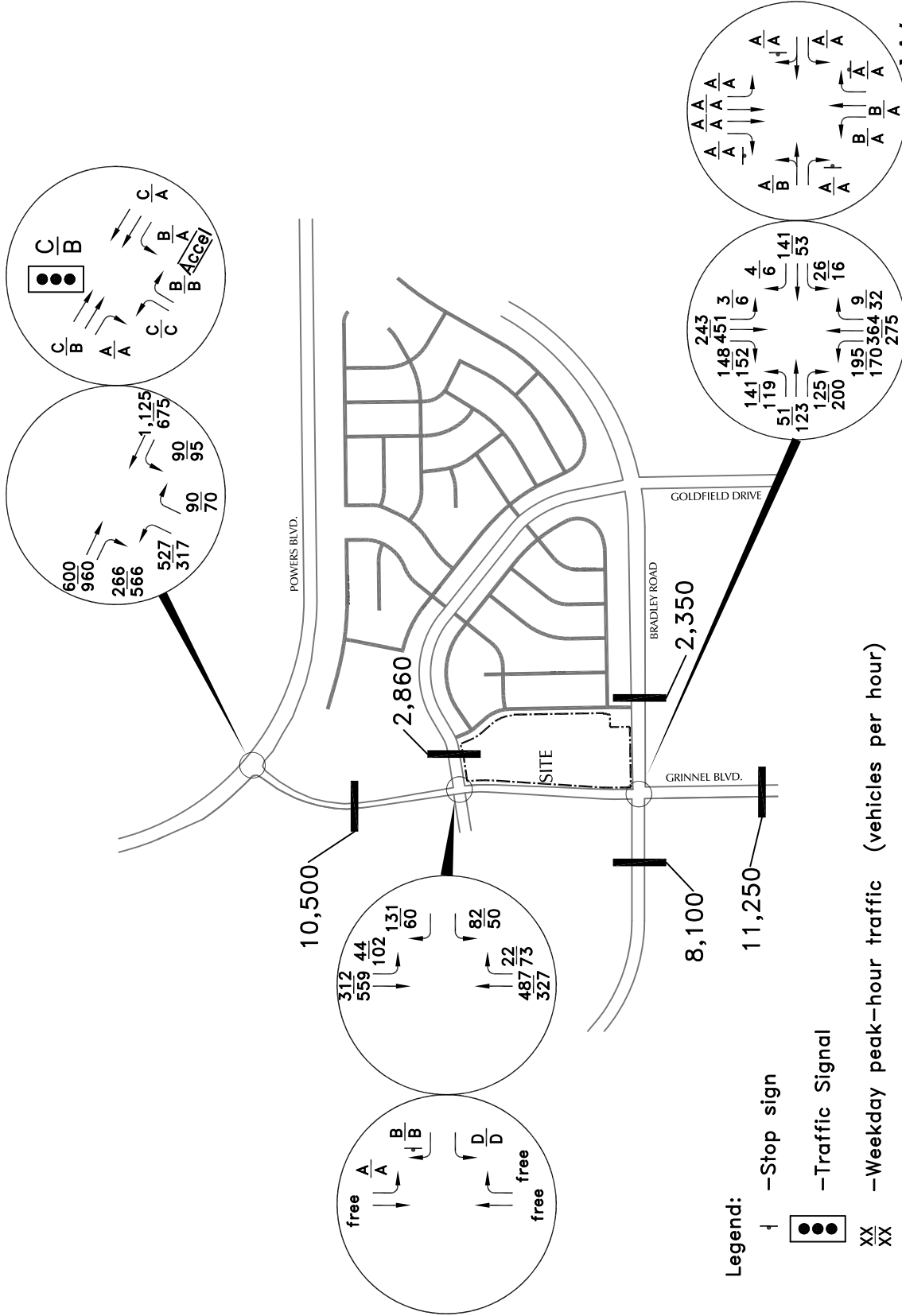


Figure 5w

West Area Year 2017 Background Traffic, Lane Geometry, Traffic Control and Level of Service

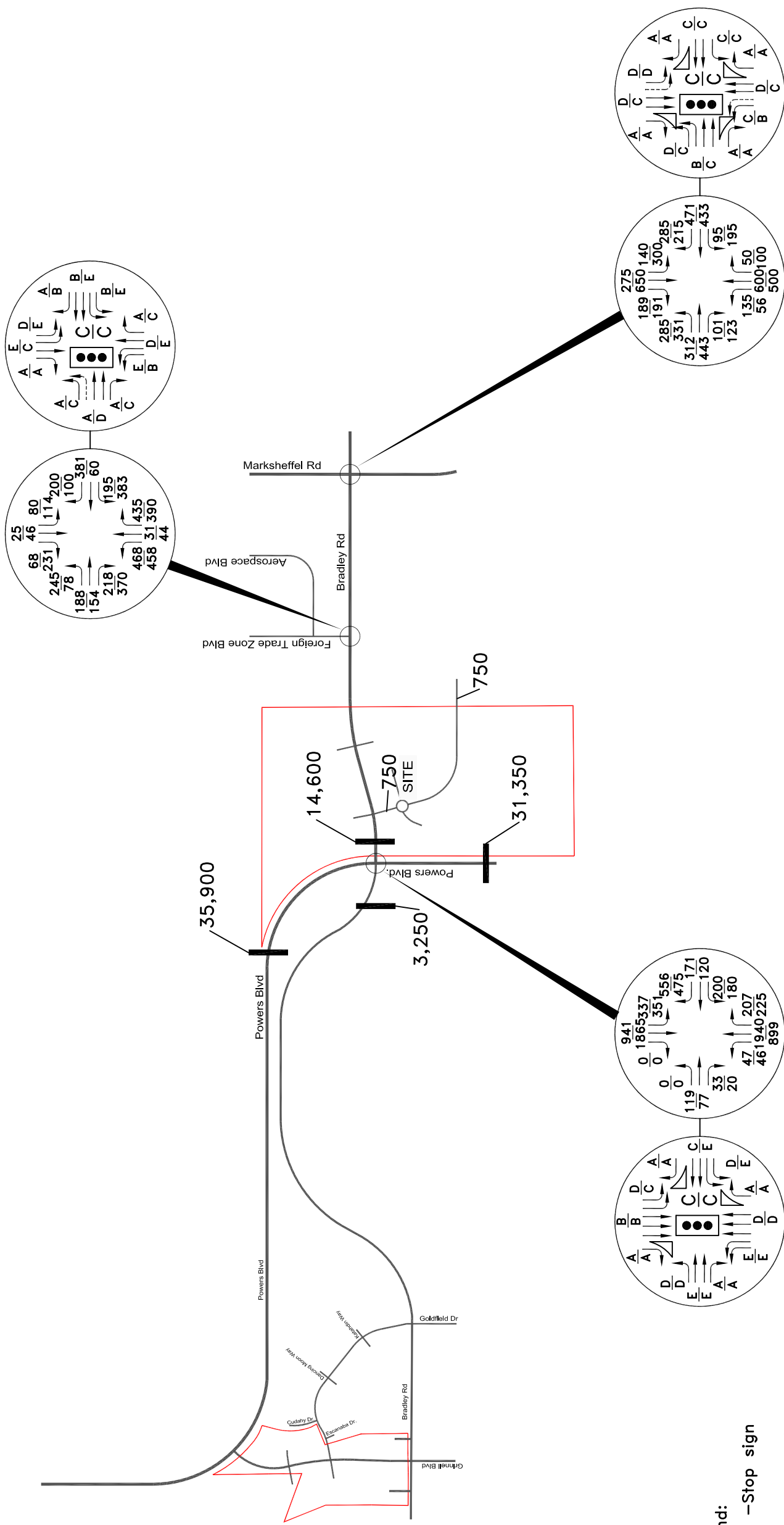
Waterview Sketch Plan Amendment (LSC #164691)

- Legend:**
- ⊥ - Stop sign
 - - Traffic Signal
 - XX XX - Weekday peak-hour traffic (vehicles per hour)
 - X,XXX - Average weekday traffic (vehicles per day)
 - $\frac{B}{C}$ - Individual movement peak-hour Level of Service
 - $\frac{B}{B}$ - Entire intersection peak-hour Level of Service
 - $\frac{B}{B}$ (weighted average of all movements)





Approximate Scale
Scale: 1" = 2,000'



Legend:

- ↑ - Stop sign
- - Traffic Signal
- XX - Weekday peak-hour traffic (vehicles per hour)
- XX - Average weekday traffic (vehicles per day)

- $\frac{B}{C}$ - Individual movement peak-hour Level of Service
- $\frac{B}{B}$ - Entire intersection peak-hour Level of Service (weighted average of all movements)

Figure 6e

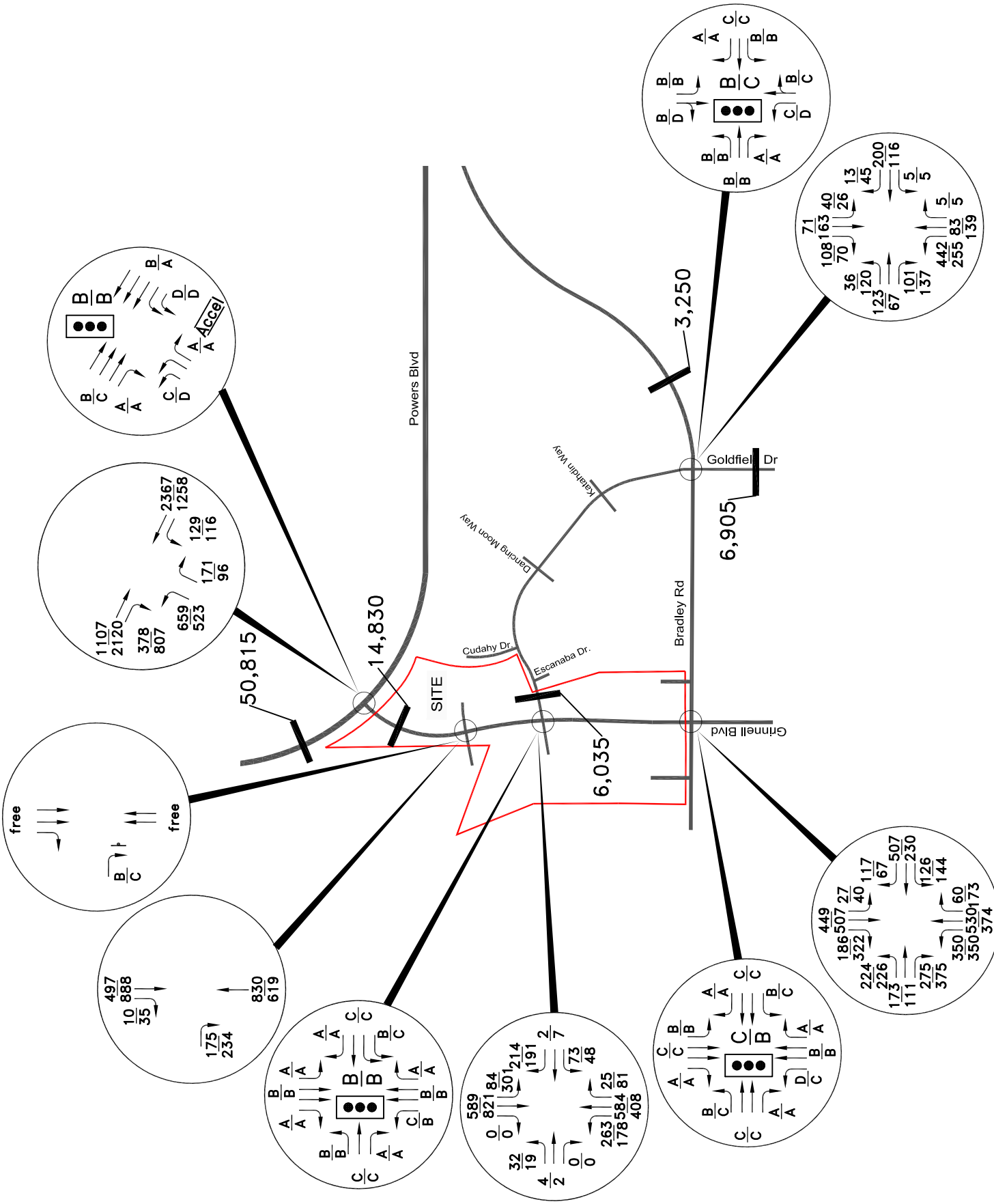
East Area 2040 Background Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview Sketch Plan Amendment (LSC #164691)





Approximate Scale
Scale: 1" = 1,200'



Legend:

- ↑ - Stop sign
- ◼◼ - Traffic Signal
- XX - Weekday peak-hour traffic (vehicles per hour)
- XX,XXX - Average weekday traffic (vehicles per day)
- $\frac{B}{C}$ - Individual movement peak-hour Level of Service
- $\frac{B}{B}$ - Entire intersection peak-hour Level of Service (weighted average of all movements)

Figure 6w

West Area West Area 2040 Background Traffic, Lane Geometry, Traffic Control and Level of Service





Approximate Scale
Scale: 1" = 3,000'

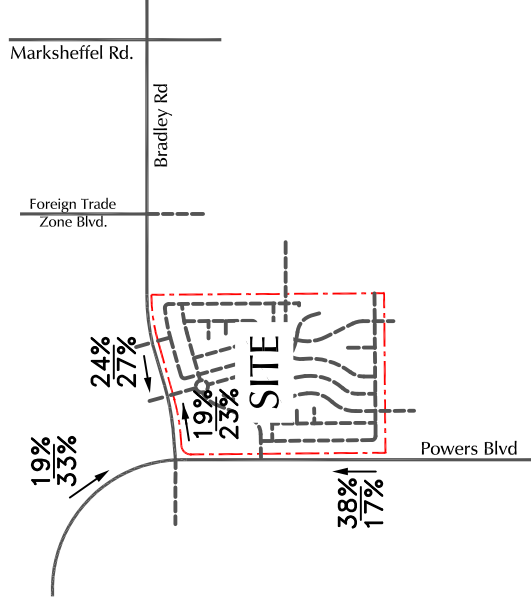


Figure 7e
East Area
Passby Distribution Estimate
Waterview Sketch Plan Amendment (LSC #164691)

Legend:
XX% AM passby distribution estimate
XX% PM passby distribution estimate





Approximate Scale
Scale: 1" = 1,200'

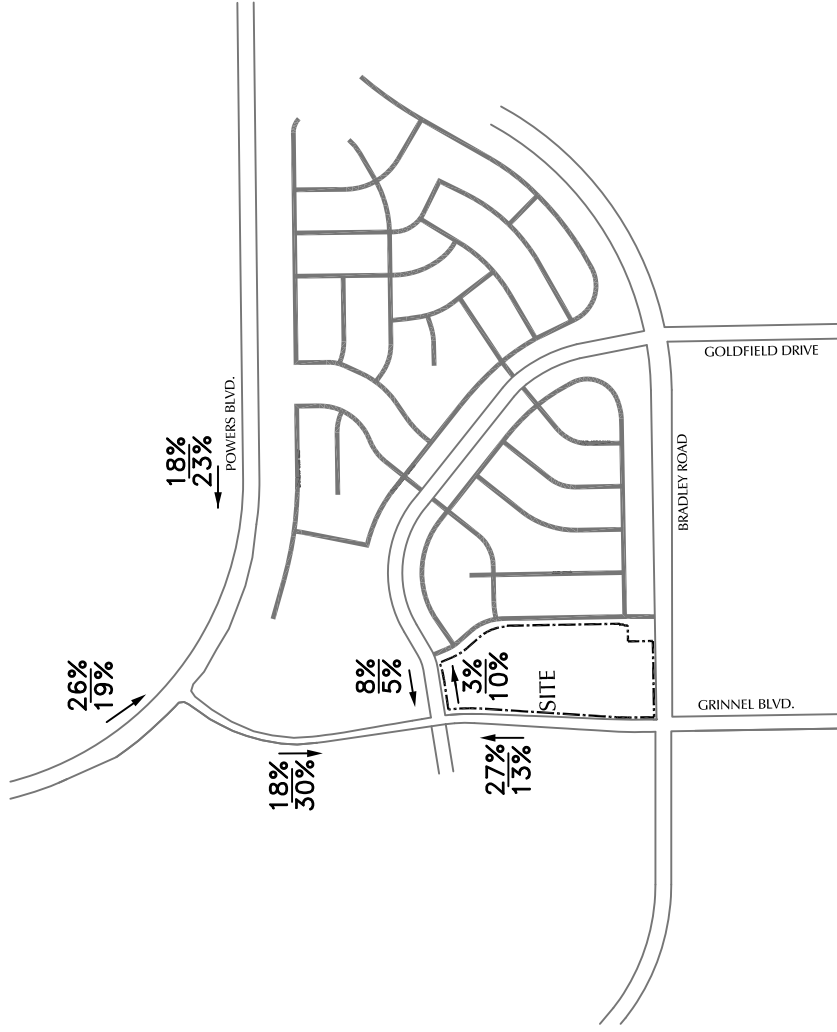


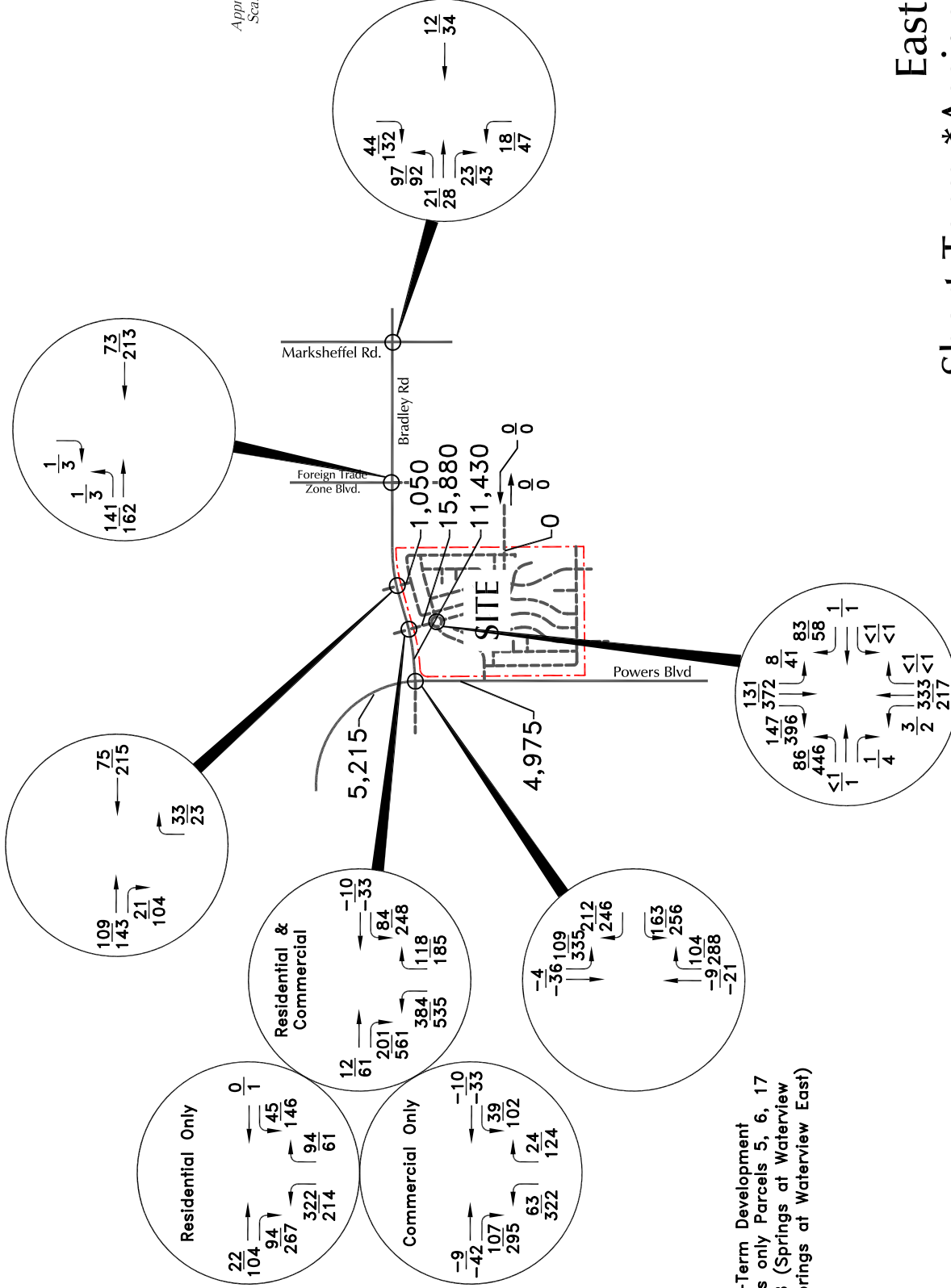
Figure 7w
West Area
Passby Distribution Estimate
Waterview Sketch Plan Amendment (LSC #164691)

Legend:
↑ XX% AM passby distribution estimate
↓ XX% PM passby distribution estimate





Approximate Scale
Scale: 1" = 3,000'



*Short-Term Development
Includes only Parcels 5, 6, 17
and 18 (Springs at Waterview
and Springs at Waterview East)

Legend:
 XX/XX - Weekday peak-hour traffic (vehicles per hour)
 X,XXX - Average weekday traffic (vehicles per day)



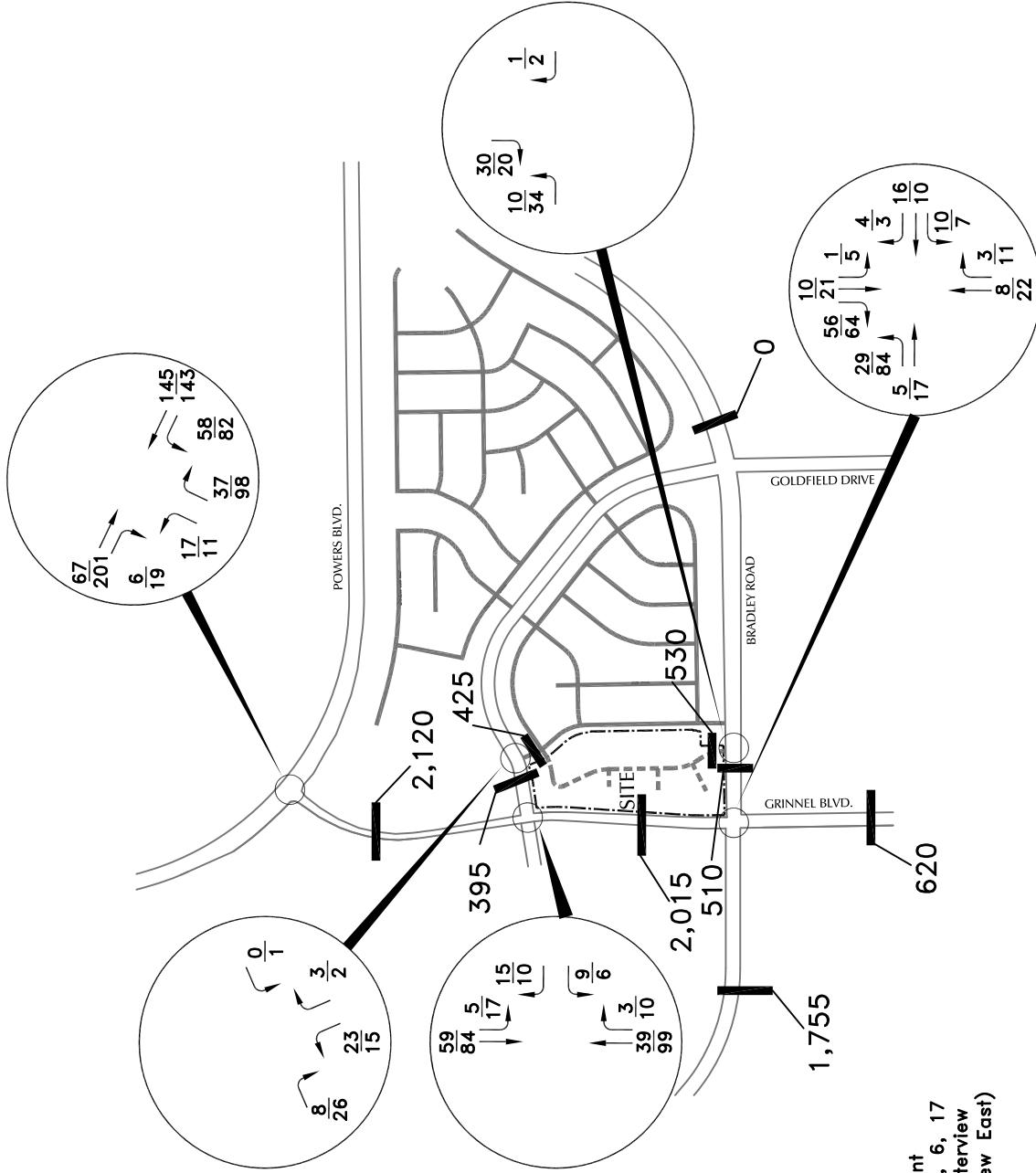
Figure 8e

East Area Short-Term *Assignment of Site-Generated Traffic

Waterview Sketch Plan Amendment (LSC #164691)



Approximate Scale
Scale: 1" = 1,200'



*Short-Term Development includes only Parcels 5, 6, 17 and 18 (Springs at Waterview and Springs at Waterview East)

Legend:
 XX XX - Weekday peak-hour traffic (vehicles per hour)
 X,XXX - Average weekday traffic (vehicles per day)



Figure 8w

West Area Short-Term *Assignment of Site-Generated Traffic

Waterview Sketch Plan Amendment (LSC #164691)



Approximate Scale
Scale: 1" = 3,000'

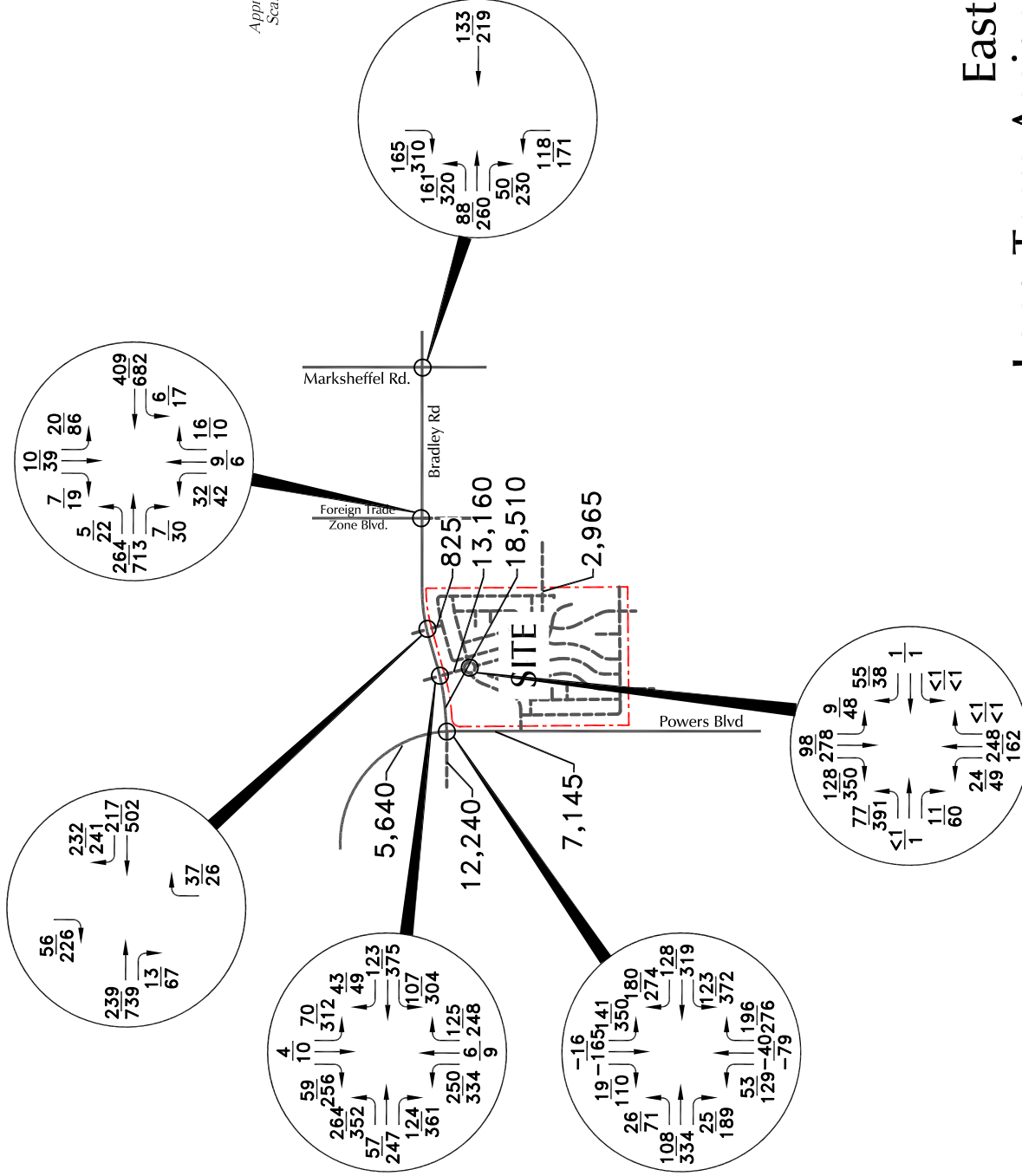


Figure 9e

East Area Long-Term Assignment of Site-Generated Traffic

Waterview Sketch Plan Amendment (LSC #164691)

Legend:
 XX/XX - Weekday peak-hour traffic (vehicles per hour)
 X,XXX - Average weekday traffic (vehicles per day)





Approximate Scale
Scale: 1" = 1,200'

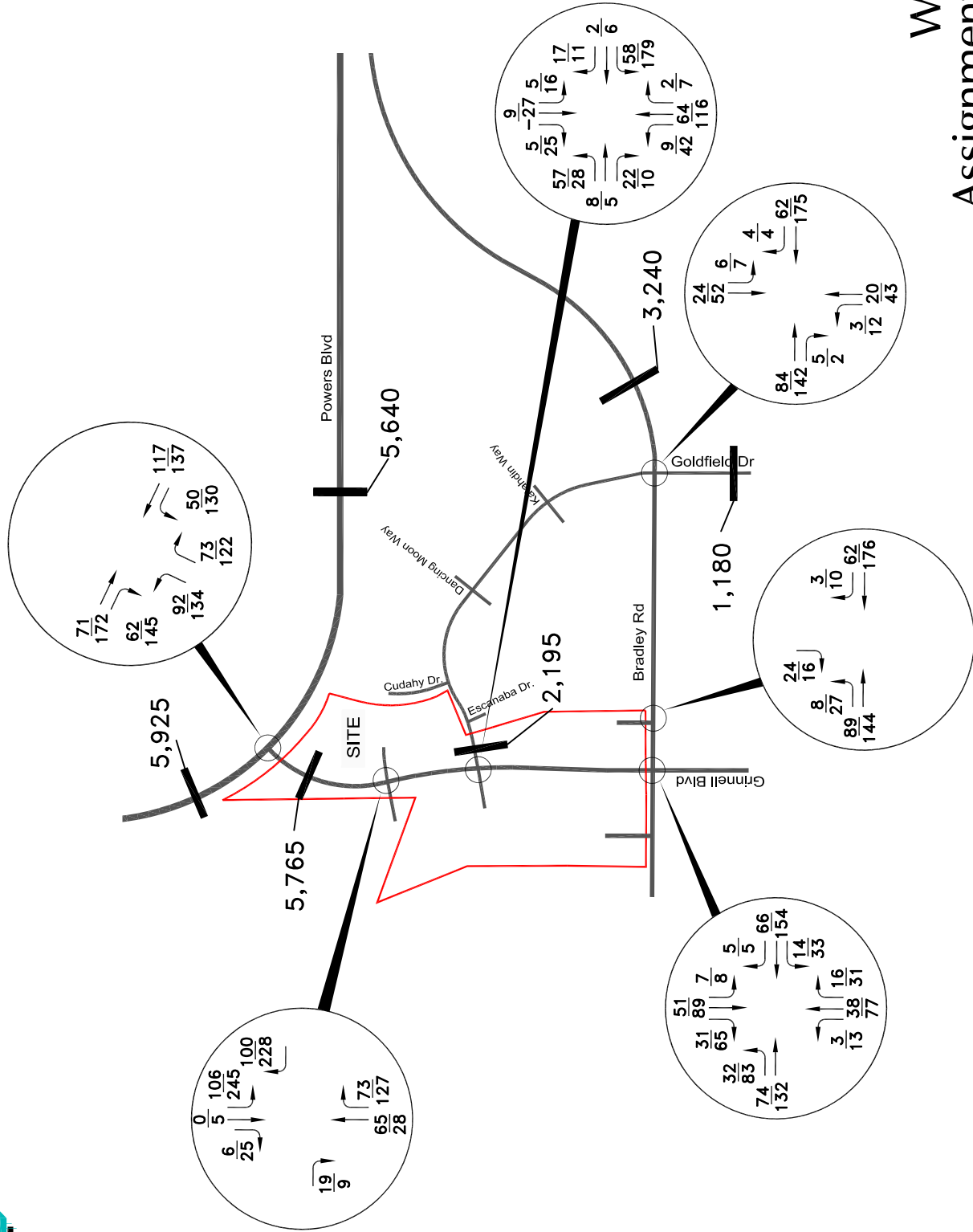


Figure 9w

West Area Assignment of Site- Generated Long-Term Traffic

Waterview Sketch Plan Amendment (LSC #164691)

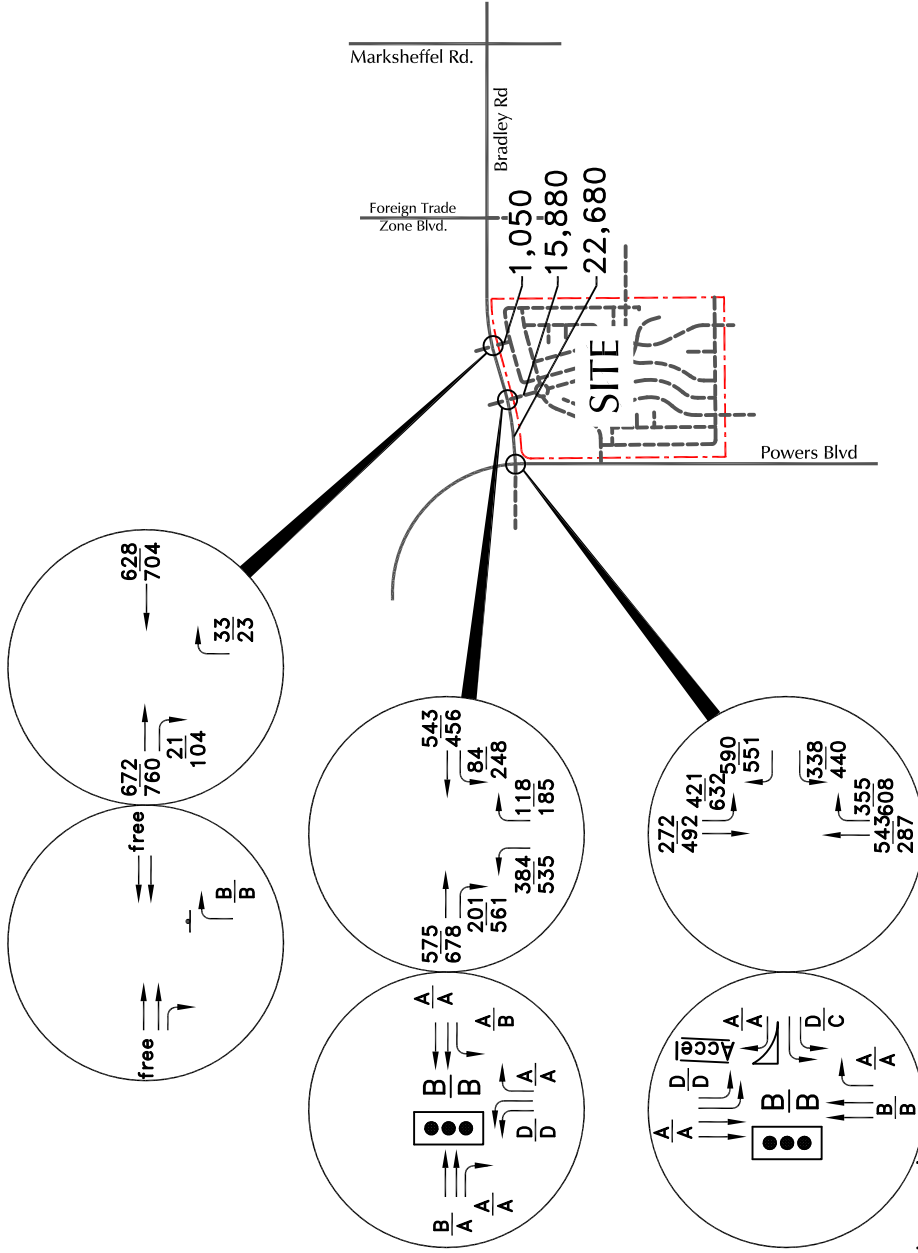
Legend:

XX/XX - Weekday peak-hour traffic (vehicles per hour)

X,XXX - Average weekday traffic (vehicles per day)



Approximate Scale
Scale: 1" = 3,000'



*Short-Term Development
includes only Parcels 5, 6, 17
and 18 (Springs at Waterview
and Springs at Waterview East)

Figure 10e

East Area 2017 Total Traffic*, Lane Geometry, Traffic Control and Level of Service

Waterview Sketch Plan Amendment (LSC #164691)

Legend:

↑ - Stop sign



- Traffic Signal

XX/XX - Weekday peak-hour traffic (vehicles per hour)

X,XXX - Average weekday traffic (vehicles per day)

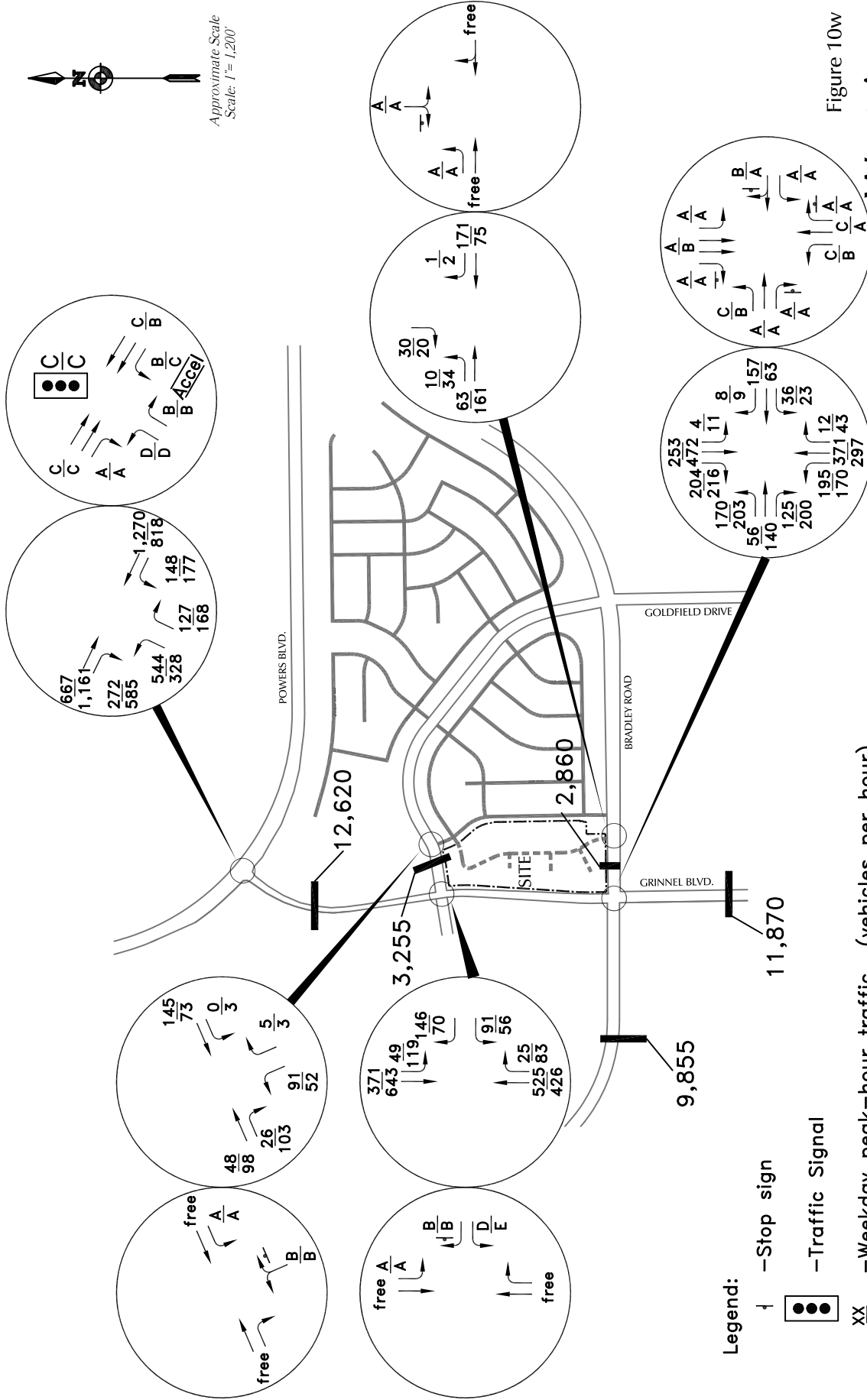
B/C - Individual movement peak-hour Level of Service

B/B - Entire intersection peak-hour Level of Service





Approximate Scale
Scale: 1" = 1,200'



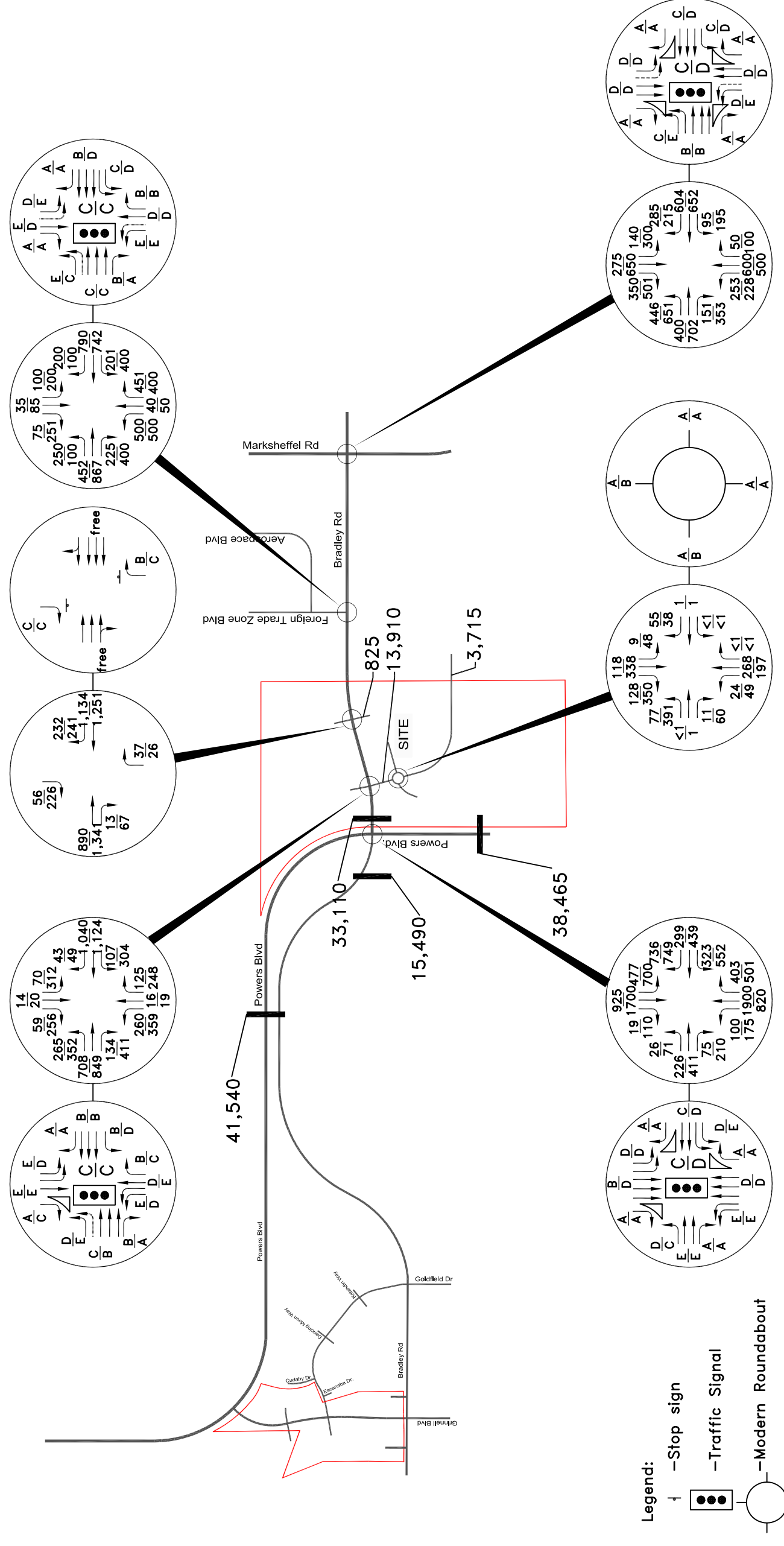
West Area 2017 Total Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview Sketch Plan Amendment (LSC #164691)





Approximate Scale
Scale: 1" = 2,000'



Legend:

↑ — Stop sign

⬢ — Traffic Signal

○ — Modern Roundabout

XX — Weekday peak-hour traffic (vehicles per hour)

X,XXX — Average weekday traffic (vehicles per day)

$\frac{B}{C}$ — Individual movement peak-hour Level of Service

$\frac{B}{B}$ — Entire intersection peak-hour Level of Service (weighted average of all movements)

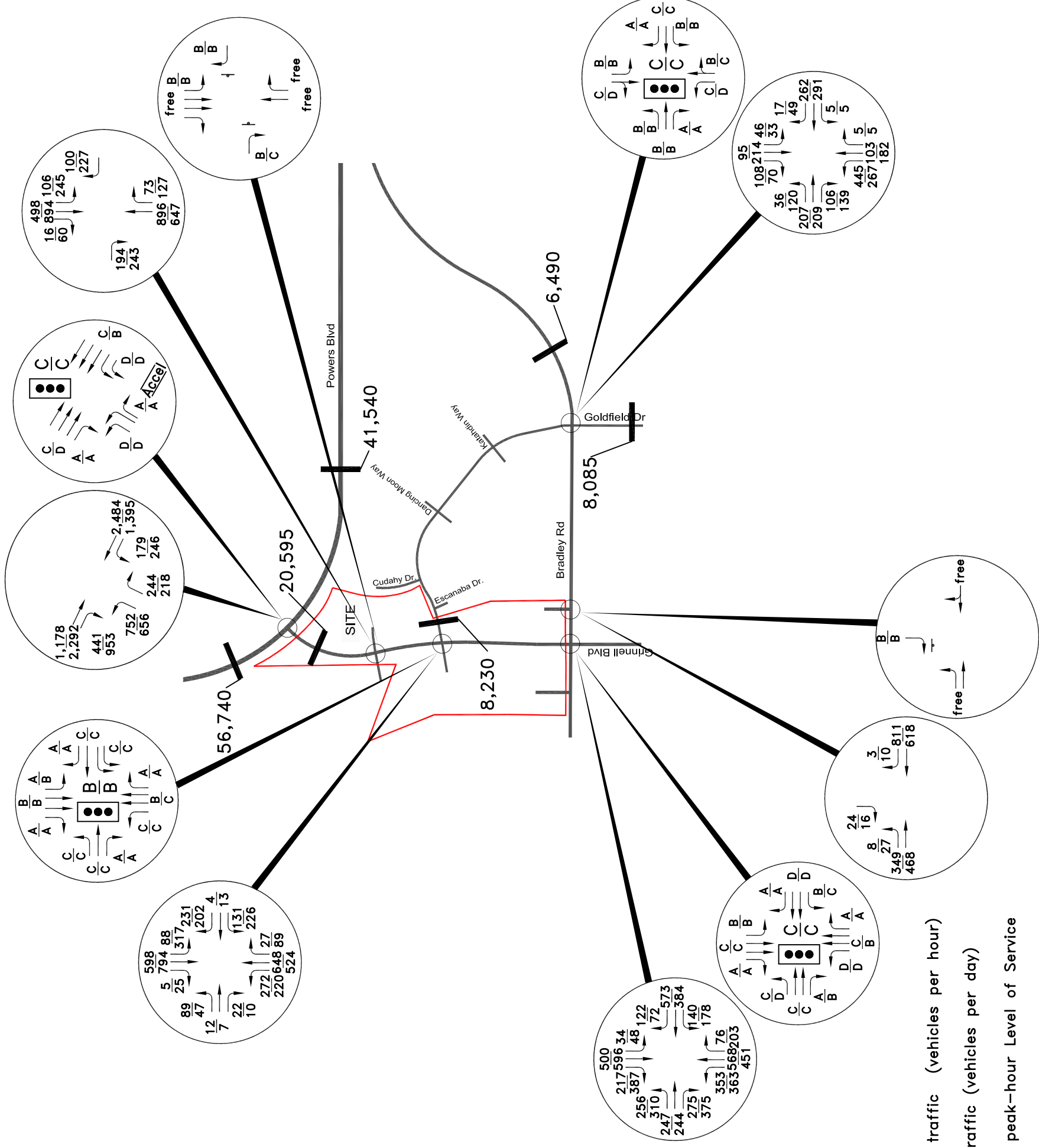
Figure 11e

East Area East Area 2040 Total Traffic, Lane Geometry, Traffic Control and Level of Service





Approximate Scale
Scale: 1" = 1,200'



- Legend:**
- ↑ - Stop sign
 - - Traffic Signal
 - XX - Weekday peak-hour traffic (vehicles per hour)
 - X,XXX - Average weekday traffic (vehicles per day)
 - $\frac{B}{C}$ - Individual movement peak-hour Level of Service
 - $\frac{B}{B}$ - Entire intersection peak-hour Level of Service (weighted average of all movements)

Figure 11w

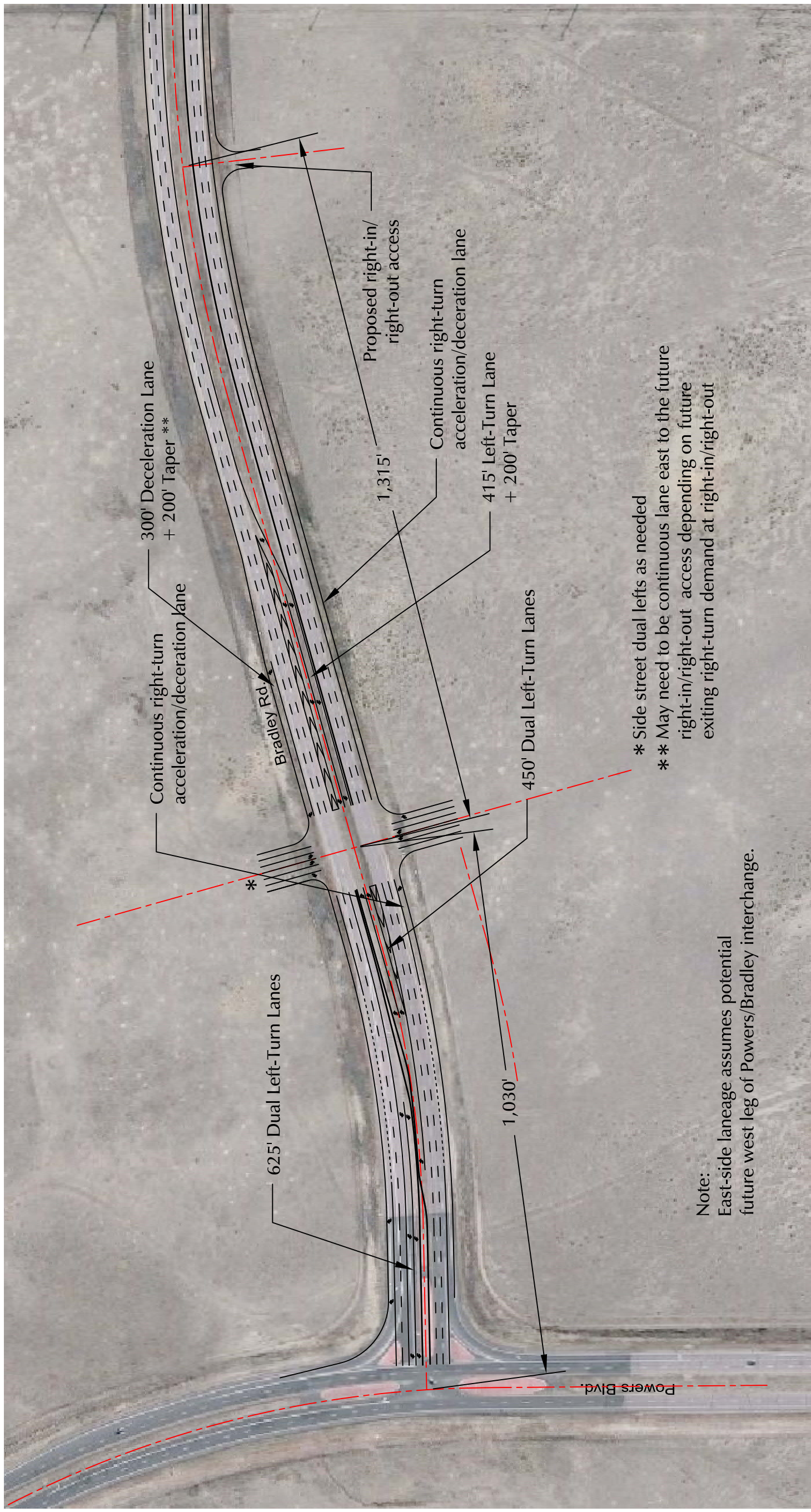
West Area 2040 Total Traffic, Lane Geometry, Traffic Control and Level of Service

Waterview Sketch Plan Amendment (LSC #164691)





Approximate Scale
Scale: 1" = 200'



- * Side street dual lefts as needed
- ** May need to be continuous lane east to the future right-in/right-out access depending on future exiting right-turn demand at right-in/right-out

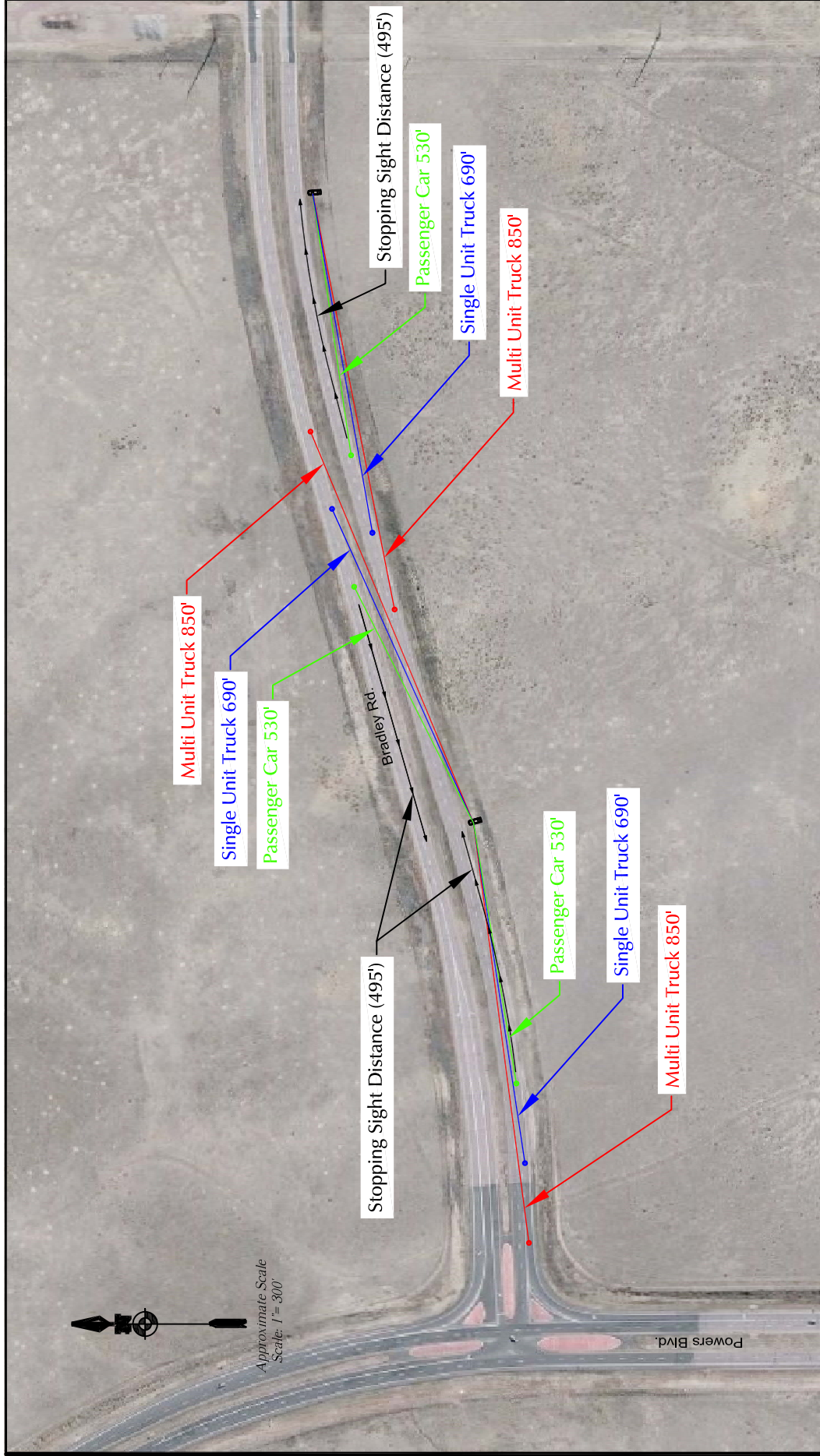
Note:
East-side laneage assumes potential future west leg of Powers/Bradley interchange.

Figure 13

Long-Term Bradley Road Lane Recommendations

Waterview Sketch Plan Amendment (LSC #164691)



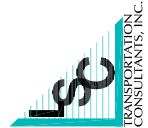


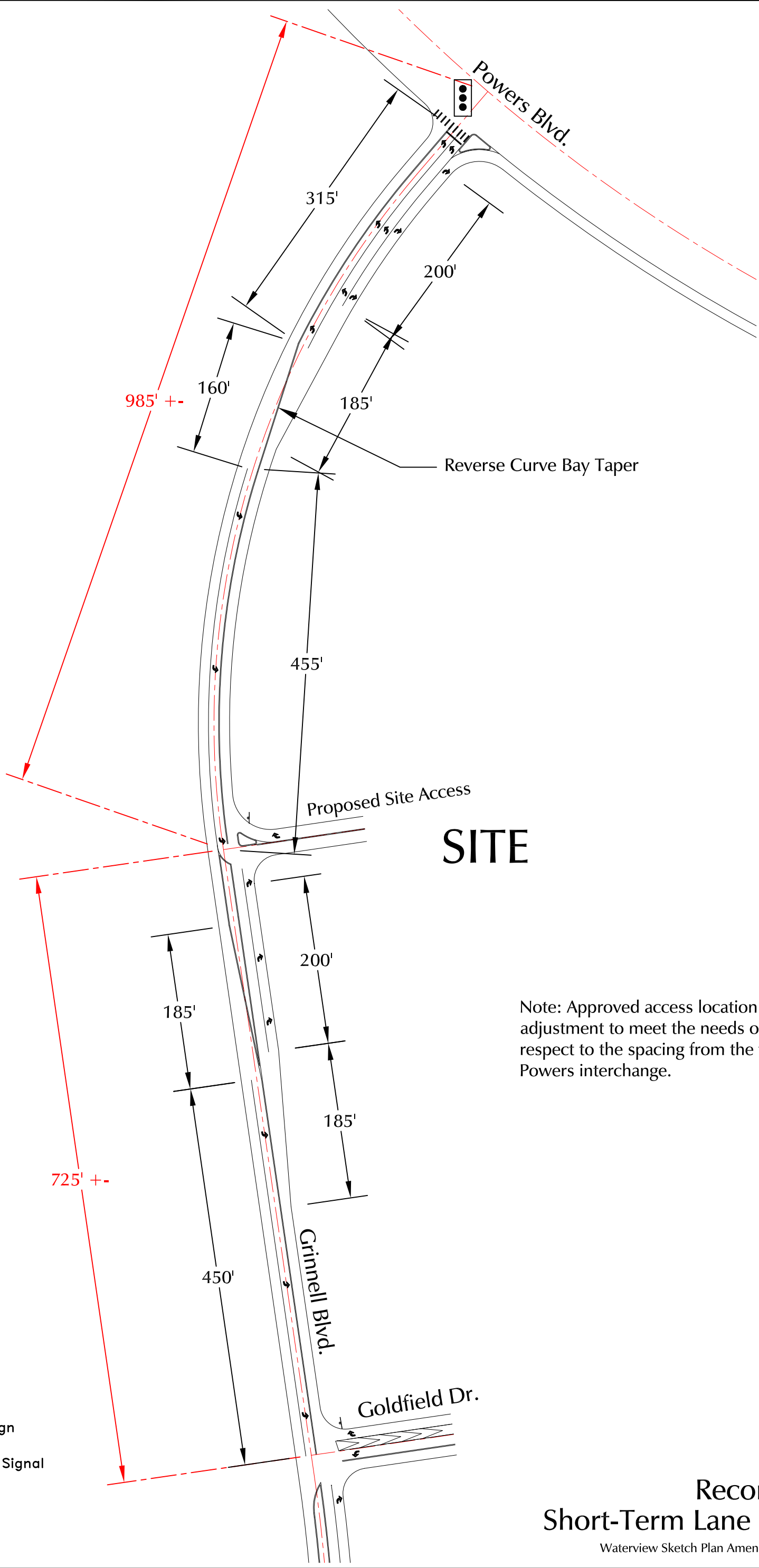
LEGEND:

- = Required intersection sight distance for passenger cars
- = Required intersection sight distance for single-unit trucks
- = Required intersection sight distance for multi-unit trucks
- = Required stopping sight distance

Based on a speed limit of 50mph (55mph design speed)

Figure 14
Sight Distance





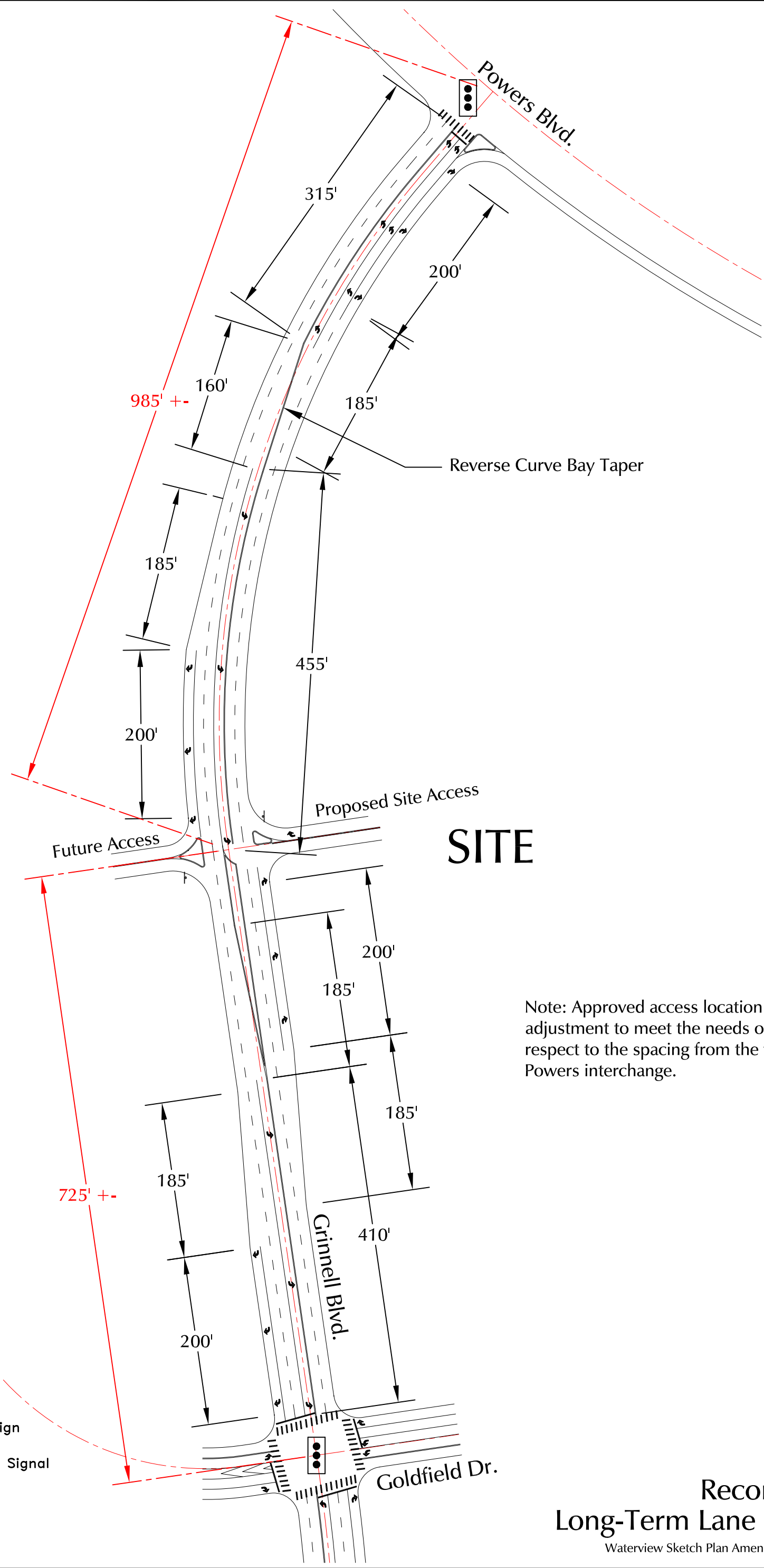
SITE

Note: Approved access location subject to adjustment to meet the needs of CDOT with respect to the spacing from the future Powers interchange.

- Legend:
- ⊥ - Stop sign
 - ◻ ● ● - Traffic Signal



Figure 15
Recommended Short-Term Lane Geometry
Waterview Sketch Plan Amendment (LSC #164691)



SITE

Note: Approved access location subject to adjustment to meet the needs of CDOT with respect to the spacing from the future Powers interchange.

- Legend:
- ⊥ - Stop sign
 - ⬢ - Traffic Signal



Figure 16
Recommended Long-Term Lane Geometry
Waterview Sketch Plan Amendment (LSC #164691)



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.:

D	E	V	I	7	0	0	6
---	---	---	---	---	---	---	---

General Property Information:

Address of Subject Property (Street Number/Name): N/A

Tax Schedule ID(s) #: 5507206036

Legal Description of Property: PARCEL A WATERVIEW PUMP STATION EXEMPTION PLAT, AS AMENDED BY AFFIDAVIT OF CORRECTION REC #216083733

Subdivision or Project Name: Springs at Waterview

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

Specific Criteria from Which a Deviation is Sought: Access spacing along a Major Collector roadway. On Major Collector roadways, the closest local roadway intersection to an arterial roadway shall be 660 feet (right of way line of Arterial to centerline of local roadway).

Proposed Nature and Extent of Deviation: Request for interim three-quarter movement (left-in/right-in/right-out) access point to Bradley Road approximately 505 east of Grinnell Boulevard (centerline spacing) to provide a second access to the proposed residential development north of Bradley Road. The Collector classification of Bradley Road in this location is per the approved Sketch Plan. The three quarter access is labeled as "interim" because the applicant is agreeable to the access being restricted in the future to right-in/right-out if Bradley Road is connected between Powers and Goldfield Drive.

Applicant Information:

Applicant: FRANK W HOWARD #2 LIMITED PARTNERSHIP LLLP

Email Address:

Applicant is: Owner Consultant Contractor

Mailing Address:

State: CO

Postal Code:

Telephone Number:

Fax Number:

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.D.1

Specific Criteria from Which a Deviation is Sought: Access spacing along a Major Collector roadway. On Major Collector roadways, the closest local roadway intersection to an arterial roadway shall be 660 feet (right of way line of Arterial to centerline of local roadway).

Proposed Nature and Extent of Deviation: Request for three-quarter movement (left-in/right-in/right-out) access point to Bradley Road approximately 505 feet east of Grinnell Boulevard (centerline spacing) to provide a second access to the proposed residential development north of Bradley Road. The Collector classification of Bradley Road in this

El Paso County Procedures Manual

Procedure # R-FM-051-07

Issue Date: 12/31/07

Revision Issued: 00/00/00

SF-16-017

location is per the approved Sketch Plan. The three quarter access is labeled as "interim" because the applicant is agreeable to the access being restricted in the future to right-in/right-out if Bradley Road is connected between Powers and Goldfield Drive.

Reason for the Requested Deviation: The deviation is requested to provide a second point of access to the proposed residential development to be located east of Grinnell Boulevard, south of Goldfield Drive, west of Escanaba Drive and north of Bradley Road. The primary access would be to Escanaba Drive near the north end of the site. The deviation is requested as the required grading to provide a secondary access to Escanaba at the south end of the site would be cost-prohibitive and an undue hardship to the applicant. The estimated additional cost associated with a second access to Escanaba versus a second access to Bradley Road would be \$400,000 to \$500,000. Please refer to attached Exhibits A and B.

Comparison of Proposed Deviation to ECM Standard: The requested accesses would be approximately 505 feet east of Grinnell Boulevard (centerline spacing). The ECM criteria for a Major Collector is 660 feet from the right of way line of Arterial to centerline of local roadway (this proposed access). The distance from the centerline of Grinnell to the ROW line is about 75 feet - therefore the ECM required centerline spacing would be 735 feet.

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.

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 cost of required site grading to provide a secondary access to Escanaba at the south end of the site would be cost-prohibitive and an undue hardship to the applicant. The estimated additional cost associated with a second access to Escanaba versus a second access to Bradley Road would be \$400,000 to \$500,000. Please refer to attached Exhibits A and B.

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.

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 based on the need to provide a second access to the proposed residential development.

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

The intersection spacing would be sufficient to provide back-to-back left-turn lanes with sufficient vehicle stacking distances on Bradley Road for a westbound left-turn lane approaching Grinnell Boulevard and an eastbound left-turn lane (in the form of a striped two-way center left turn lane) approaching the proposed three-quarter movement access. The southbound left movement would be prohibited via a raised right turn channelizing island and no-left-turn signage/pavement markings.

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 posted speed limit is 35 mph. The intersection spacing would be sufficient. The intersection spacing would be sufficient to provide back-to-back left-turn lanes with sufficient vehicle stacking distances on Bradley Road for a westbound left-turn lane approaching Grinnell Boulevard and an eastbound left-turn lane (in the form of a striped two-way center left turn lane) approaching the proposed three-quarter movement access. The southbound left movement would be prohibited via a raised right turn channelizing island and no-left-turn signage/pavement markings. The applicant is agreeable to the access being restricted in the future to right-in/right-out if Bradley Road is connected between Powers and Goldfield Drive.

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

The right turn channelizing island may require some minor maintenance with signs, striping and curb repairs.

The deviation will not adversely affect aesthetic appearance.

The access would not adversely affect aesthetic appearance.

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

12/20/16
Date

Signature of applicant (if different from owner)

12/20/16
Date

Signature of Engineer

12/20/16
Date

Engineer's Seal



Review and Recommendation:

APPROVED by the ECM Administrator *W/CONDITION NOTED BELOW.*

Date *15 MARCH 2017*

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

X CONDITION OF DEVIATION APPROVAL:
3/4 ACCESS MAY BE FURTHER RESTRICTED IF BRADLEY ROAD
IS CONNECTED BETWEEN POWERS BLVD & GOLDFIELD DRIVE OR AS
DETERMINED BY THE COUNTY ENGINEER.

____ Additional comments or information are attached.

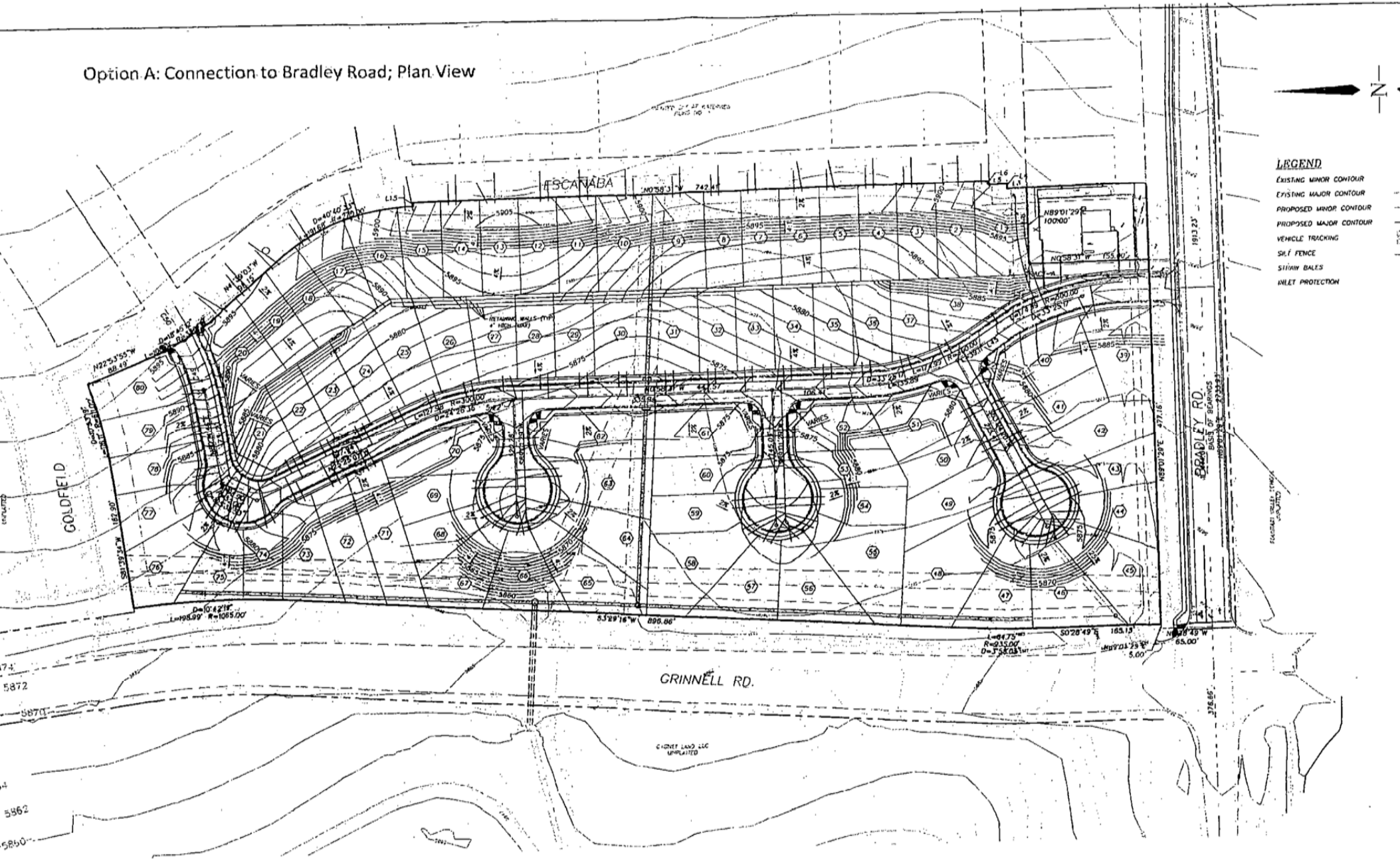
DENIED by the ECM Administrator

_____ 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.

Option A: Connection to Bradley Road; Plan View



- LEGEND**
- EXISTING MINOR CONTOUR
 - EXISTING MAJOR CONTOUR
 - PROPOSED MINOR CONTOUR
 - PROPOSED MAJOR CONTOUR
 - VEHICLE TRACKING
 - SLIT FENCE
 - STRAW BALES
 - INLET PROTECTION

THE OWNER WILL COMPLY WITH THE REQUIREMENTS OF THE EROSION CONTROL PLAN.

OWNER/REPRESENTATIVE _____ DATE _____
 COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEMENTS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.
 FILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE COLORADO COUNTY LAND DEVELOPMENT CODE, ORDINANCE CRITERIA, AND ENGINEERING CRITERIA MANUAL AS APPLICABLE.

JENNIFER SWINE, P.E. _____ DATE _____
 COUNTY ENGINEER/TECH ADMINISTRATOR

REVISIONS:	
NO.	DESCRIPTION

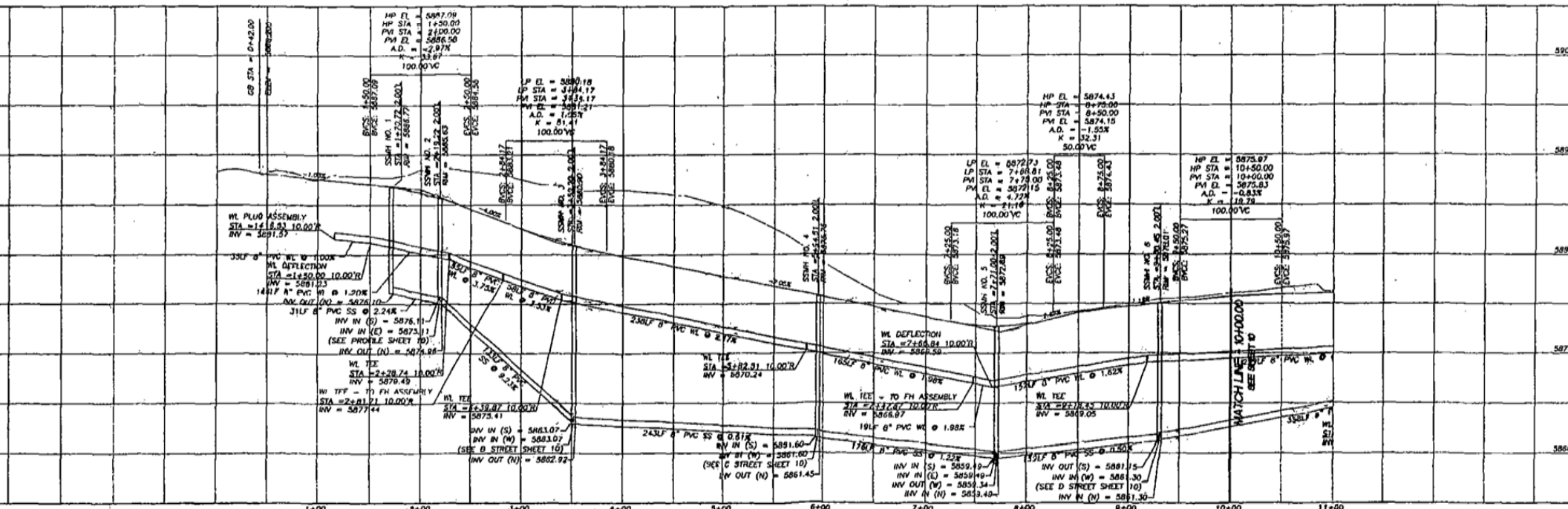
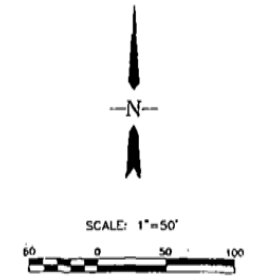
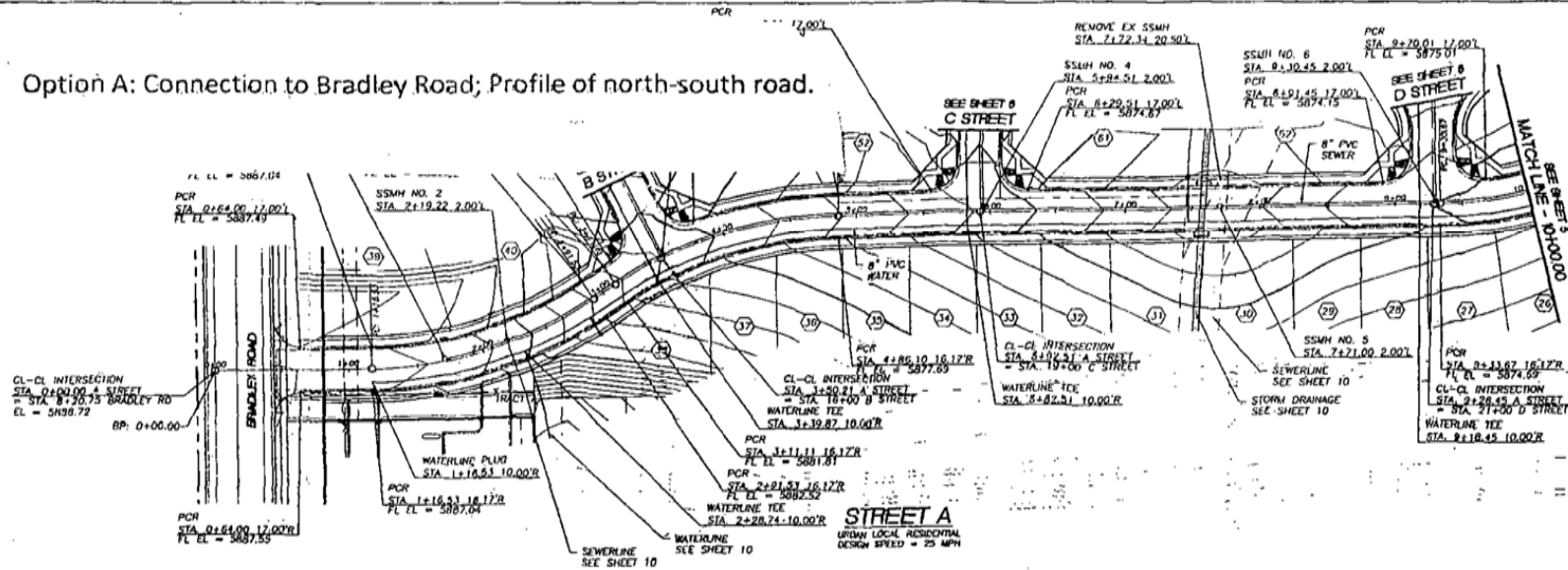
ENGINEER: DESIGNED BY: PAK/BG DATE: 8-27-18
 DRAWN BY: JJM/BG DATE: 9-3-18
 CHECKED BY: PAK DATE: 9-20-18
 48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
8-1-1
 CITY OF COLORADO SPRINGS DEPT. OF UTILITIES
 GAS, ELECTRIC, WATER AND WASTEWATER

DSB *Dakota Springs Engineering*
 PROJECT: THE SPRINGS AT WATERVIEW
 SHEET TITLE: GRANNIS & EROSION CONTROL PLAN
 FROM 0/a TO 0/a
 JOB NO. 0001-02-18-01 SHEET 9 OF 9

THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER THE DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SOAK PLANS HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENCE, ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARING THIS PLAN.

31 W. TEACH
 COLORADO SPRING
 P. (719)
 F. (719)

Option A: Connection to Bradley Road; Profile of north-south road.

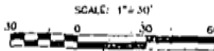
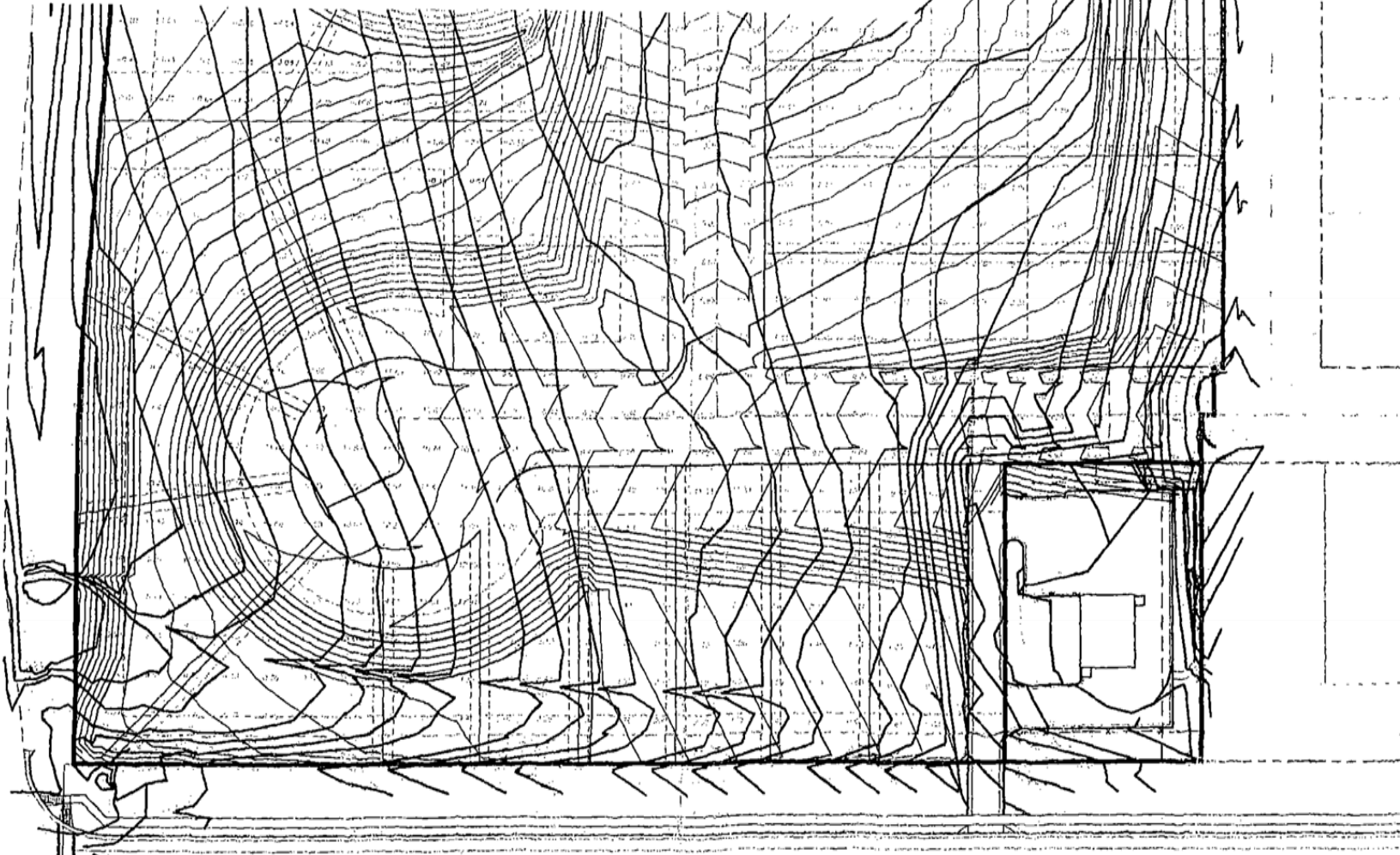


DESIGN: _____ DATE: _____ OUTTER REVIEW: _____ DATE: _____ DESIGN DRAINAGE BASIN: _____ ACCORDANCE WITH SECTION 15-3-906 RADO SPRINGS 1980, AS AMENDED DATE: _____	DESIGN DATA: SIDEWALKS: WIDTH 5' LOCATION: ATTACHED # DETACHED: 6" FROM P/L 0 CURB TYPE 1.0 TO 3.0 R/W WIDTH 30' +/- F/C STREET TYPE HYVEM	ASPHALT THICKNESS: AC SURFACE _____ AC BASE _____ AGGREGATE BASE THICKNESS: CLASS 8 _____ CLASS 5 _____ CLASS 2 _____	SCALE: HORIZONTAL 1"=50' VERTICAL 1"=5' BENCH MARK: _____	REVISIONS: <table border="1"> <thead> <tr> <th>NO</th> <th>DESCRIPTION</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	NO	DESCRIPTION	DATE							ENGINEER: _____ DATE: 8-27-18 DESIGNED BY: PAK/AG DRAWN BY: JBL/BO DATE: 8-27-18 CHECKED BY: BAR DATE: 8-20-18 48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS 8-1-1 CITY OF COLORADO SPRINGS DEPT. OF UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER	PROJECT: THE SPRINGS AT WATERVIEW SHEET TITLE: PLAN & PROFILE - STREET A FROM: 0+00.00 TO: 10+00.00 JOB NO. 0001-02-18-01 SHEET 4 OF 19
	NO	DESCRIPTION	DATE												

Option B: Connection to Escanaba (If Bradley Road Deviation is not approved);
Plan View

Additional "cut" on property of 39,000 yards

Additional Import of 32,000 yards.

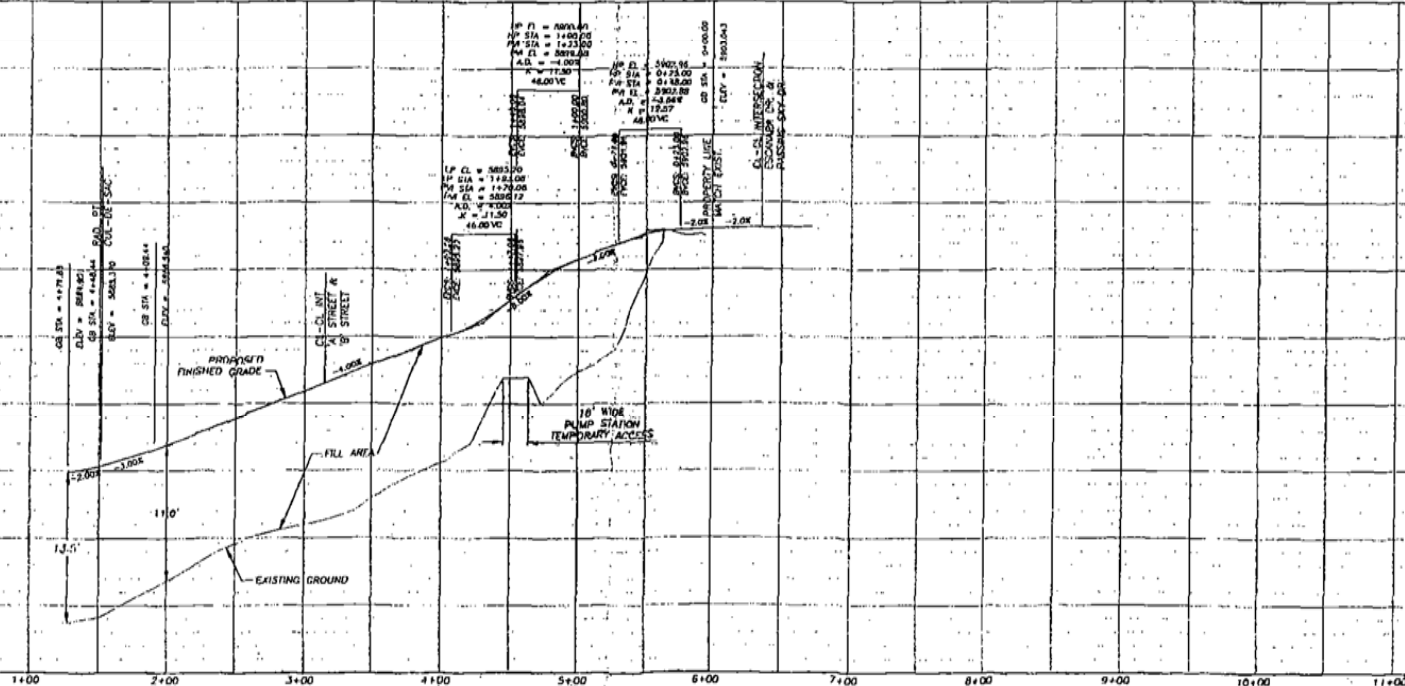
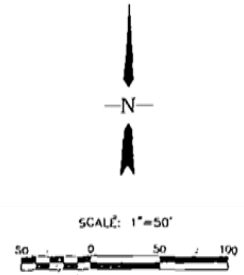
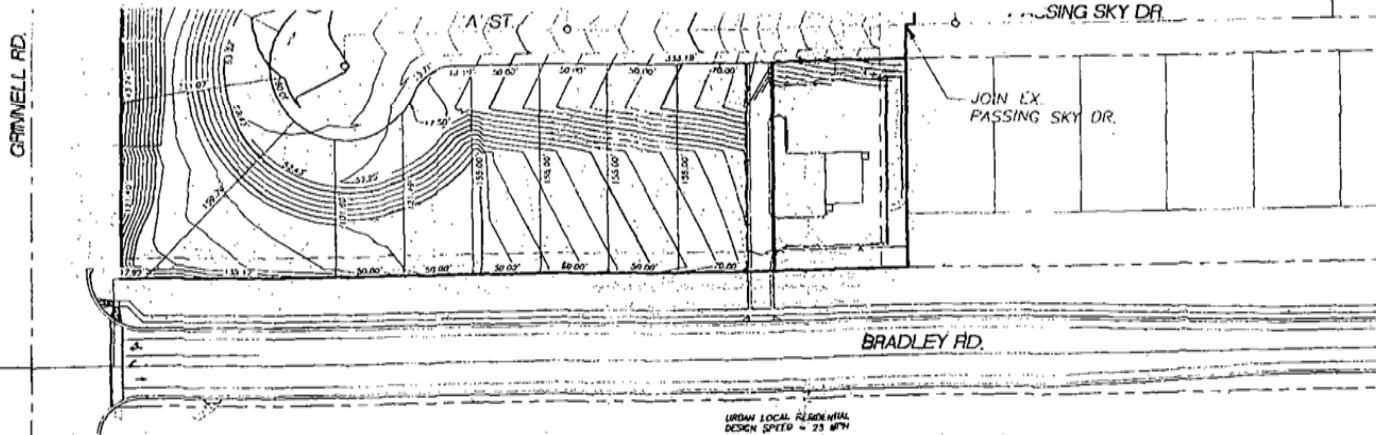


REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER: DESIGNED BY: EAK DATE: 12-8-16
 DRAWN BY: JBL DATE: 12-7-16
 CHECKED BY: EAK DATE: 12-8-16
 48 HOURS BEFORE YOU DIG.
 CALL UTILITY LOCATORS
 8-1-1
 CITY OF COLORADO SPRINGS DEPT. OF UTILITIES
 GAS, ELECTRIC, WATER AND WASTEWATER

DSE *Colorado Springs*
Engineering
 31 N. H. ROAD, SUITE 500
 COLORADO SPRINGS, CO 80903
 P: (719) 593-2380
 F: (719) 593-2382
 PROJECT: THE SPRINGS AT WATERVIEW
 SHEET TITLE: DBASE COMPARISON EXHIBIT
 FROM: D2a TO: D/S
 JOB NO.: DD01-02-16-01 SHEET: 1 OF 1

Option B: Connection to Escanaba (If Bradley Road Deviation is not approved);
 Profile View of Connector Road to Escanaba



DESIGN: CUTTER REVIEW _____ DATE: _____ VIEW _____ DATE: _____	DESIGN DATA: SIDEWALKS: WIDTH 5' LOCATION: ATTACHED R DETACHED, 6" FROM P/S 0 CURB TYPE 1 0 2 0 3 0 R/W WIDTH 50' F/C F/C STREET TYPE FREEWAY	ASPHALT THICKNESS: AC SURFACE _____ AC BASE _____ AGGREGATE BASE THICKNESS: CLASS 6 _____ CLASS 5 _____ CLASS 2 _____	SCALE: HORIZONTAL: 1"=50' VERTICAL: 1"=5' BENCH MARK:	ENGINEER: DESIGNED BY: PAK/BS. DATE: 8-27-18	PROJECT: THE SPRINGS AT WATERVIEW
				DRAWN BY: JMW/BS. DATE: 8-27-18	
DESIGN: DRAINAGE BASIN _____ DATE: _____ ACCORDANCE WITH SECTION 15-3-906 ROAD SPRINGS 1980, AS AMENDED				CHECKED BY: PAK. DATE: 9-20-18	FROM: 0+00.00 TO: 10+00.00
				48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATIONS 888-8-1-1	JOB NO. 0001-02-16-01 SHEET 4 OF 19
				CITY OF COLORADO SPRINGS DEPT. OF UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER	31 N. ROCKY MOUNTAIN BLVD. COLORADO SPRINGS, CO 80904 (719) 277-2300

Appendix Table 1
Trip Generation Estimate
Hassell Parcel
El Paso County Assessor Schedule Number 6501400009

Land Use Code	Land Use Description	Trip Generation Units	Trip Generation Rates ⁽¹⁾				Total Trips Generated					
			Average Weekday Traffic	Morning Peak Hour		Afternoon Peak Hour		Average Weekday Traffic	Morning Peak Hour		Afternoon Peak Hour	
				In	Out	In	Out		In	Out	In	Out
210	Single-Family Detached Housing	87 DU ⁽²⁾	9.52	0.19	0.56	0.63	0.37	828	16	49	55	32
230	Residential Condominium/Townhouse	61 DU	5.81	0.07	0.37	0.35	0.17	354	5	22	21	10
								1,182	21	71	76	42

Notes:

(1) Source: "Trip Generation, 9th Edition, 2012" by the Institute of Transportation Engineers (ITE)

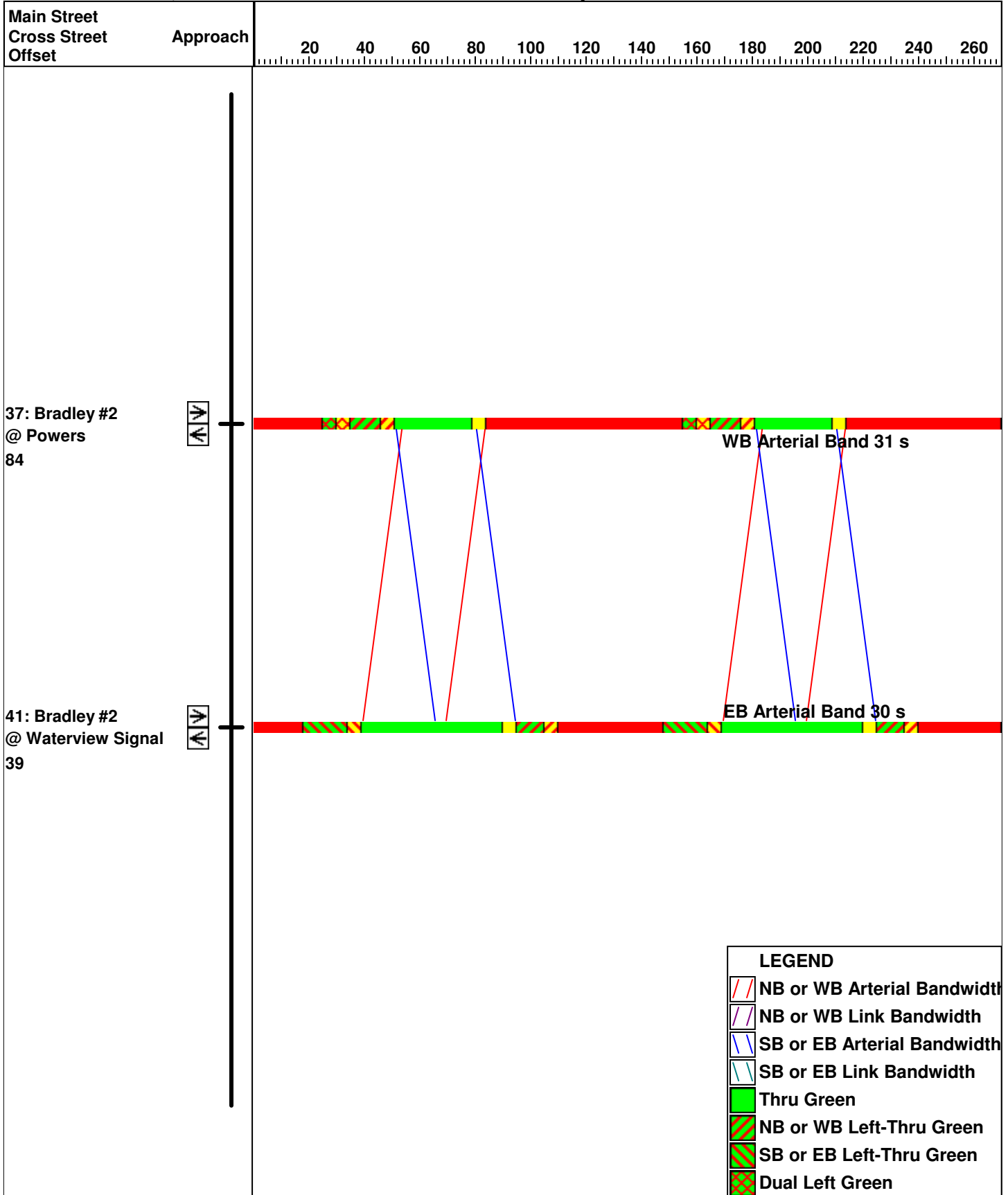
(2) DU = dwelling unit

Source: LSC Transportation Consultants, Inc.

Exhibit 1A

Arterial Bandwidths, Maximum Green Times Powers and Access Only

2040 Total PM Peak Hour



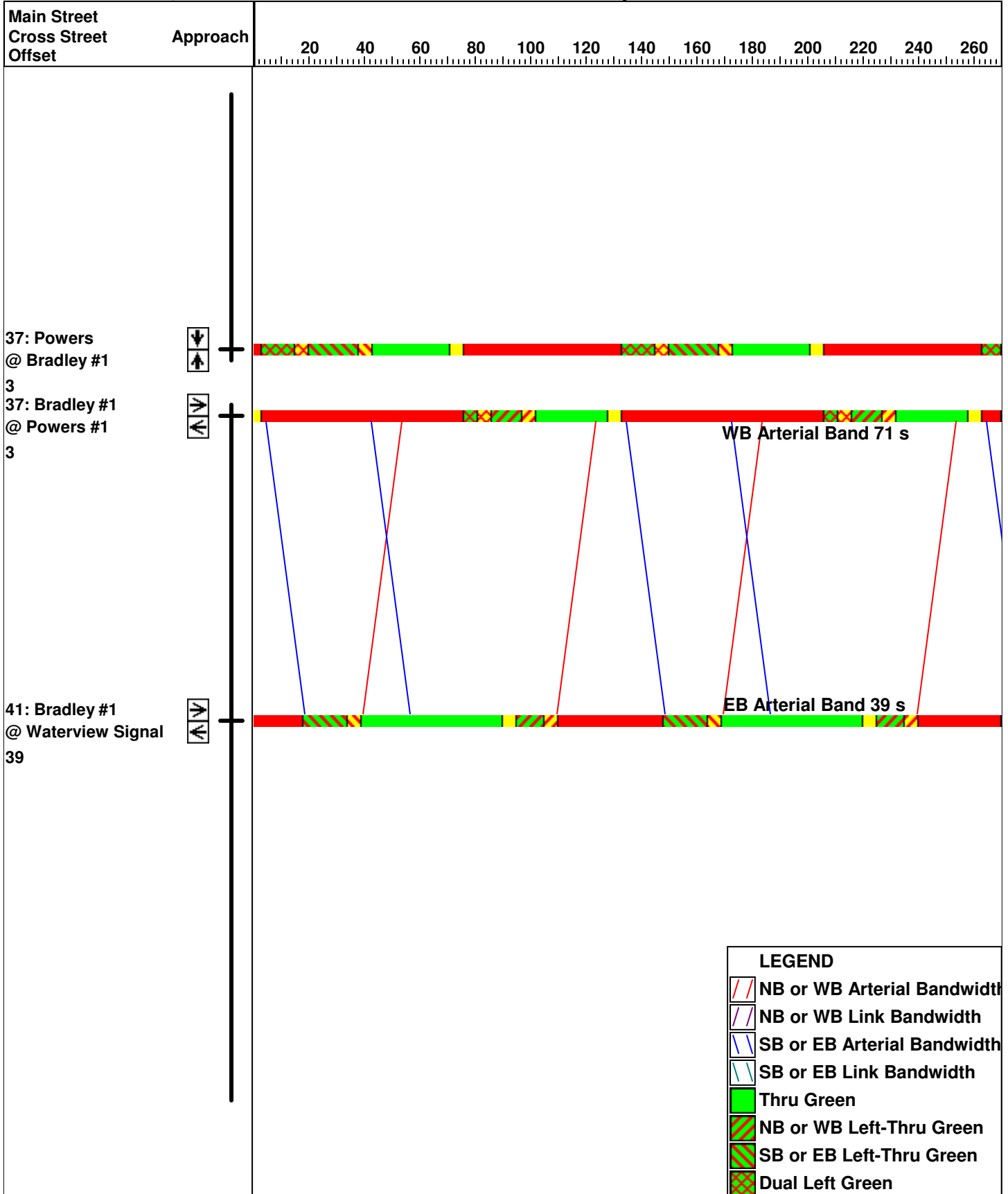
2040 Total PM Peak Hour

KDF

Exhibit 1B

Arterial Bandwidths, Maximum Green Times SB LT @ Powers Access Only

2040 Total PM Peak Hour

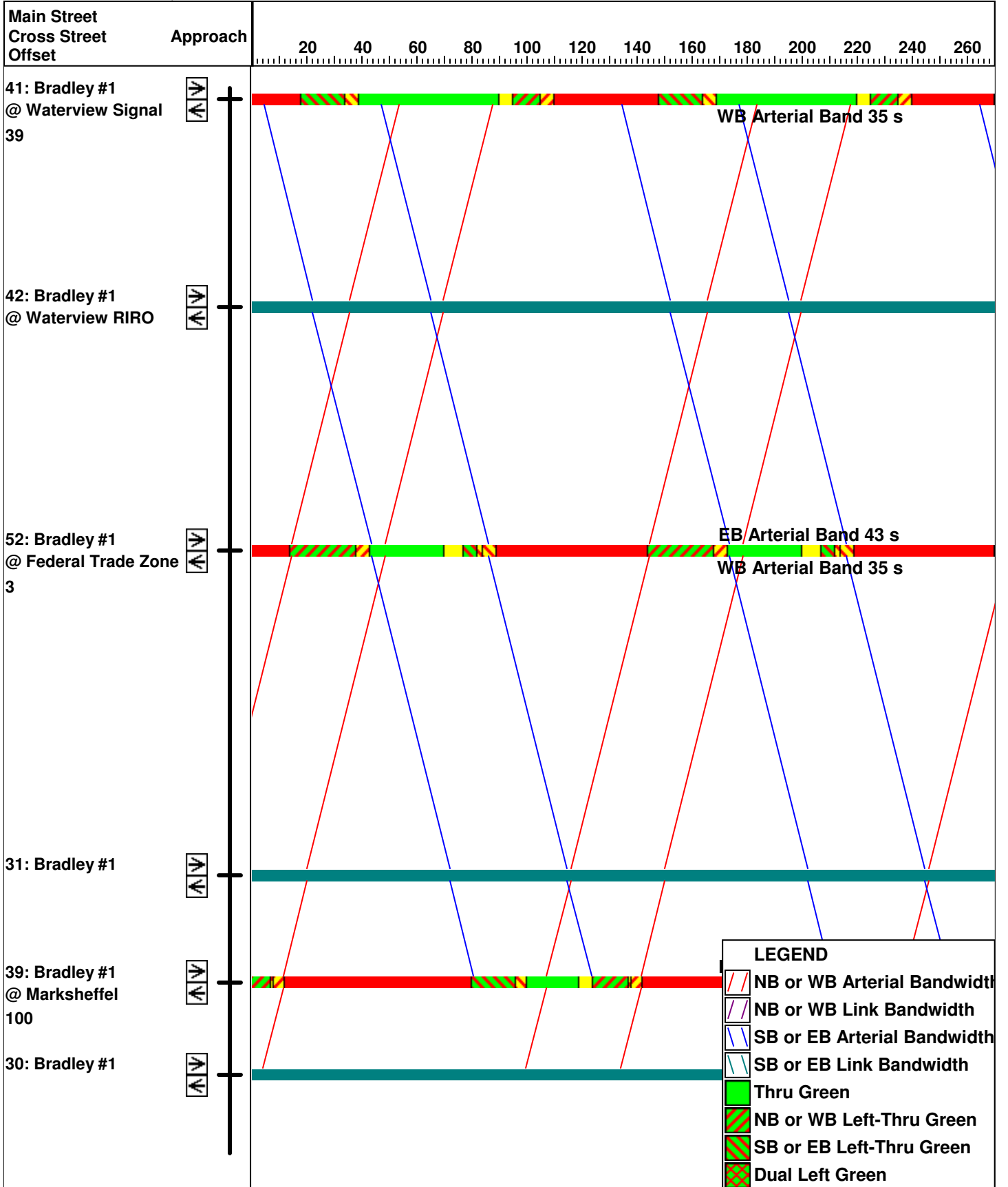


2040 Total PM Peak Hour

KDF

Exhibit 2A
Arterial Bandwidths, Maximum Green Times Without Powers

2040 Total PM Peak Hour



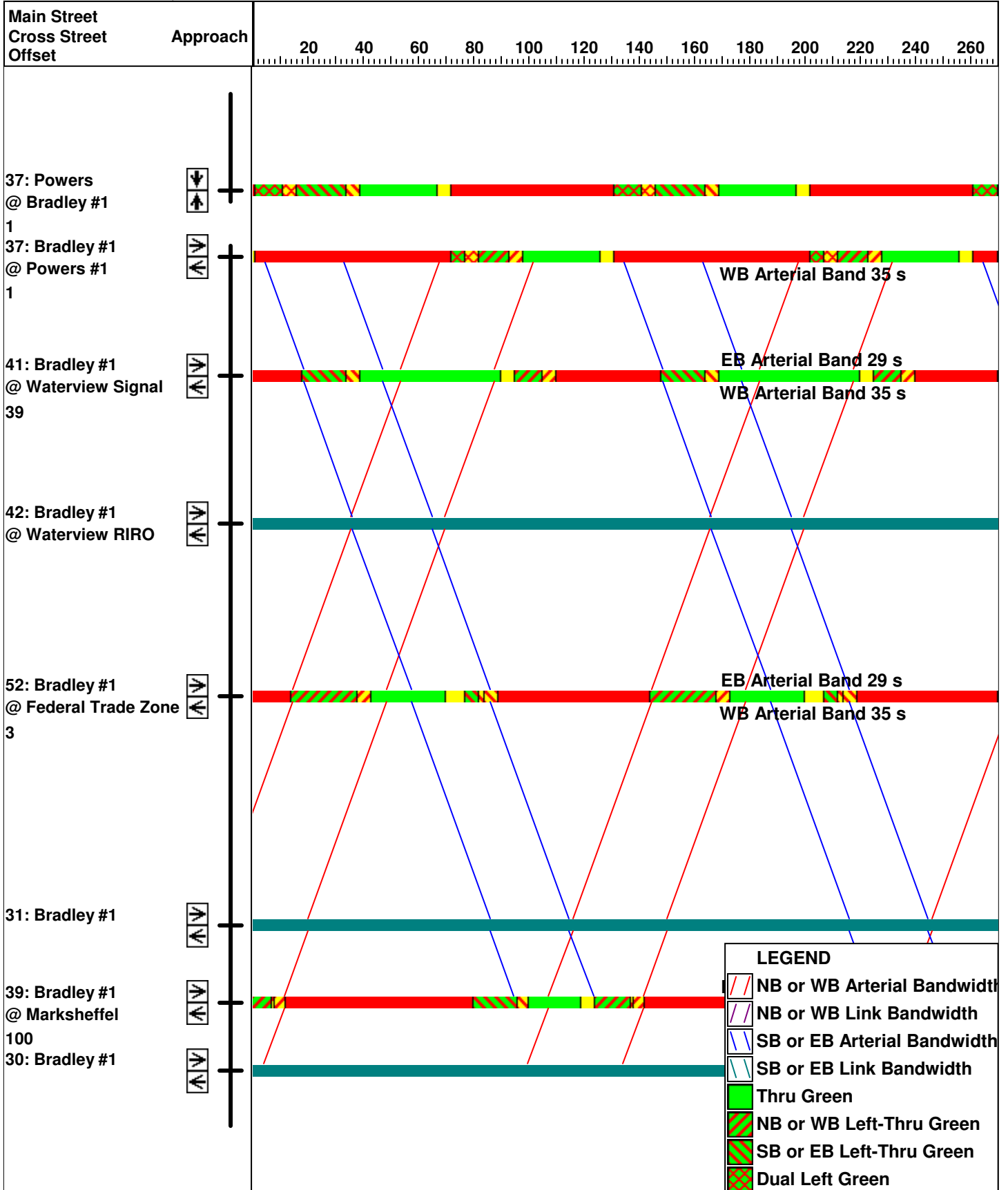
2040 Total PM Peak Hour

KDF

Exhibit 2B

Arterial Bandwidths, Maximum Green Times From SB LT @ Powers

2040 Total PM Peak Hour



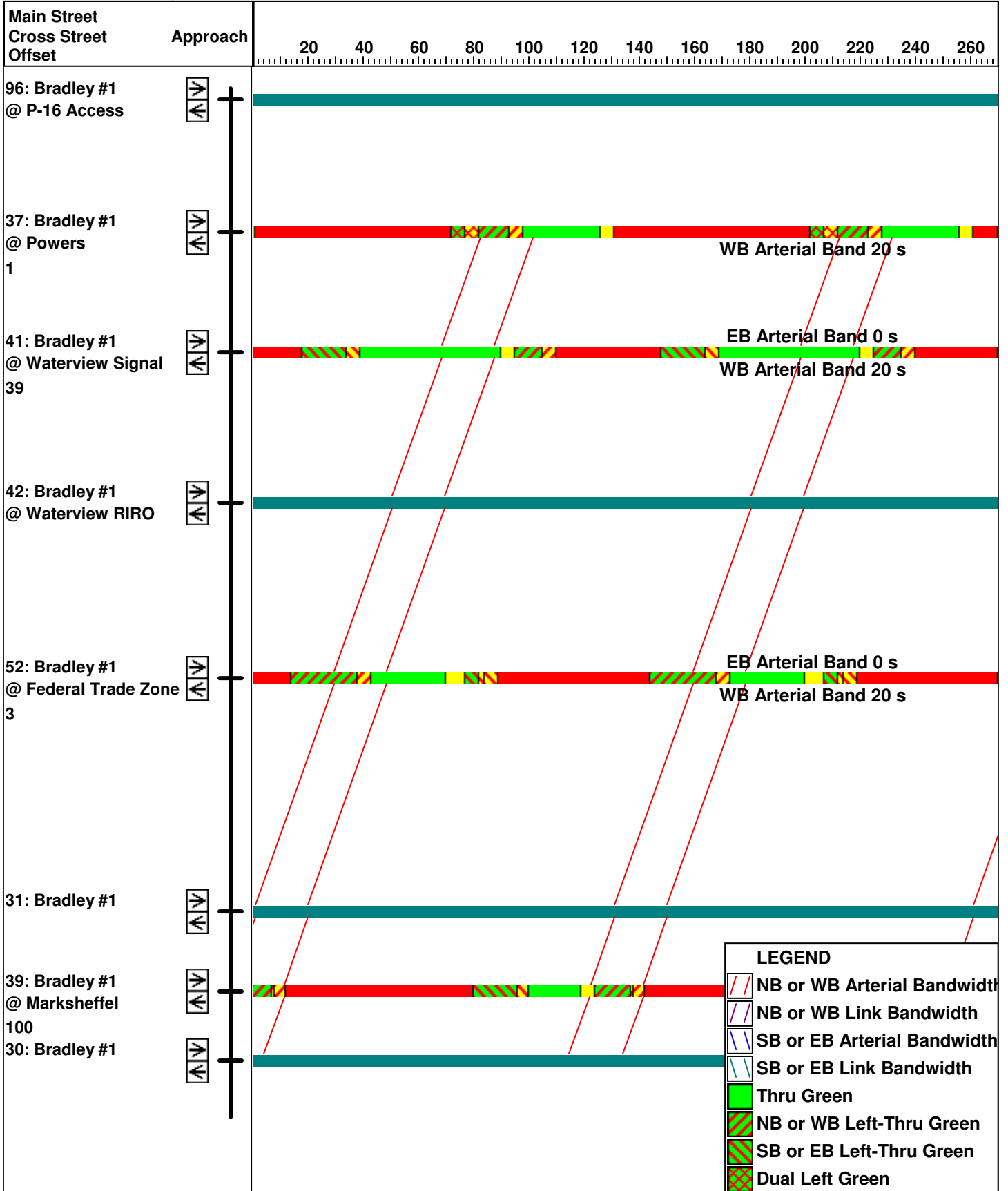
2040 Total PM Peak Hour

KDF

Exhibit 2C

Arterial Bandwidths, Maximum Green Times Across Powers

2040 Total PM Peak Hour



2040 Total PM Peak Hour

KDF

LSC Transportation Consultants, Inc.
545 E. Pikes Peak Ave., #210
Colorado Springs, CO 80903
(719) 633-2868

LSC Transportation Consultants, Inc. File Name : Powers - Bradley Rd AM
 Site Code : 00164691
 Start Date : 10/25/2016
 Page No : 1

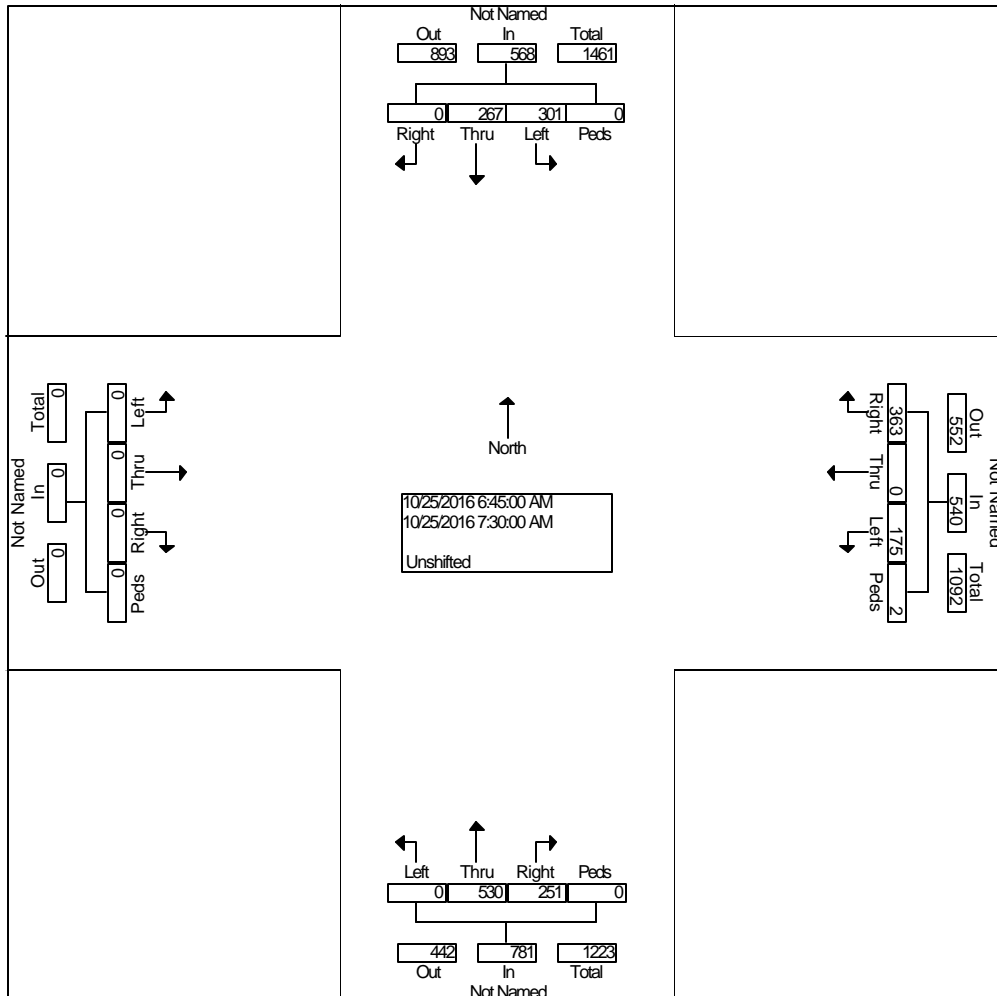
Groups Printed- Unshifted

Start Time	From North				From East				From South				From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	0	60	57	0	77	0	35	0	59	112	0	0	0	0	0	0	400
06:45 AM	0	62	63	0	84	0	49	0	67	120	0	0	0	0	0	0	445
Total	0	122	120	0	161	0	84	0	126	232	0	0	0	0	0	0	845
07:00 AM	0	57	78	0	89	0	44	1	69	132	0	0	0	0	0	0	470
07:15 AM	0	75	82	0	84	0	41	1	67	159	0	0	0	0	0	0	509
07:30 AM	0	73	78	0	106	0	41	0	48	119	0	0	0	0	0	0	465
07:45 AM	0	74	57	0	68	0	55	0	56	86	0	0	0	0	0	0	396
Total	0	279	295	0	347	0	181	2	240	496	0	0	0	0	0	0	1840
08:00 AM	0	58	52	0	56	0	49	0	34	109	0	0	0	0	0	0	358
08:15 AM	0	54	49	0	52	0	43	0	32	101	0	0	0	0	0	0	331
Grand Total	0	513	516	0	616	0	357	2	432	938	0	0	0	0	0	0	3374
Apprch %	0.0	49.9	50.1	0.0	63.2	0.0	36.6	0.2	31.5	68.5	0.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	15.2	15.3	0.0	18.3	0.0	10.6	0.1	12.8	27.8	0.0	0.0	0.0	0.0	0.0	0.0	

LSC Transportation Consultants, Inc.
 545 E. Pikes Peak Ave., #210
 Colorado Springs, CO 80903
 (719) 633-2868

File Name : Powers - Bradley Rd AM
 Site Code : 00164691
 Start Date : 10/25/2016
 Page No : 2

Start Time	From North					From East					From South					From West					Int. Total
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	
Peak Hour From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Intersection	06:45 AM																				
Volume	0	26	30	0	568	36	0	17	2	540	25	53	0	0	781	0	0	0	0	0	1889
Percent	0.0	47.	53.	0.0		67.	0.0	32.	0.4		32.	67.	0.0	0.0		0.0	0.0	0.0	0.0		
		0	0			2		4			1	9									
07:15 Volume	0	75	82	0	157	84	0	41	1	126	67	15	0	0	226	0	0	0	0	0	509
Peak Factor																				0.928	
High Int.	07:15 AM					07:30 AM					07:15 AM					6:15:00 AM					
Volume	0	75	82	0	157	10	0	41	0	147	67	15	0	0	226						
Peak Factor					0.90					0.91					0.86						
					4					8					4						



LSC Transportation Consultants, Inc.
545 E. Pikes Peak Ave., #210
Colorado Springs, CO 80903
(719) 633-2868

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 Page No : 1

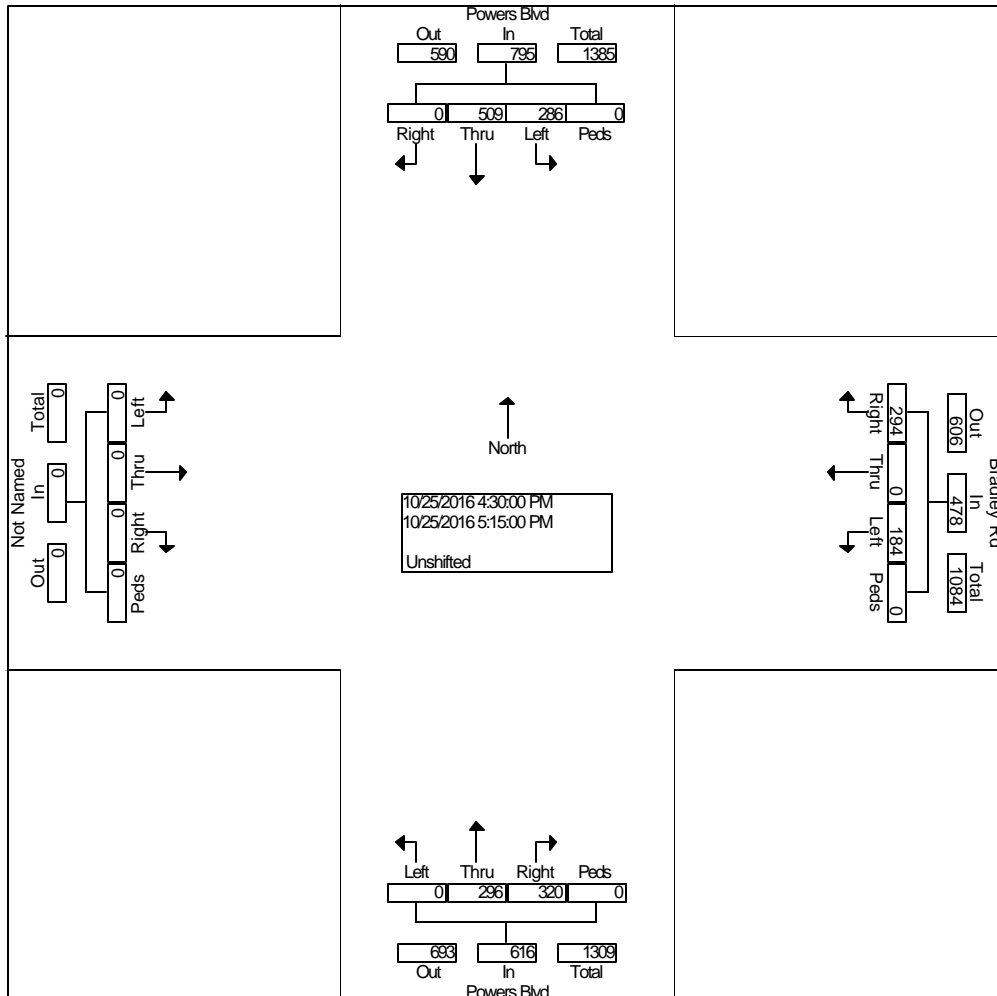
Groups Printed- Unshifted

Start Time	Powers Blvd From North				Bradley Rd From East				Powers Blvd From South				From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	0	119	79	0	58	0	45	1	69	60	0	0	0	0	0	0	431
04:15 PM	0	135	71	0	89	0	52	0	68	71	0	0	0	0	0	0	486
04:30 PM	0	129	82	0	65	0	45	0	87	67	0	0	0	0	0	0	475
04:45 PM	0	119	62	0	85	0	56	0	81	71	0	0	0	0	0	0	474
Total	0	502	294	0	297	0	198	1	305	269	0	0	0	0	0	0	1866
05:00 PM	0	119	73	0	70	0	31	0	78	77	0	0	0	0	0	0	448
05:15 PM	0	142	69	0	74	0	52	0	74	81	0	0	0	0	0	0	492
05:30 PM	0	134	70	0	52	0	39	0	90	75	0	0	0	0	0	0	460
05:45 PM	0	129	63	1	45	0	36	0	81	70	0	0	0	0	0	0	425
Total	0	524	275	1	241	0	158	0	323	303	0	0	0	0	0	0	1825
Grand Total	0	1026	569	1	538	0	356	1	628	572	0	0	0	0	0	0	3691
Apprch %	0.0	64.3	35.7	0.1	60.1	0.0	39.8	0.1	52.3	47.7	0.0	0.0	0.0	0.0	0.0	0.0	
Total %	0.0	27.8	15.4	0.0	14.6	0.0	9.6	0.0	17.0	15.5	0.0	0.0	0.0	0.0	0.0	0.0	

LSC Transportation Consultants, Inc.
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Start Time	Powers Blvd From North					Bradley Rd From East					Powers Blvd From South					From West					Int. Total	
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total		
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																						
Intersection	04:30 PM																					
Volume	0	50	28	0	795	29	0	18	0	478	32	29	0	0	616	0	0	0	0	0	1889	
Percent	0.0	64.0	36.0	0.0		61.5	0.0	38.5	0.0		51.9	48.1	0.0	0.0		0.0	0.0	0.0	0.0			
05:15 Volume	0	14	2	69	0	211	74	0	52	0	126	74	81	0	0	155	0	0	0	0	0	492
Peak Factor																						
High Int.	04:30 PM					04:45 PM					05:00 PM					3:45:00 PM						
Volume	0	12	9	82	0	211	85	0	56	0	141	78	77	0	0	155						
Peak Factor	0.94					0.84					0.99											
	2					8					4											



LSC Transportation Consultants, Inc.

545 E. Pikes Peak Ave., #210

LSC Transportation Consultants, Inc. Colorado Springs, CO 80903 Name : Grinnell Blvd - Bradley Rd AM

(719) 633-2868

Site Code : 00164690

Start Date : 08/30/2016

Page No : 1

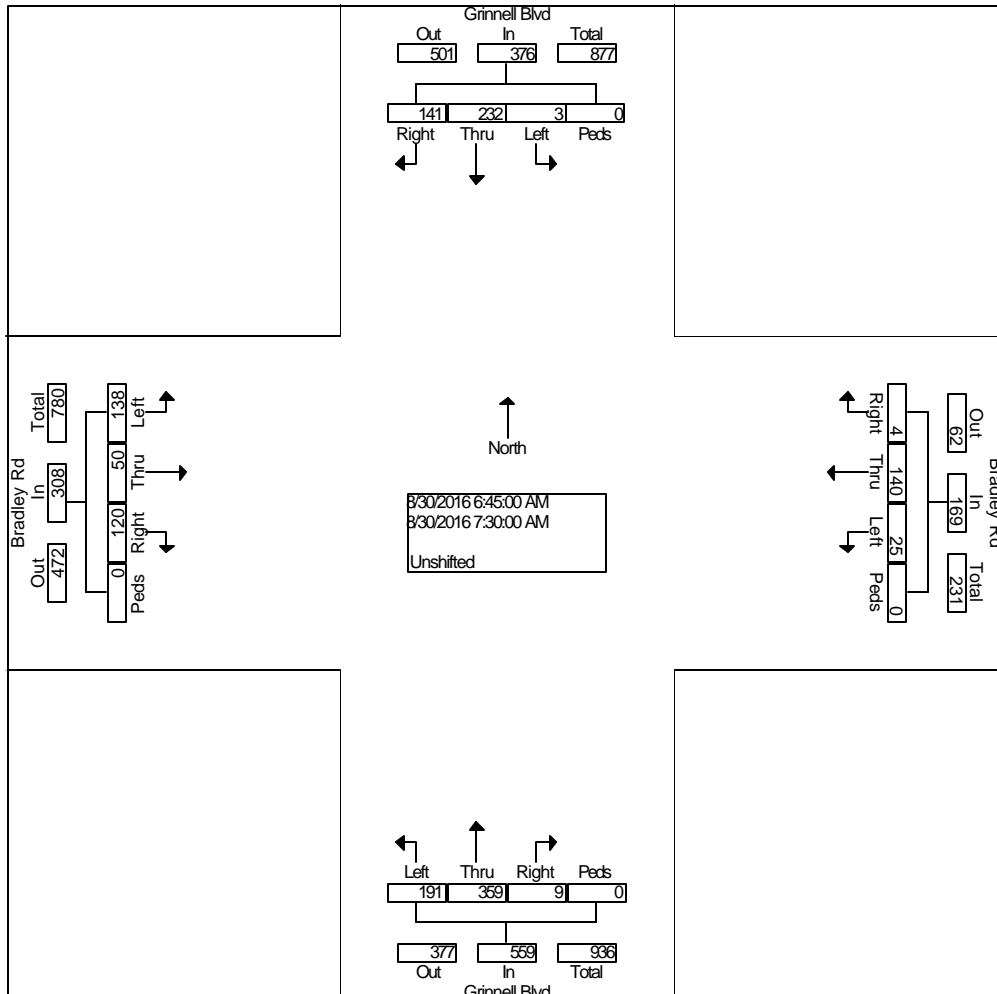
Groups Printed- Unshifted

Start Time	Grinnell Blvd From North				Bradley Rd From East				Grinnell Blvd From South				Bradley Rd From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	38	43	1	0	1	35	5	0	2	77	36	0	29	11	31	0	309
06:45 AM	43	49	1	0	0	39	6	0	3	79	40	0	32	13	35	0	340
Total	81	92	2	0	1	74	11	0	5	156	76	0	61	24	66	0	649
07:00 AM	34	56	0	0	2	30	7	0	2	90	51	0	30	16	50	0	368
07:15 AM	33	54	1	0	0	40	5	0	1	96	58	0	27	10	27	0	352
07:30 AM	31	73	1	0	2	31	7	0	3	94	42	0	31	11	26	0	352
07:45 AM	34	57	0	0	1	25	4	0	3	56	31	1	26	9	21	0	268
Total	132	240	2	0	5	126	23	0	9	336	182	1	114	46	124	0	1340
08:00 AM	29	51	4	0	2	18	7	0	3	56	27	0	29	13	25	0	264
08:15 AM	34	56	2	0	2	31	13	0	2	84	42	0	22	5	18	0	311
Grand Total	276	439	10	0	10	249	54	0	19	632	327	1	226	88	233	0	2564
Apprch %	38.1	60.6	1.4	0.0	3.2	79.6	17.3	0.0	1.9	64.6	33.4	0.1	41.3	16.1	42.6	0.0	
Total %	10.8	17.1	0.4	0.0	0.4	9.7	2.1	0.0	0.7	24.6	12.8	0.0	8.8	3.4	9.1	0.0	

LSC Transportation Consultants, Inc.
 545 E. Pikes Peak Ave., #210
 Colorado Springs, CO 80903
 (719) 633-2868

Project Name : Grinnell Blvd - Bradley Rd AM
 Site Code : 00164690
 Start Date : 08/30/2016
 Page No : 2

Start Time	Grinnell Blvd From North					Bradley Rd From East					Grinnell Blvd From South					Bradley Rd From West					Int. Total
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	
Peak Hour From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Intersection	06:45 AM																				
Volume	14	23	3	0	376	4	14	25	0	169	9	35	19	0	559	12	50	13	0	308	1412
Percent	37.5	61.7	0.8	0.0		2.4	82.8	14.8	0.0		1.6	64.2	34.2	0.0		39.0	16.2	44.8	0.0		
07:00 Volume	34	56	0	0	90	2	30	7	0	39	2	90	51	0	143	30	16	50	0	96	368
Peak Factor	0.959																				
High Int.	07:30 AM					06:45 AM					07:15 AM					07:00 AM					
Volume	31	73	1	0	105	0	39	6	0	45	1	96	58	0	155	30	16	50	0	96	
Peak Factor	0.89					0.93					0.90					0.80					
	5					9					2					2					



LSC Transportation Consultants, Inc.

545 E. Pikes Peak Ave., #210

LSC Transportation Consultants, Inc. Colorado Springs, CO 80903 Name : Grinnell Blvd - Bradley Rd PM

(719) 633-2868

Site Code : 00164690

Start Date : 08/31/2016

Page No : 1

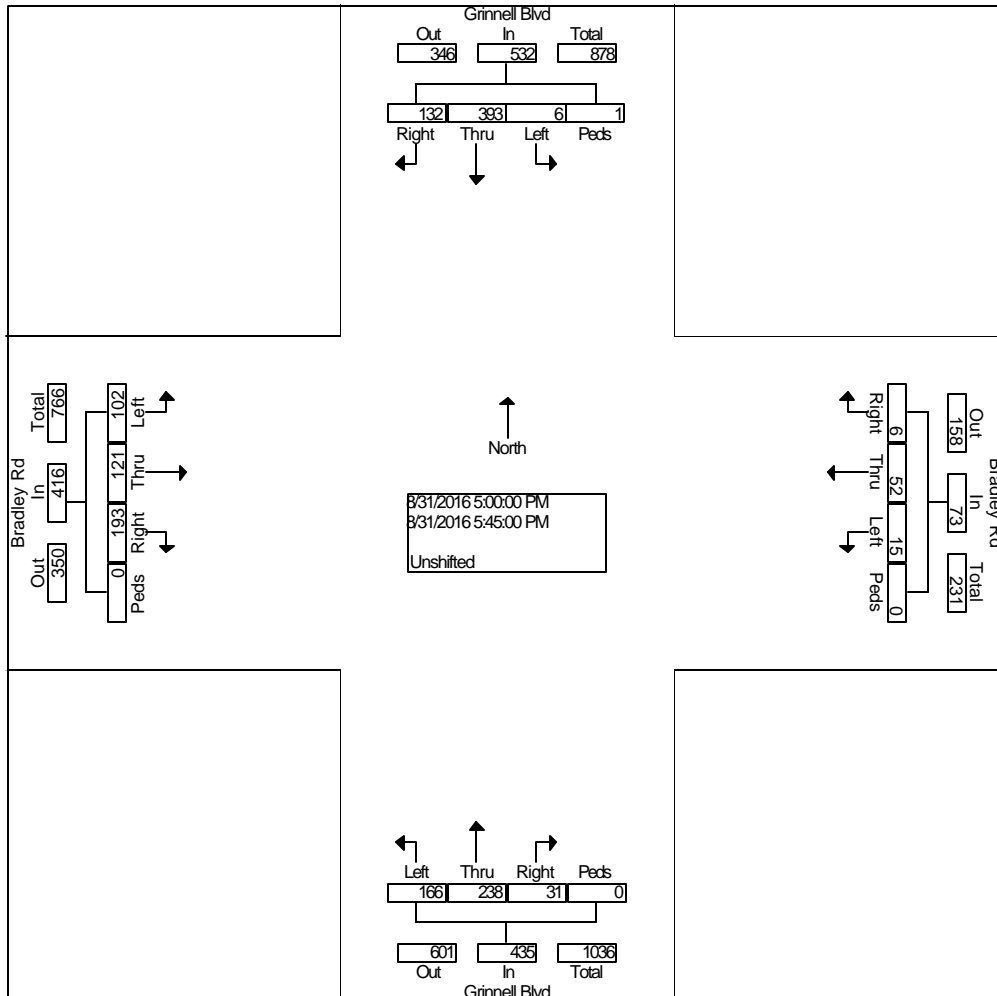
Groups Printed- Unshifted

Start Time	Grinnell Blvd From North				Bradley Rd From East				Grinnell Blvd From South				Bradley Rd From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
04:00 PM	38	98	2	0	2	11	5	0	5	49	41	0	41	16	19	0	327
04:15 PM	43	111	2	0	4	15	6	0	6	57	43	0	46	14	22	0	369
04:30 PM	41	73	3	0	0	13	6	0	4	70	39	0	62	20	22	0	353
04:45 PM	40	100	3	0	0	14	7	0	7	43	33	0	44	35	19	0	345
Total	162	382	10	0	6	53	24	0	22	219	156	0	193	85	82	0	1394
05:00 PM	38	102	1	1	1	13	2	0	7	59	56	0	43	27	20	0	370
05:15 PM	35	93	0	0	1	12	5	0	6	60	32	0	49	37	29	0	359
05:30 PM	25	106	4	0	1	10	4	0	10	50	39	0	64	31	30	0	374
05:45 PM	34	92	1	0	3	17	4	0	8	69	39	0	37	26	23	0	353
Total	132	393	6	1	6	52	15	0	31	238	166	0	193	121	102	0	1456
Grand Total	294	775	16	1	12	105	39	0	53	457	322	0	386	206	184	0	2850
Apprch %	27.1	71.4	1.5	0.1	7.7	67.3	25.0	0.0	6.4	54.9	38.7	0.0	49.7	26.5	23.7	0.0	
Total %	10.3	27.2	0.6	0.0	0.4	3.7	1.4	0.0	1.9	16.0	11.3	0.0	13.5	7.2	6.5	0.0	

LSC Transportation Consultants, Inc.
 545 E. Pikes Peak Ave., #210
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Project Name : Grinnell Blvd - Bradley Rd PM
 Site Code : 00164690
 Start Date : 08/31/2016
 Page No : 2

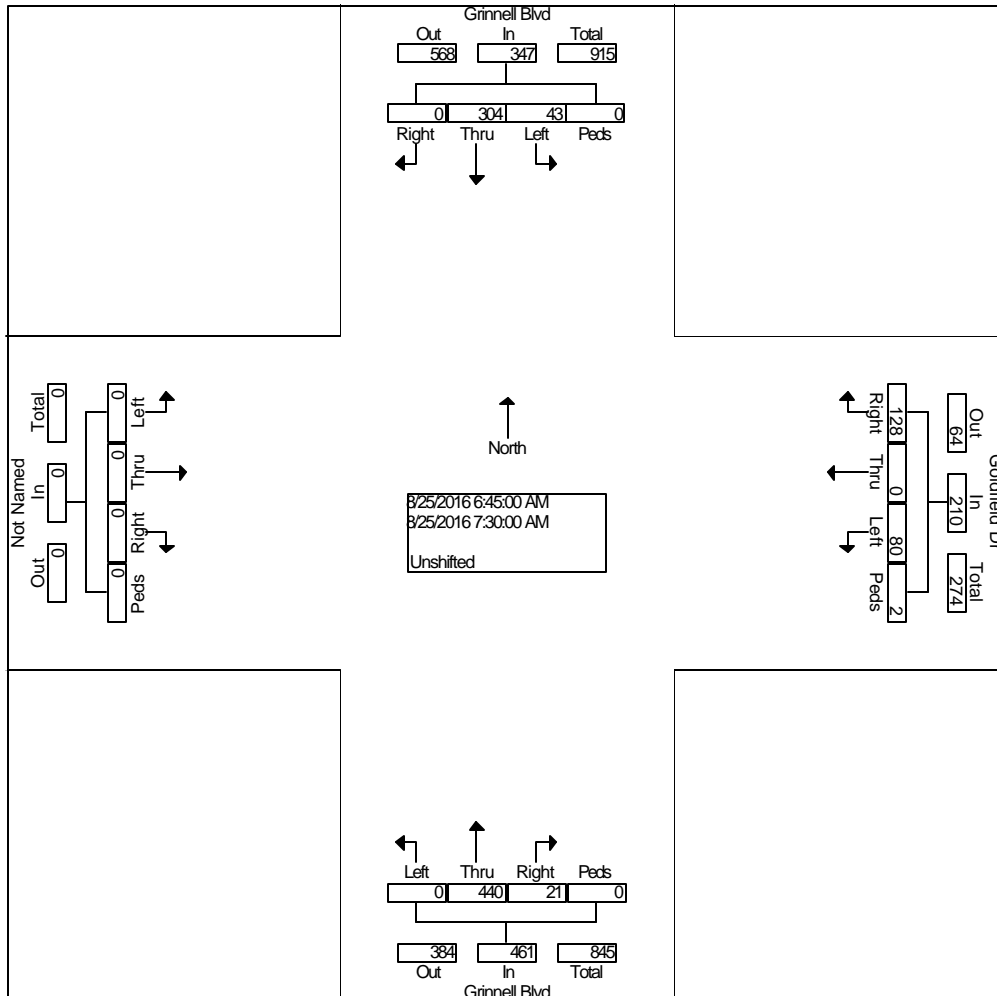
Start Time	Grinnell Blvd From North					Bradley Rd From East					Grinnell Blvd From South					Bradley Rd From West					Int. Total
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	05:00 PM																				
Volume	13	39	6	1	532	6	52	15	0	73	31	23	16	0	435	19	12	10	0	416	1456
Percent	24.8	73.9	1.1	0.2		8.2	71.2	20.5	0.0		7.1	54.7	38.2	0.0		46.4	29.1	24.5	0.0		
05:30 Peak Factor	25	10	4	0	135	1	10	4	0	15	10	50	39	0	99	64	31	30	0	125	374
High Int.	05:00 PM					05:45 PM					05:00 PM					05:30 PM					0.973
Volume	38	10	1	1	142	3	17	4	0	24	7	59	56	0	122	64	31	30	0	125	125
Peak Factor					0.93					0.76					0.89					0.83	2



LSC Transportation Consultants, Inc.
 545 E. Pikes Peak Ave., #210
 Colorado Springs, CO 80903
 (719) 633-2868

Project Name : Grinnell Blvd - Goldfield Dr AM
 Site Code : 00164690
 Start Date : 08/25/2016
 Page No : 2

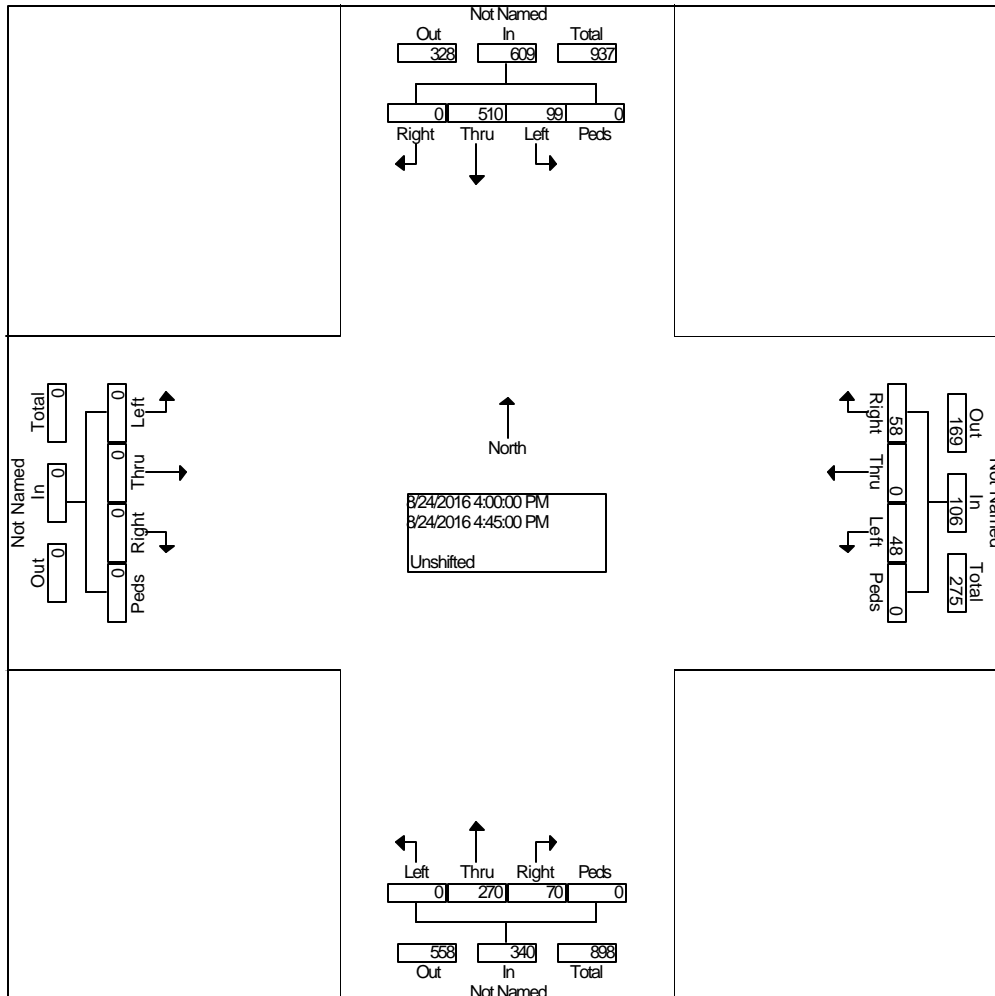
Start Time	Grinnell Blvd From North					Goldfield Dr From East					Grinnell Blvd From South					From West					Int. Total
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	
Peak Hour From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Intersection	06:45 AM																				
Volume	0	30	43	0	347	12	0	80	2	210	21	44	0	0	461	0	0	0	0	0	1018
Percent	0.0	87.6	12.4	0.0		61.0	0.0	38.1	1.0		4.6	95.4	0.0	0.0		0.0	0.0	0.0	0.0		
07:15 Volume	0	86	13	0	99	41	0	15	1	57	5	11	0	0	124	0	0	0	0	0	280
Peak Factor	0.909																				
High Int.	06:45 AM					07:15 AM					07:00 AM					6:15:00 AM					
Volume	0	88	12	0	100	41	0	15	1	57	7	12	0	0	130						
Peak Factor	0.868										0.921					0.887					



LSC Transportation Consultants, Inc.
 545 E. Pikes Peak Ave., #210
 Colorado Springs, CO 80903
 (719) 633-2868

Name : Grinnell Blvd - Goldfield Dr PM
 Site Code : 00164690
 Start Date : 08/24/2016
 Page No : 2

Start Time	From North					From East					From South					From West					Int. Total
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:00 PM																				
Volume	0	51	99	0	609	58	0	48	0	106	70	27	0	0	340	0	0	0	0	0	1055
Percent	0.0	83.7	16.3	0.0		54.7	0.0	45.3	0.0		20.6	79.4	0.0	0.0		0.0	0.0	0.0	0.0		
04:15 Volume	0	13	26	0	161	17	0	15	0	32	18	64	0	0	82	0	0	0	0	0	275
Peak Factor	0.959																				
High Int.	04:15 PM					04:15 PM					04:00 PM					3:45:00 PM					
Volume	0	13	26	0	161	17	0	15	0	32	13	79	0	0	92						
Peak Factor	0.946					0.828					0.924										



LSC Transportation Consultants, Inc.
545 E. Pikes Peak Ave., #210

LSC Transportation Consultants, Inc. Colorado Springs, CO 80903
 (719) 633-2868
 Name : Powers Blvd - Grinnell Blvd AM
 Site Code : 00164690
 Start Date : 08/31/2016
 Page No : 1

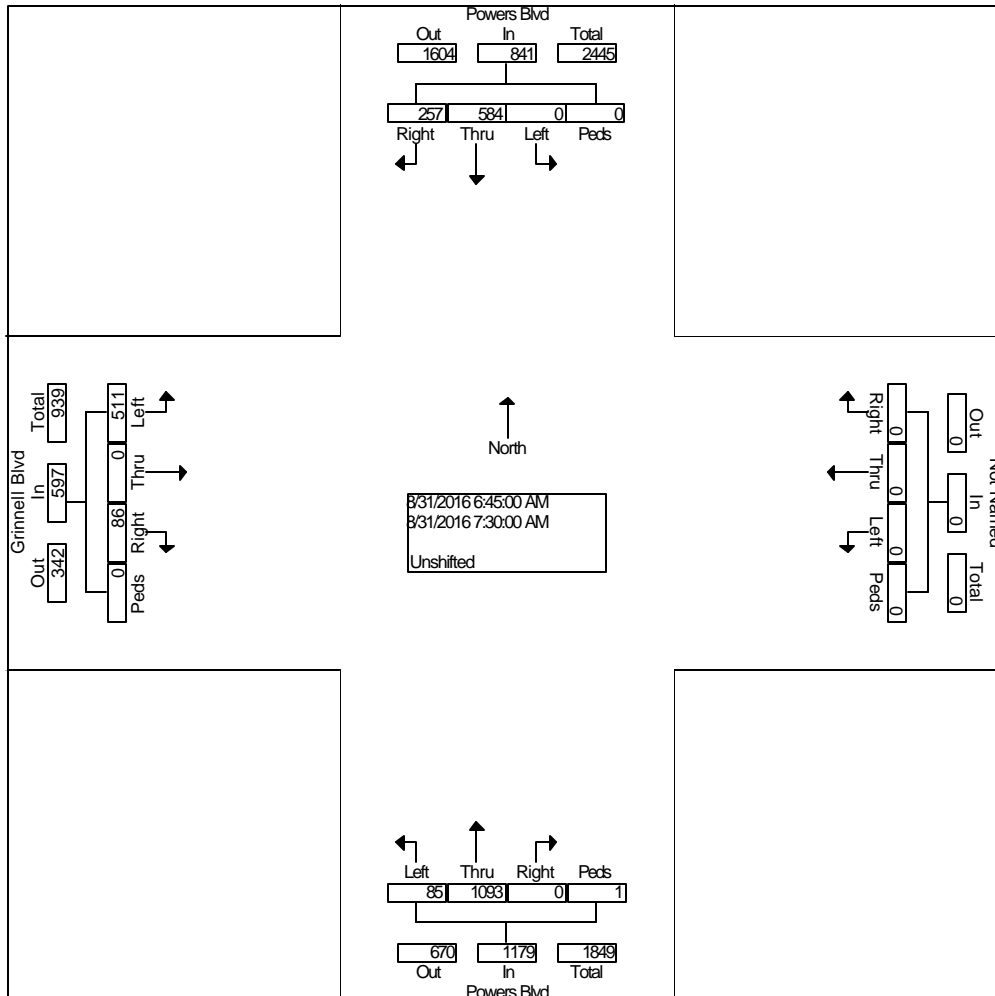
Groups Printed- Unshifted

Start Time	Powers Blvd From North				From East				Powers Blvd From South				Grinnell Blvd From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
06:30 AM	33	73	0	0	0	0	0	0	0	148	15	0	14	0	89	0	372
06:45 AM	67	150	0	0	0	0	0	0	0	240	30	0	23	0	108	0	618
Total	100	223	0	0	0	0	0	0	0	388	45	0	37	0	197	0	990
07:00 AM	54	150	0	0	0	0	0	0	0	291	16	0	26	0	128	0	665
07:15 AM	68	137	0	0	0	0	0	0	0	297	18	1	19	0	147	0	687
07:30 AM	68	147	0	0	0	0	0	0	0	265	21	0	18	0	128	0	647
07:45 AM	70	121	0	0	0	0	0	0	0	202	19	1	9	0	83	0	505
Total	260	555	0	0	0	0	0	0	0	1055	74	2	72	0	486	0	2504
08:00 AM	72	115	0	0	0	0	0	0	0	166	18	0	5	0	87	0	463
08:15 AM	61	129	0	0	0	0	0	0	0	165	21	0	16	0	79	0	471
Grand Total	493	1022	0	0	0	0	0	0	0	1774	158	2	130	0	849	0	4428
Apprch %	32.5	67.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.7	8.2	0.1	13.3	0.0	86.7	0.0	
Total %	11.1	23.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.1	3.6	0.0	2.9	0.0	19.2	0.0	

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545 E. Pikes Peak Ave., #210
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Name : Powers Blvd - Grinnell Blvd AM
 Site Code : 00164690
 Start Date : 08/31/2016
 Page No : 2

Start Time	Powers Blvd From North					From East					Powers Blvd From South					Grinnell Blvd From West					Int. Total
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	
Peak Hour From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Intersection	06:45 AM																				
Volume	25	58	0	0	841	0	0	0	0	0	0	10	85	1	1179	86	0	51	0	597	2617
Percent	30.6	69.4	0.0	0.0		0.0	0.0	0.0	0.0		0.0	92.7	7.2	0.1		14.4	0.0	85.6	0.0		
07:15 Volume	68	13	0	0	205	0	0	0	0	0	0	29	18	1	316	19	0	14	0	166	687
Peak Factor	0.952																				
High Int.	06:45 AM					6:15:00 AM					07:15 AM					07:15 AM					
Volume	67	15	0	0	217	0	0	0	0	0	0	29	18	1	316	19	0	14	0	166	
Peak Factor	0.969										0.933					0.899					



LSC Transportation Consultants, Inc.

545 E. Pikes Peak Ave., #210

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(719) 633-2868

Site Code : 00164690

Start Date : 09/01/2016

Page No : 1

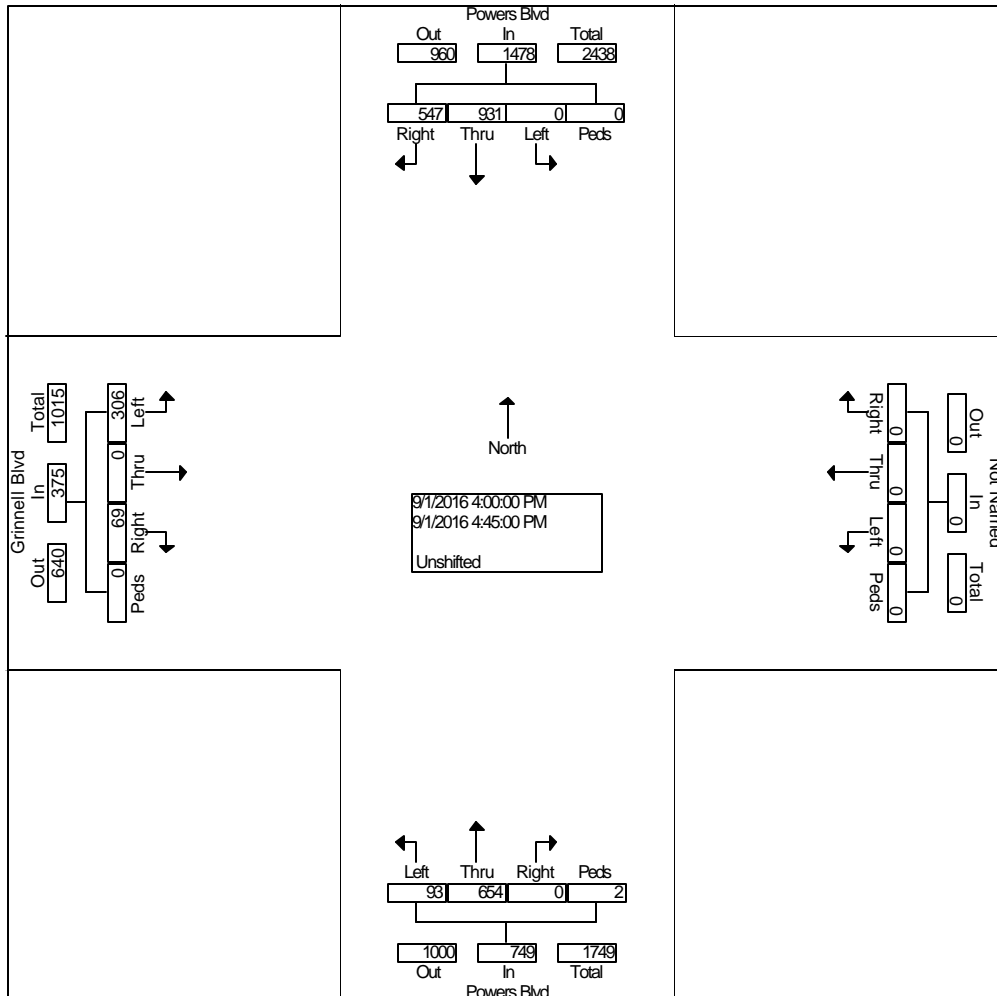
Groups Printed- Unshifted

Start Time	Powers Blvd From North				From East				Powers Blvd From South				Grinnell Blvd From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
04:00 PM	138	210	0	0	0	0	0	0	0	157	25	0	30	0	81	0	641
04:15 PM	146	237	0	0	0	0	0	0	0	182	24	1	16	0	73	0	679
04:30 PM	123	195	0	0	0	0	0	0	0	161	25	0	12	0	88	0	604
04:45 PM	140	289	0	0	0	0	0	0	0	154	19	1	11	0	64	0	678
Total	547	931	0	0	0	0	0	0	0	654	93	2	69	0	306	0	2602
05:00 PM	117	248	0	0	0	0	0	0	0	152	27	0	19	0	71	0	634
05:15 PM	138	205	0	0	0	0	0	0	0	177	11	0	12	0	43	0	586
05:30 PM	138	231	0	0	0	0	0	0	0	141	11	0	6	0	47	0	574
05:45 PM	122	195	0	1	0	0	0	0	0	154	14	0	12	0	74	0	572
Total	515	879	0	1	0	0	0	0	0	624	63	0	49	0	235	0	2366
Grand Total	1062	1810	0	1	0	0	0	0	0	1278	156	2	118	0	541	0	4968
Apprch %	37.0	63.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.0	10.9	0.1	17.9	0.0	82.1	0.0	
Total %	21.4	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.7	3.1	0.0	2.4	0.0	10.9	0.0	

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Name : Powers Blvd - Grinnell Blvd PM
 Site Code : 00164690
 Start Date : 09/01/2016
 Page No : 2

Start Time	Powers Blvd From North					From East					Powers Blvd From South					Grinnell Blvd From West					Int. Total
	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	Rig ht	Thr u	Lef t	Pe ds	App. Total	
Peak Hour From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Intersection	04:00 PM																				
Volume	54	93	0	0	1478	0	0	0	0	0	0	65	93	2	749	69	0	30	0	375	2602
Percent	37.0	63.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	87.3	12.4	0.3		18.4	0.0	81.6	0.0		
04:15 Volume	14	23	0	0	383	0	0	0	0	0	0	18	24	1	207	16	0	73	0	89	679
Peak Factor	0.958																				
High Int.	04:45 PM					3:45:00 PM					04:15 PM					04:00 PM					
Volume	14	28	0	0	429	0	0	0	0	0	0	18	24	1	207	30	0	81	0	111	
Peak Factor	0.86										0.90					0.84					
	1										5					5					



Timings
2: Grinnell & Powers

Existing Traffic
AM Peak Hour

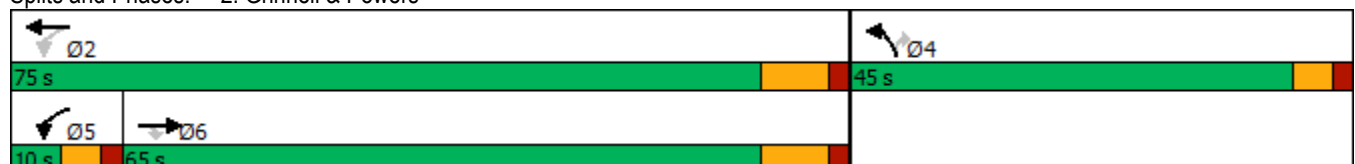


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘	↗
Traffic Volume (vph)	584	257	85	1093	511	86
Future Volume (vph)	584	257	85	1093	511	86
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						
Minimum Initial (s)	30.0	30.0	4.0	30.0	8.0	8.0
Minimum Split (s)	38.0	38.0	10.0	38.0	22.0	22.0
Total Split (s)	65.0	65.0	10.0	75.0	45.0	45.0
Total Split (%)	54.2%	54.2%	8.3%	62.5%	37.5%	37.5%
Yellow Time (s)	6.0	6.0	3.5	6.0	3.5	3.5
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)	8.0	8.0	5.5	8.0	5.5	5.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None
Act Effct Green (s)	32.0	32.0	42.2	39.7	37.4	37.4
Actuated g/C Ratio	0.35	0.35	0.47	0.44	0.41	0.41
v/c Ratio	0.48	0.35	0.27	0.78	0.78	0.14
Control Delay	25.3	4.4	16.0	26.2	33.0	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.3	4.4	16.0	26.2	33.0	12.4
LOS	C	A	B	C	C	B
Approach Delay	18.9			25.5	30.1	
Approach LOS	B			C	C	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 90.7
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 24.6
 Intersection LOS: C
 Intersection Capacity Utilization 73.9%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 2: Grinnell & Powers



Intersection						
Int Delay, s/veh	3.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	80	128	475	21	43	300
Future Vol, veh/h	80	128	475	21	43	300
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	0	-	380	295	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	88	88
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	86	138	511	23	49	341













Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	950	511	0	0	534	0
Stage 1	511	-	-	-	-	-
Stage 2	439	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	290	565	-	-	1039	-
Stage 1	604	-	-	-	-	-
Stage 2	652	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	276	565	-	-	1039	-
Mov Cap-2 Maneuver	276	-	-	-	-	-
Stage 1	576	-	-	-	-	-
Stage 2	652	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.4	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	276	565	1039
HCM Lane V/C Ratio	-	-	0.312	0.244	0.047
HCM Control Delay (s)	-	-	23.8	13.4	8.6
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	1.3	0.9	0.1

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)	21.0	21.0	50.0	50.0	20.0	70.0
Total Split (%)	23.1%	23.1%	54.9%	54.9%	22.0%	76.9%
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)	11.0	11.0	16.5	16.5	15.2	36.8
Actuated g/C Ratio	0.19	0.19	0.28	0.28	0.26	0.63
v/c Ratio	0.52	0.61	0.61	0.44	0.72	0.13
Control Delay	27.9	7.9	21.0	4.8	33.2	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.9	7.9	21.0	4.8	33.2	4.7
LOS	C	A	C	A	C	A
Approach Delay	14.4		15.8			19.8
Approach LOS	B		B			B

Intersection Summary

Cycle Length: 91
 Actuated Cycle Length: 58
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 16.6
 Intersection LOS: B
 Intersection Capacity Utilization 53.5%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 37: Powers & Bradley Rd.



SimTraffic Performance Report

Existing Traffic
AM Peak Hour

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 6:45

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	11.2	3.4	4.5	7.7	8.3	13.0	3.0		5.5	6.8	6.4	9.0

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 7:00

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	11.9	4.1	5.6	8.1	9.2	14.0	3.0	4.9	4.5	6.7	6.8	9.2

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 7:15

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	9.1	3.9	4.6	7.9	9.4	8.8	2.9		6.0	6.3	5.4	7.5

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 7:30

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	7.1	3.4	6.2	8.5	7.3	9.2	2.5		5.2	6.7	6.6	7.3

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	10.3	3.8	5.2	8.2	8.8	11.7	2.9	6.1	5.4	6.8	6.4	8.5

Total Zone Performance By Interval

Interval Start	6:45	7:00	7:15	7:30	All
Stop Del/Veh (s)	228.5	116.7	282.5	293.2	427.6

Timings
2: Grinnell & Powers

Existing Traffic
PM Peak Hour

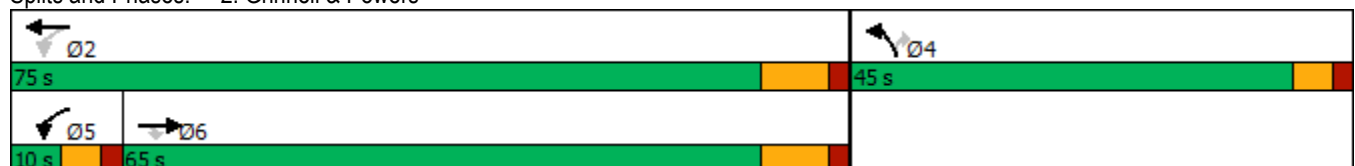


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↵	↑↑	↵	↵
Traffic Volume (vph)	931	547	93	654	306	69
Future Volume (vph)	931	547	93	654	306	69
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						
Minimum Initial (s)	30.0	30.0	4.0	30.0	8.0	8.0
Minimum Split (s)	38.0	38.0	10.0	38.0	22.0	22.0
Total Split (s)	65.0	65.0	10.0	75.0	45.0	45.0
Total Split (%)	54.2%	54.2%	8.3%	62.5%	37.5%	37.5%
Yellow Time (s)	6.0	6.0	3.5	6.0	3.5	3.5
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)	8.0	8.0	5.5	8.0	5.5	5.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None
Act Effct Green (s)	34.1	34.1	44.3	41.7	19.0	19.0
Actuated g/C Ratio	0.46	0.46	0.59	0.56	0.25	0.25
v/c Ratio	0.62	0.55	0.34	0.37	0.68	0.16
Control Delay	18.8	3.7	10.7	10.3	34.5	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	3.7	10.7	10.3	34.5	11.2
LOS	B	A	B	B	C	B
Approach Delay	13.2			10.4	30.2	
Approach LOS	B			B	C	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 74.7
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.68
 Intersection Signal Delay: 14.7
 Intersection Capacity Utilization 63.7%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 2: Grinnell & Powers



Intersection

Int Delay, s/veh 2.7

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	48	58	275	70	99	510
Future Vol, veh/h	48	58	275	70	99	510
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	0	-	380	295	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	83	83	100	100	95	95
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	58	70	275	70	104	537

Major/Minor Minor1 Major1 Major2

Conflicting Flow All	1020	275	0	0	345	0
Stage 1	275	-	-	-	-	-
Stage 2	745	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	263	766	-	-	1220	-
Stage 1	774	-	-	-	-	-
Stage 2	471	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	241	766	-	-	1220	-
Mov Cap-2 Maneuver	241	-	-	-	-	-
Stage 1	708	-	-	-	-	-
Stage 2	471	-	-	-	-	-

Approach WB NB SB

HCM Control Delay, s	16.7	0	1.3
HCM LOS	C		

Minor Lane/Major Mvmt NBT NBRWBLn1WBLn2 SBL SBT

Capacity (veh/h)	-	-	241	766	1220	-
HCM Lane V/C Ratio	-	-	0.24	0.091	0.085	-
HCM Control Delay (s)	-	-	24.6	10.2	8.2	-
HCM Lane LOS	-	-	C	B	A	-
HCM 95th %tile Q(veh)	-	-	0.9	0.3	0.3	-

Timings
37: Powers & Bradley Rd.

Existing Traffic
PM Peak Hour



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↕	↗	↙	↕
Traffic Volume (vph)	184	294	296	320	286	509
Future Volume (vph)	184	294	296	320	286	509
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)	21.0	21.0	50.0	50.0	20.0	70.0
Total Split (%)	23.1%	23.1%	54.9%	54.9%	22.0%	76.9%
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 Effct Green (s)	11.0	11.0	10.1	10.1	15.1	30.3
Actuated g/C Ratio	0.21	0.21	0.20	0.20	0.29	0.59
v/c Ratio	0.51	0.53	0.43	0.57	0.58	0.26
Control Delay	23.4	6.5	20.6	7.2	23.0	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.4	6.5	20.6	7.2	23.0	5.9
LOS	C	A	C	A	C	A
Approach Delay	13.0		13.6			12.0
Approach LOS	B		B			B

Intersection Summary

Cycle Length: 91
 Actuated Cycle Length: 51.4
 Natural Cycle: 45
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.58
 Intersection Signal Delay: 12.8
 Intersection Capacity Utilization 46.7%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 37: Powers & Bradley Rd.



SimTraffic Performance Report

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 5:00

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	6.6	4.6	4.1	5.2	6.7	5.7	3.1	3.4	4.8	6.0	5.9	5.6

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 5:15

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	9.3	5.1	6.7	5.9	7.7	6.5	3.2	3.1	5.2	7.5	5.1	6.6

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 5:30

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	7.2	4.5	5.7	5.9	6.3	5.4	3.2	3.6	4.9	6.6	4.4	5.7

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 5:45

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	6.8	3.7	4.2	5.3	6.4	5.3	3.0	2.6	4.6	5.6	4.1	5.2

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	7.8	4.5	5.0	5.7	6.9	5.9	3.1	3.7	5.0	6.6	4.9	5.9

Total Zone Performance By Interval

Interval Start	5:00	5:15	5:30	5:45	All
Stop Del/Veh (s)	123.4	106.7	131.8	175.9	231.8

Timings
2: Grinnell & Powers

2017 Background Traffic
AM Peak Hour

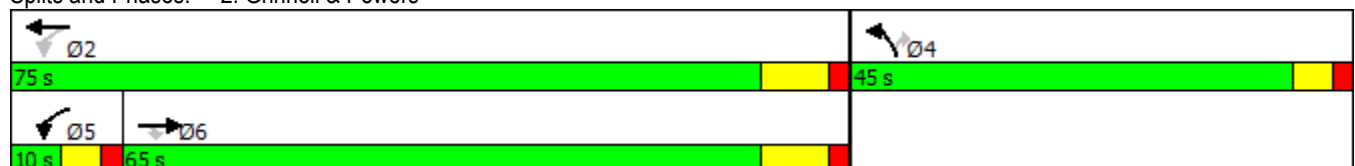
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘	↗
Traffic Volume (vph)	600	266	90	1125	527	90
Future Volume (vph)	600	266	90	1125	527	90
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						
Minimum Initial (s)	30.0	30.0	4.0	30.0	8.0	8.0
Minimum Split (s)	38.0	38.0	10.0	38.0	22.0	22.0
Total Split (s)	65.0	65.0	10.0	75.0	45.0	45.0
Total Split (%)	54.2%	54.2%	8.3%	62.5%	37.5%	37.5%
Yellow Time (s)	6.0	6.0	3.5	6.0	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-4.0	-4.0	-1.5	-4.0	-1.5	-1.5
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None
Act Effct Green (s)	36.5	36.5	46.5	46.5	38.9	38.9
Actuated g/C Ratio	0.39	0.39	0.50	0.50	0.42	0.42
v/c Ratio	0.45	0.34	0.28	0.71	0.80	0.15
Control Delay	22.5	3.7	15.1	21.2	33.9	12.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.5	3.7	15.1	21.2	33.9	12.1
LOS	C	A	B	C	C	B
Approach Delay	16.7			20.8	30.7	
Approach LOS	B			C	C	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 93.5
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 21.9
 Intersection Capacity Utilization 69.2%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 2: Grinnell & Powers



Intersection

Int Delay, s/veh 3.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	82	131	487	22	44	312
Future Vol, veh/h	82	131	487	22	44	312
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	0	-	380	295	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	88	88
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	88	141	524	24	50	355













Major/Minor	Minor1	Minor2	Major1	Major2	Major3	Major4
Conflicting Flow All	979	524	0	0	524	0
Stage 1	524	-	-	-	-	-
Stage 2	455	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	279	555	-	-	1048	-
Stage 1	596	-	-	-	-	-
Stage 2	641	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	266	555	-	-	1048	-
Mov Cap-2 Maneuver	266	-	-	-	-	-
Stage 1	596	-	-	-	-	-
Stage 2	610	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.1	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	266	555	1048	-
HCM Lane V/C Ratio	-	-	0.331	0.254	0.048	-
HCM Control Delay (s)	-	-	25.1	13.7	8.6	-
HCM Lane LOS	-	-	D	B	A	-
HCM 95th %tile Q(veh)	-	-	1.4	1	0.1	-

Timings
37: Powers & Bradley Rd.

2017 Background Traffic
AM Peak Hour

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	182	378	552	261	312	276
Future Volume (vph)	182	378	552	261	312	276
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		50.0	50.0	20.0	70.0
Total Split (%)	30.0%		50.0%	50.0%	20.0%	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 Effct Green (s)	10.6	100.0	59.1	59.1	15.2	79.4
Actuated g/C Ratio	0.11	1.00	0.59	0.59	0.15	0.79
v/c Ratio	0.50	0.24	0.31	0.29	0.66	0.11
Control Delay	46.6	0.4	11.4	2.2	46.1	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.6	0.4	11.4	2.2	46.1	2.6
LOS	D	A	B	A	D	A
Approach Delay	15.4		8.5			25.7
Approach LOS	B		A			C

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 64 (64%), Referenced to phase 2:NBT and 6:SBT, Start of Green
 Natural Cycle: 40
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.66
 Intersection Signal Delay: 15.5
 Intersection Capacity Utilization 41.9%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 37: Powers & Bradley Rd.



SimTraffic Performance Report

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 5:00

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	7.8	5.2	5.8	6.3	8.1	5.4	3.7	7.1	6.2	7.0	5.2	6.4

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 5:15

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	12.1	6.2	7.4	6.8	8.4	7.9	3.7	7.2	5.4	7.0	4.8	7.6

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 5:30

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	10.0	4.9	5.7	6.2	7.2	5.7	2.8	2.9	5.7	7.2	4.6	6.4

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 5:45

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	8.5	4.4	6.5	6.6	7.6	7.4	2.6	5.4	6.0	8.1	4.6	6.8

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	10.2	5.3	6.4	6.6	7.8	6.9	3.2	6.2	5.9	7.6	4.9	7.0

Total Zone Performance By Interval

Interval Start	5:00	5:15	5:30	5:45	All
Stop Del/Veh (s)	211.5	113.9	201.3	275.0	467.0

SimTraffic Performance Report

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 7:00

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	9.0	3.8	5.7	8.8	10.9	10.5	2.7		6.8	7.7	6.0	8.6

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 7:15

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	8.6	3.5	4.8	7.8	7.1	8.7	1.7		4.3	5.9	5.5	6.8

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 7:30

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	9.1	3.8	4.9	9.6	11.0	13.2	2.5		6.5	7.6	7.5	9.4

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 7:45

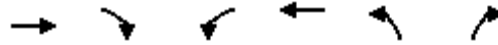
Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	7.8	3.5	5.1	6.8	8.9	9.1	2.0		4.7	6.0	4.5	7.0

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB	All
Movements Served	LT	R	L	TR	L	T	R	L	T	T	R	
Stop Del/Veh (s)	9.0	3.7	5.1	8.5	9.8	10.7	2.2	10.0	5.6	7.1	6.0	8.1

Timings
2: Grinnell & Powers

2017 Background Traffic
PM Peak Hour



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	↑
Traffic Volume (vph)	960	566	95	675	317	70
Future Volume (vph)	960	566	95	675	317	70
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						
Minimum Initial (s)	30.0	30.0	4.0	30.0	8.0	8.0
Minimum Split (s)	38.0	38.0	10.0	38.0	22.0	22.0
Total Split (s)	65.0	65.0	10.0	75.0	45.0	45.0
Total Split (%)	54.2%	54.2%	8.3%	62.5%	37.5%	37.5%
Yellow Time (s)	6.0	6.0	3.5	6.0	3.5	3.5
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-4.0	-4.0	-1.5	-4.0	-1.5	-1.5
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None
Act Effct Green (s)	39.1	39.1	46.7	46.7	21.4	21.4
Actuated g/C Ratio	0.51	0.51	0.61	0.61	0.28	0.28
v/c Ratio	0.57	0.54	0.33	0.35	0.64	0.15
Control Delay	15.8	3.2	10.0	8.4	31.8	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.8	3.2	10.0	8.4	31.8	10.8
LOS	B	A	A	A	C	B
Approach Delay	11.2			8.6	28.0	
Approach LOS	B			A	C	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 76.4
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.64
 Intersection Signal Delay: 12.7
 Intersection Capacity Utilization 59.4%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 2: Grinnell & Powers



Intersection

Int Delay, s/veh 3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	50	60	327	73	102	559
Future Vol, veh/h	50	60	327	73	102	559
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	0	-	380	295	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	54	65	355	79	111	608

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1184	355	0	0	355	0
Stage 1	355	-	-	-	-	-
Stage 2	829	-	-	-	-	-
Critical Hdwy	7.11	6.21	-	-	4.11	-
Critical Hdwy Stg 1	6.11	-	-	-	-	-
Critical Hdwy Stg 2	6.11	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	167	691	-	-	1209	-
Stage 1	664	-	-	-	-	-
Stage 2	366	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	155	691	-	-	1209	-
Mov Cap-2 Maneuver	155	-	-	-	-	-
Stage 1	664	-	-	-	-	-
Stage 2	332	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	24.2	0	1.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	155	691	1209	-
HCM Lane V/C Ratio	-	-	0.351	0.094	0.092	-
HCM Control Delay (s)	-	-	40.3	10.8	8.3	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	1.5	0.3	0.3	-

Timings
37: Powers & Bradley Rd.

2017 Background Traffic
PM Peak Hour

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖↗	↖	↖↗	↖	↖↗	↖↗
Traffic Volume (vph)	191	305	308	330	297	528
Future Volume (vph)	191	305	308	330	297	528
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		50.0	50.0	20.0	70.0
Total Split (%)	30.0%		50.0%	50.0%	20.0%	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 Effct Green (s)	11.2	100.0	59.4	59.4	14.4	78.8
Actuated g/C Ratio	0.11	1.00	0.59	0.59	0.14	0.79
v/c Ratio	0.52	0.20	0.15	0.31	0.64	0.20
Control Delay	46.5	0.3	10.1	2.2	46.2	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.5	0.3	10.1	2.2	46.2	3.0
LOS	D	A	B	A	D	A
Approach Delay	18.1		6.0			18.6
Approach LOS	B		A			B

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: 0.64
 Intersection Signal Delay: 14.5
 Intersection Capacity Utilization 37.2%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 37: Powers & Bradley Rd.



Timings
2: Grinnell & Powers

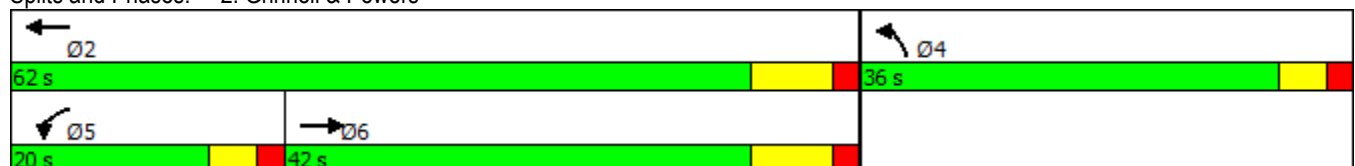
2040 Background AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↘↘	↑↑↑	↘↘	↗
Traffic Volume (vph)	1107	378	129	2367	659	171
Future Volume (vph)	1107	378	129	2367	659	171
Turn Type	NA	Free	Prot	NA	Prot	Free
Protected Phases	6		5	2	4	
Permitted Phases		Free				Free
Detector Phase	6		5	2	4	
Switch Phase						
Minimum Initial (s)	30.0		4.0	30.0	8.0	
Minimum Split (s)	38.0		9.5	38.0	21.5	
Total Split (s)	42.0		20.0	62.0	36.0	
Total Split (%)	42.9%		20.4%	63.3%	36.7%	
Yellow Time (s)	6.0		3.5	6.0	3.5	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-4.0		-1.5	-4.0	-1.5	
Total Lost Time (s)	4.0		4.0	4.0	4.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effct Green (s)	40.2	87.3	10.4	54.7	24.5	87.3
Actuated g/C Ratio	0.46	1.00	0.12	0.63	0.28	1.00
v/c Ratio	0.50	0.25	0.33	0.79	0.70	0.11
Control Delay	18.3	0.4	39.3	15.2	32.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.3	0.4	39.3	15.2	32.8	0.1
LOS	B	A	D	B	C	A
Approach Delay	13.7			16.4	26.0	
Approach LOS	B			B	C	

Intersection Summary

Cycle Length: 98
 Actuated Cycle Length: 87.3
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 17.2
 Intersection LOS: B
 Intersection Capacity Utilization 71.2%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 2: Grinnell & Powers



Timings

3: Grinnell Blvd. & Goldfield Drive

2040 Background AM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↘	↑	↘↘	↑	↗	↘	↑↑	↗	↘	↑↑
Traffic Volume (vph)	32	4	73	2	214	263	584	25	84	589
Future Volume (vph)	32	4	73	2	214	263	584	25	84	589
Turn Type	pm+pt	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4				8	2		2	6	
Detector Phase	7	4	3	8	8	5	2	2	1	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	21.0	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0
Total Split (s)	10.0	21.0	10.0	21.0	21.0	10.0	50.0	50.0	10.0	50.0
Total Split (%)	11.0%	23.1%	11.0%	23.1%	23.1%	11.0%	54.9%	54.9%	11.0%	54.9%
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)	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	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	Min	None	Min
Act Effct Green (s)	7.1	6.6	7.5	6.9	6.9	22.0	19.3	19.3	19.5	14.2
Actuated g/C Ratio	0.16	0.15	0.17	0.15	0.15	0.49	0.43	0.43	0.43	0.31
v/c Ratio	0.12	0.01	0.13	0.01	0.52	0.67	0.41	0.03	0.19	0.56
Control Delay	18.2	21.0	19.9	20.5	8.9	21.1	12.8	0.1	7.9	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.2	21.0	19.9	20.5	8.9	21.1	12.8	0.1	7.9	15.9
LOS	B	C	B	C	A	C	B	A	A	B
Approach Delay		18.5		11.7			15.0			14.9
Approach LOS		B		B			B			B

Intersection Summary

Cycle Length: 91

Actuated Cycle Length: 45.3

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.67

Intersection Signal Delay: 14.5

Intersection LOS: B

Intersection Capacity Utilization 52.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Grinnell Blvd. & Goldfield Drive



Timings

4: Grinnell Blvd. & Bradley Rd.

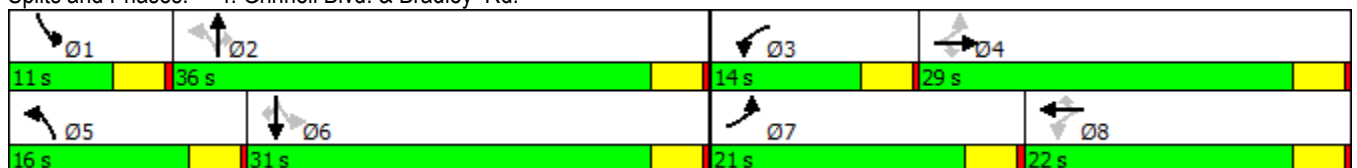
2040 Background AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	224	173	275	126	507	117	350	530	60	27	449	186
Future Volume (vph)	224	173	275	126	507	117	350	530	60	27	449	186
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	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	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	21.0	29.0	29.0	14.0	22.0	22.0	16.0	36.0	36.0	11.0	31.0	31.0
Total Split (%)	23.3%	32.2%	32.2%	15.6%	24.4%	24.4%	17.8%	40.0%	40.0%	12.2%	34.4%	34.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
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)	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	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	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	32.7	22.8	22.8	23.8	15.4	15.4	31.8	28.0	28.0	21.7	15.5	15.5
Actuated g/C Ratio	0.45	0.31	0.31	0.33	0.21	0.21	0.44	0.39	0.39	0.30	0.21	0.21
v/c Ratio	0.55	0.16	0.42	0.29	0.71	0.25	0.84	0.41	0.09	0.09	0.63	0.39
Control Delay	18.4	20.7	5.1	14.9	33.4	1.6	36.7	19.7	0.2	14.3	30.6	6.2
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	18.4	20.7	5.1	14.9	33.4	1.6	36.7	19.7	0.2	14.3	30.6	6.2
LOS	B	C	A	B	C	A	D	B	A	B	C	A
Approach Delay		13.6			25.3			24.8			23.0	
Approach LOS		B			C			C			C	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 72.7	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 71.6%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: Grinnell Blvd. & Bradley Rd.



HCM 2010 TWSC
 22: Grinnell Blvd. & Three-Quarter Site Access

2040 Background AM Peak Hour

Intersection

Int Delay, s/veh 1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↗↗	↗	↗	↗↗	↗
Traffic Vol, veh/h	0	0	175	0	0	0	0	830	0	0	498	10
Future Vol, veh/h	0	0	175	0	0	0	0	830	0	0	498	10
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	-	-	0	-	-	0	-	-	200	455	-	200
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	0	184	0	0	0	0	874	0	0	524	11

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	-	-	262	-	-	437	-	0	0	874	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	737	0	0	567	0	-	-	768	-	-
Stage 1	0	0	-	0	0	-	0	-	-	-	-	-
Stage 2	0	0	-	0	0	-	0	-	-	-	-	-
Platoon blocked, %							-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	737	-	-	567	-	-	-	768	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	0	0	0
HCM LOS	B	A		

Minor Lane/Major Mvmt	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	737	-	768	-
HCM Lane V/C Ratio	-	-	0.25	-	-	-
HCM Control Delay (s)	-	-	11.5	0	0	-
HCM Lane LOS	-	-	B	A	A	-
HCM 95th %tile Q(veh)	-	-	1	-	0	-

Timings

37: Powers & Bradley #2

2040 Background AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
Lane Configurations												
Traffic Volume (vph)	1	119	49	200	171	556	47	1940	207	337	941	
Future Volume (vph)	1	119	49	200	171	556	47	1940	207	337	941	
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		Free			Free			Free			
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	10.0		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	
Total Split (s)	10.0	20.0		22.0	32.0		10.0	59.0		29.0	78.0	
Total Split (%)	7.7%	15.4%		16.9%	24.6%		7.7%	45.4%		22.3%	60.0%	
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		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	None		C-Max	None	
Act Effct Green (s)	15.8	10.7	130.0	13.1	26.8	130.0	7.0	53.9	130.0	32.2	81.3	
Actuated g/C Ratio	0.12	0.08	1.00	0.10	0.21	1.00	0.05	0.41	1.00	0.25	0.63	
v/c Ratio	0.01	0.43	0.03	0.60	0.24	0.36	0.26	0.95	0.13	0.41	0.31	
Control Delay	38.0	61.2	0.0	45.1	33.9	4.5	62.3	47.6	0.2	43.5	12.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	38.0	61.2	0.0	45.1	33.9	4.5	62.3	47.6	0.2	43.5	12.4	
LOS	D	E	A	D	C	A	E	D	A	D	B	
Approach Delay		43.2			18.7			43.4			20.6	
Approach LOS		D			B			D			C	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 125 (96%), Referenced to phase 1:SBL, Start of Green
 Natural Cycle: 75
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.95
 Intersection Signal Delay: 32.0
 Intersection Capacity Utilization 72.0%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 37: Powers & Bradley #2



Timings

39: Marksheffel & Bradley #1

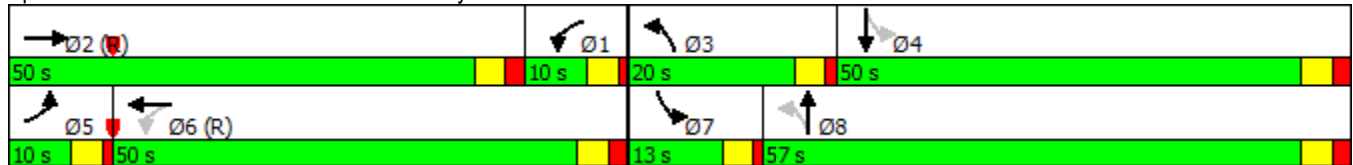
2040 Background AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	285	312	101	95	471	285	135	600	50	140	275	189
Future Volume (vph)	285	312	101	95	471	285	135	600	50	140	275	189
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	10.0		9.0	10.0	
Total Split (s)	10.0	50.0		10.0	50.0		20.0	57.0		13.0	50.0	
Total Split (%)	7.7%	38.5%		7.7%	38.5%		15.4%	43.8%		10.0%	38.5%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lead		Lag	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	None		None	None	
Act Effct Green (s)	24.5	68.2	130.0	50.7	49.7	130.0	41.7	28.8	130.0	34.8	24.8	130.0
Actuated g/C Ratio	0.19	0.52	1.00	0.39	0.38	1.00	0.32	0.22	1.00	0.27	0.19	1.00
v/c Ratio	0.45	0.12	0.07	0.22	0.25	0.18	0.40	0.78	0.03	0.73	0.42	0.12
Control Delay	46.1	17.7	0.1	28.5	27.8	0.3	34.2	54.8	0.0	54.4	47.9	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	46.1	17.7	0.1	28.5	27.8	0.3	34.2	54.8	0.0	54.4	47.9	0.2
LOS	D	B	A	C	C	A	C	D	A	D	D	A
Approach Delay		26.8			18.7			47.7			34.5	
Approach LOS		C			B			D			C	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 97 (75%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
 Natural Cycle: 50
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 31.6
 Intersection LOS: C
 Intersection Capacity Utilization 56.6%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 39: Marksheffel & Bradley #1



Timings

52: Bradley Heights/Federal Trade Zone & Bradley #1

2040 Background AM Peak Hour

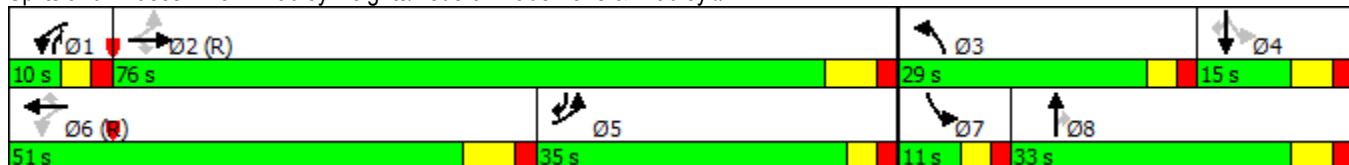
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	245	188	218	195	381	200	468	31	435	80	25	68
Future Volume (vph)	245	188	218	195	381	200	468	31	435	80	25	68
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2		2	6		6			8	4		4
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	5
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	2.0	5.0
Minimum Split (s)	10.0	12.0	12.0	10.0	12.0	12.0	10.0	11.0	10.0	10.0	8.0	10.0
Total Split (s)	35.0	76.0	76.0	10.0	51.0	51.0	29.0	33.0	10.0	11.0	15.0	35.0
Total Split (%)	26.9%	58.5%	58.5%	7.7%	39.2%	39.2%	22.3%	25.4%	7.7%	8.5%	11.5%	26.9%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.0	3.0	3.0	4.0	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	7.0	7.0	5.0	7.0	7.0	5.0	6.0	5.0	5.0	6.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	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 Effct Green (s)	77.4	75.4	75.4	54.2	52.2	52.2	22.3	20.4	30.7	14.6	7.2	35.5
Actuated g/C Ratio	0.60	0.58	0.58	0.42	0.40	0.40	0.17	0.16	0.24	0.11	0.06	0.27
v/c Ratio	0.34	0.07	0.23	0.23	0.20	0.28	0.84	0.11	0.63	0.23	0.25	0.13
Control Delay	8.6	4.4	0.7	15.3	16.2	5.7	65.3	45.0	7.4	39.8	64.2	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	8.6	4.4	0.7	15.3	16.2	5.7	65.3	45.0	7.4	39.8	64.2	0.5
LOS	A	A	A	B	B	A	E	D	A	D	E	A
Approach Delay		4.7			13.3			37.7			27.7	
Approach LOS		A			B			D			C	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 28 (22%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 45
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.84
 Intersection Signal Delay: 21.1
 Intersection Capacity Utilization 56.0%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service B

Splits and Phases: 52: Bradley Heights/Federal Trade Zone & Bradley #1



Timings
2: Grinnell & Powers

2040 Background PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↘↙	↑↑↑	↘↙	↑
Traffic Volume (vph)	2120	807	116	1258	523	96
Future Volume (vph)	2120	807	116	1258	523	96
Turn Type	NA	Free	Prot	NA	Prot	Free
Protected Phases	6		5	2	4	
Permitted Phases		Free				Free
Detector Phase	6		5	2	4	
Switch Phase						
Minimum Initial (s)	30.0		4.0	30.0	8.0	
Minimum Split (s)	38.0		9.5	38.0	21.5	
Total Split (s)	62.0		23.0	85.0	45.0	
Total Split (%)	47.7%		17.7%	65.4%	34.6%	
Yellow Time (s)	6.0		3.5	6.0	3.5	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	-4.0		-1.5	-4.0	-1.5	
Total Lost Time (s)	4.0		4.0	4.0	4.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effct Green (s)	57.5	103.1	10.5	72.0	23.0	103.1
Actuated g/C Ratio	0.56	1.00	0.10	0.70	0.22	1.00
v/c Ratio	0.79	0.53	0.34	0.38	0.70	0.06
Control Delay	21.8	1.3	47.0	7.1	42.5	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	1.3	47.0	7.1	42.5	0.1
LOS	C	A	D	A	D	A
Approach Delay	16.1			10.5	35.9	
Approach LOS	B			B	D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 103.1
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 17.0
 Intersection LOS: B
 Intersection Capacity Utilization 69.2%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 2: Grinnell & Powers



Timings

3: Grinnell Blvd. & Goldfield Drive

2040 Background PM Peak Hour



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↖	↑	↖↗	↑	↖	↖	↑↑	↖	↖	↑↑
Traffic Volume (vph)	19	2	48	7	191	178	408	81	301	821
Future Volume (vph)	19	2	48	7	191	178	408	81	301	821
Turn Type	pm+pt	NA	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	7	4	3	8		5	2		1	6
Permitted Phases	4				8	2		2	6	
Detector Phase	7	4	3	8	8	5	2	2	1	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	21.0	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0
Total Split (s)	10.0	21.0	16.0	27.0	27.0	10.0	36.0	36.0	18.0	44.0
Total Split (%)	11.0%	23.1%	17.6%	29.7%	29.7%	11.0%	39.6%	39.6%	19.8%	48.4%
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)	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	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Min	Min	None	Min
Act Effct Green (s)	6.8	6.2	6.7	6.9	6.9	18.6	13.3	13.3	27.3	18.2
Actuated g/C Ratio	0.14	0.13	0.14	0.15	0.15	0.39	0.28	0.28	0.57	0.38
v/c Ratio	0.08	0.01	0.10	0.03	0.49	0.53	0.43	0.13	0.51	0.64
Control Delay	19.1	24.0	22.5	21.7	9.0	15.0	16.5	0.4	8.5	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.1	24.0	22.5	21.7	9.0	15.0	16.5	0.4	8.5	14.7
LOS	B	C	C	C	A	B	B	A	A	B
Approach Delay		19.6		12.0			14.2			13.0
Approach LOS		B		B			B			B

Intersection Summary

Cycle Length: 91

Actuated Cycle Length: 47.5

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.64

Intersection Signal Delay: 13.4

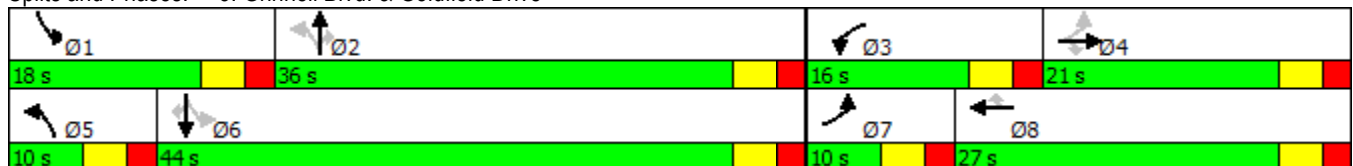
Intersection LOS: B

Intersection Capacity Utilization 53.1%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Grinnell Blvd. & Goldfield Drive



Timings

4: Grinnell Blvd. & Bradley Rd.

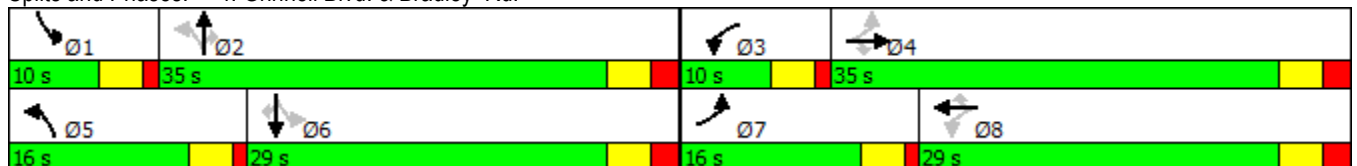
2040 Background PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	226	111	375	144	230	67	350	374	173	40	507	322
Future Volume (vph)	226	111	375	144	230	67	350	374	173	40	507	322
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	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	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	9.0	9.0
Total Split (s)	16.0	35.0	35.0	10.0	29.0	29.0	16.0	35.0	35.0	10.0	29.0	29.0
Total Split (%)	17.8%	38.9%	38.9%	11.1%	32.2%	32.2%	17.8%	38.9%	38.9%	11.1%	32.2%	32.2%
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)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	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)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	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	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	26.7	15.8	15.8	17.5	10.5	10.5	41.0	34.2	34.2	30.9	24.0	24.0
Actuated g/C Ratio	0.35	0.21	0.21	0.23	0.14	0.14	0.54	0.45	0.45	0.41	0.32	0.32
v/c Ratio	0.56	0.16	0.64	0.46	0.50	0.17	0.72	0.25	0.22	0.09	0.48	0.46
Control Delay	23.7	24.7	9.8	23.5	34.0	0.9	21.0	15.1	3.6	10.2	23.1	5.0
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	23.7	24.7	9.8	23.5	34.0	0.9	21.0	15.1	3.6	10.2	23.1	5.0
LOS	C	C	A	C	C	A	C	B	A	B	C	A
Approach Delay		16.5			25.5			15.2			15.8	
Approach LOS		B			C			B			B	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 75.9	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 17.3	Intersection LOS: B
Intersection Capacity Utilization 67.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: Grinnell Blvd. & Bradley Rd.



Timings

37: Powers & Bradley #2

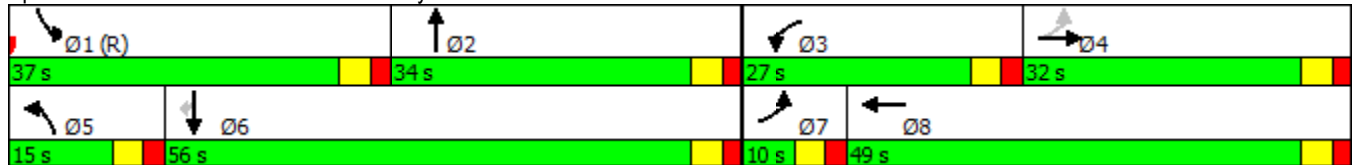
2040 Background PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	1	77	21	180	120	475	46	899	225	351	1865
Future Volume (vph)	1	77	21	180	120	475	46	899	225	351	1865
Turn Type	pm+pt	NA	Free	Prot	NA	Free	Prot	NA	Free	Prot	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases	4		Free			Free			Free		
Detector Phase	7	4		3	8		5	2		1	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)	9.0	9.0		9.0	9.0		9.0	9.0		9.0	9.0
Total Split (s)	10.0	32.0		27.0	49.0		15.0	34.0		37.0	56.0
Total Split (%)	7.7%	24.6%		20.8%	37.7%		11.5%	26.2%		28.5%	43.1%
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	None		None	None		None	Max		C-Max	Max
Act Effct Green (s)	13.4	8.4	130.0	12.4	23.8	130.0	7.2	29.0	130.0	60.2	84.1
Actuated g/C Ratio	0.10	0.06	1.00	0.10	0.18	1.00	0.06	0.22	1.00	0.46	0.65
v/c Ratio	0.01	0.36	0.01	0.57	0.19	0.31	0.25	0.82	0.15	0.23	0.58
Control Delay	40.0	62.1	0.0	66.7	57.4	4.0	61.5	54.8	0.2	22.1	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.0	62.1	0.0	66.7	57.4	4.0	61.5	54.8	0.2	22.1	15.1
LOS	D	E	A	E	E	A	E	D	A	C	B
Approach Delay		48.7			26.9			44.6			16.2
Approach LOS		D			C			D			B

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: 0.82
 Intersection Signal Delay: 26.7
 Intersection LOS: C
 Intersection Capacity Utilization 63.7%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 37: Powers & Bradley #2



Timings

39: Marksheffel & Bradley #1

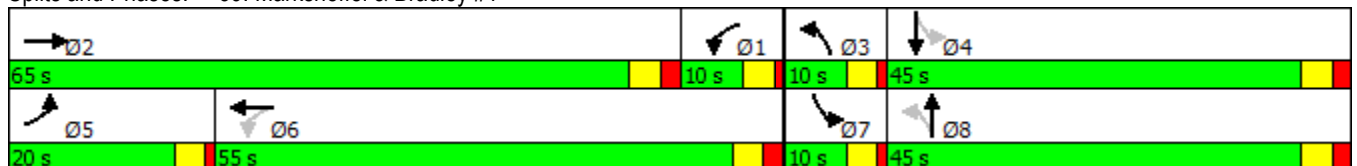
2040 Background PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	331	443	123	195	433	215	56	500	100	300	650	191
Future Volume (vph)	331	443	123	195	433	215	56	500	100	300	650	191
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	30.0		9.0	30.0	
Total Split (s)	20.0	65.0		10.0	55.0		10.0	45.0		10.0	45.0	
Total Split (%)	15.4%	50.0%		7.7%	42.3%		7.7%	34.6%		7.7%	34.6%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lead		Lag	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	None		None	None	
Act Effct Green (s)	13.0	12.4	67.8	13.2	12.1	67.8	25.3	18.3	67.8	26.4	20.8	67.8
Actuated g/C Ratio	0.19	0.18	1.00	0.19	0.18	1.00	0.37	0.27	1.00	0.39	0.31	1.00
v/c Ratio	0.52	0.49	0.08	0.55	0.49	0.14	0.18	0.54	0.06	0.86	0.61	0.12
Control Delay	28.8	27.8	0.1	32.6	28.0	0.2	13.6	23.7	0.1	43.4	24.3	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	28.8	27.8	0.1	32.6	28.0	0.2	13.6	23.7	0.1	43.4	24.3	0.2
LOS	C	C	A	C	C	A	B	C	A	D	C	A
Approach Delay		24.3			22.0			19.2			25.3	
Approach LOS		C			C			B			C	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 67.8
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 23.1
 Intersection LOS: C
 Intersection Capacity Utilization 64.8%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 39: Marksheffel & Bradley #1



Timings

52: Bradley Heights/Federal Trade Zone & Bradley #1

2040 Background PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	154	370	383	60	100	458	44	390	114	46	231
Future Volume (vph)	78	154	370	383	60	100	458	44	390	114	46	231
Turn Type	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2		2			6			8			4
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	5
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	2.0	5.0
Minimum Split (s)	10.0	12.0	12.0	10.0	12.0	12.0	10.0	11.0	10.0	10.0	8.0	10.0
Total Split (s)	12.0	46.0	46.0	29.0	63.0	63.0	44.0	11.0	29.0	44.0	11.0	12.0
Total Split (%)	9.2%	35.4%	35.4%	22.3%	48.5%	48.5%	33.8%	8.5%	22.3%	33.8%	8.5%	9.2%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.0	3.0	3.0	4.0	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	7.0	7.0	5.0	7.0	7.0	5.0	6.0	5.0	5.0	6.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	24.9	11.7	11.7	20.5	7.3	7.3	23.7	64.9	91.4	9.9	51.1	77.0
Actuated g/C Ratio	0.19	0.09	0.09	0.16	0.06	0.06	0.18	0.50	0.70	0.08	0.39	0.59
v/c Ratio	0.24	0.35	0.78	0.75	0.22	0.51	0.77	0.05	0.33	0.46	0.07	0.23
Control Delay	28.0	37.3	25.2	61.0	59.9	14.6	59.1	20.8	1.6	62.7	30.5	1.5
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	28.0	37.3	25.2	61.0	59.9	14.6	59.1	20.8	1.6	62.7	30.5	1.5
LOS	C	D	C	E	E	B	E	C	A	E	C	A
Approach Delay		28.7			52.4			32.1			22.7	
Approach LOS		C			D			C			C	

Intersection Summary

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 3 (2%), Referenced to phase 4:SBT and 8:NBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 34.3

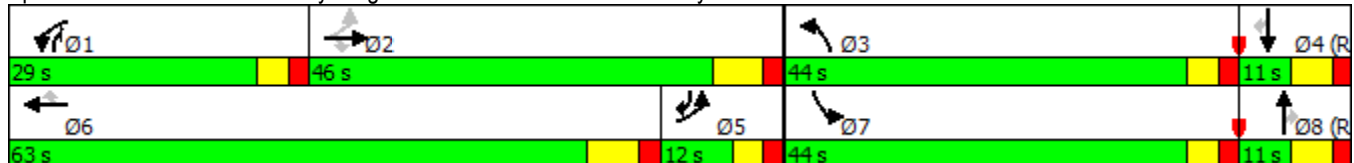
Intersection LOS: C

Intersection Capacity Utilization 52.2%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 52: Bradley Heights/Federal Trade Zone & Bradley #1



Timings
2: Grinnell & Powers

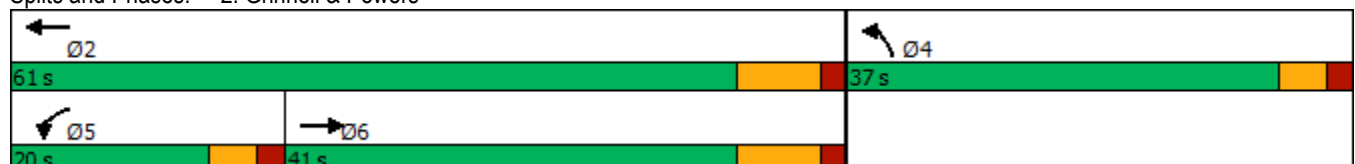
2040 Total AM Peak Hour

	→	↘	↙	←	↗	↖
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↗	↘	↑↑↑	↘	↗
Traffic Volume (vph)	1178	441	179	2484	752	244
Future Volume (vph)	1178	441	179	2484	752	244
Turn Type	NA	Free	Prot	NA	Prot	Free
Protected Phases	6		5	2	4	
Permitted Phases		Free				Free
Detector Phase	6		5	2	4	
Switch Phase						
Minimum Initial (s)	30.0		4.0	30.0	8.0	
Minimum Split (s)	38.0		9.5	38.0	21.5	
Total Split (s)	41.0		20.0	61.0	37.0	
Total Split (%)	41.8%		20.4%	62.2%	37.8%	
Yellow Time (s)	6.0		3.5	6.0	3.5	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	8.0		5.5	8.0	5.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effct Green (s)	36.0	91.3	10.3	51.8	25.9	91.3
Actuated g/C Ratio	0.39	1.00	0.11	0.57	0.28	1.00
v/c Ratio	0.62	0.29	0.48	0.91	0.80	0.16
Control Delay	24.9	0.5	43.1	24.8	37.2	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.9	0.5	43.1	24.8	37.2	0.2
LOS	C	A	D	C	D	A
Approach Delay	18.2			26.1	28.1	
Approach LOS	B			C	C	

Intersection Summary

Cycle Length: 98
 Actuated Cycle Length: 91.3
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 24.1
 Intersection LOS: C
 Intersection Capacity Utilization 80.7%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 2: Grinnell & Powers



Timings

3: Grinnell Blvd. & Goldfield Drive

2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	12	22	131	4	231	272	648	27	88	598	5
Future Volume (vph)	89	12	22	131	4	231	272	648	27	88	598	5
Turn Type	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Detector Phase	7	4	4	3	8	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	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0
Total Split (s)	10.0	21.0	21.0	10.0	21.0	21.0	10.0	50.0	50.0	10.0	50.0	50.0
Total Split (%)	11.0%	23.1%	23.1%	11.0%	23.1%	23.1%	11.0%	54.9%	54.9%	11.0%	54.9%	54.9%
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	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	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	8.5	7.1	7.1	9.5	7.0	7.0	22.1	18.4	18.4	20.7	15.4	15.4
Actuated g/C Ratio	0.17	0.14	0.14	0.19	0.14	0.14	0.44	0.36	0.36	0.41	0.30	0.30
v/c Ratio	0.33	0.05	0.07	0.21	0.02	0.57	0.78	0.53	0.04	0.25	0.58	0.01
Control Delay	20.4	22.0	0.4	22.9	21.5	9.7	29.6	16.7	0.1	9.5	17.8	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	20.4	22.0	0.4	22.9	21.5	9.7	29.6	16.7	0.1	9.5	17.8	0.0
LOS	C	C	A	C	C	A	C	B	A	A	B	A
Approach Delay		17.0			14.5			19.9			16.6	
Approach LOS		B			B			B			B	

Intersection Summary

Cycle Length: 91

Actuated Cycle Length: 50.8

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 17.8

Intersection LOS: B

Intersection Capacity Utilization 55.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Grinnell Blvd. & Goldfield Drive



Timings

4: Grinnell Blvd. & Bradley Rd.

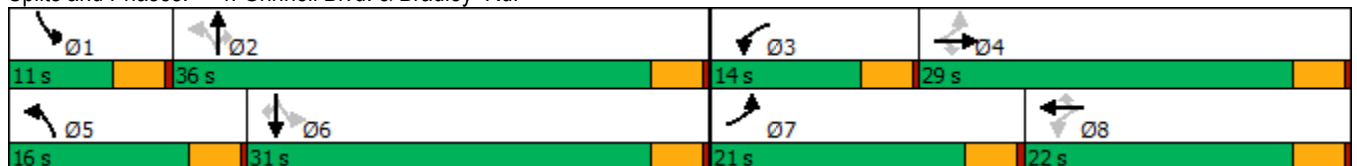
2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	256	247	275	140	573	122	353	568	76	34	500	217
Future Volume (vph)	256	247	275	140	573	122	353	568	76	34	500	217
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	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	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	21.0	29.0	29.0	14.0	22.0	22.0	16.0	36.0	36.0	11.0	31.0	31.0
Total Split (%)	23.3%	32.2%	32.2%	15.6%	24.4%	24.4%	17.8%	40.0%	40.0%	12.2%	34.4%	34.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
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)	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	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	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	34.3	21.9	21.9	25.2	16.5	16.5	33.4	27.5	27.5	23.5	17.2	17.2
Actuated g/C Ratio	0.45	0.29	0.29	0.33	0.22	0.22	0.44	0.36	0.36	0.31	0.23	0.23
v/c Ratio	0.64	0.26	0.44	0.33	0.79	0.25	0.91	0.47	0.12	0.11	0.66	0.43
Control Delay	22.1	22.4	5.4	16.1	37.8	1.9	46.7	22.2	0.4	14.5	31.5	6.5
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	22.1	22.4	5.4	16.1	37.8	1.9	46.7	22.2	0.4	14.5	31.5	6.5
LOS	C	C	A	B	D	A	D	C	A	B	C	A
Approach Delay		16.3			28.9			29.2			23.5	
Approach LOS		B			C			C			C	

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 76.2
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 24.9
 Intersection LOS: C
 Intersection Capacity Utilization 76.7%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 4: Grinnell Blvd. & Bradley Rd.



HCM 6th TWSC
 22: Grinnell Blvd. & Three-Quarter Site Access

2040 Total 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	0	0	194	0	0	100	0	896	73	106	498	16
Future Vol, veh/h	0	0	194	0	0	100	0	896	73	106	498	16
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	-	-	0	-	-	0	-	-	200	455	-	200
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	0	204	0	0	105	0	943	77	112	524	17

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	262	-	-	472	-	0	0	1020	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	737	0	0	538	0	-	-	676	-	-
Stage 1	0	0	-	0	0	-	0	-	-	-	-	-
Stage 2	0	0	-	0	0	-	0	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	737	-	-	538	-	-	-	676	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	11.7		13.3		0		1.9	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	737	538	676	-	-
HCM Lane V/C Ratio	-	-	0.277	0.196	0.165	-	-
HCM Control Delay (s)	-	-	11.7	13.3	11.4	-	-
HCM Lane LOS	-	-	B	B	B	-	-
HCM 95th %tile Q(veh)	-	-	1.1	0.7	0.6	-	-

Timings
37: Powers & Bradley

2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	226	75	323	299	736	100	1900	403	477	925	19
Future Volume (vph)	26	226	75	323	299	736	100	1900	403	477	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	20.0		22.0	32.0		17.0	57.0		31.0	71.0	71.0
Total Split (%)	7.7%	15.4%		16.9%	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 Effct Green (s)	18.4	13.4	130.0	16.1	28.4	130.0	9.3	52.0	130.0	28.6	71.3	71.3
Actuated g/C Ratio	0.14	0.10	1.00	0.12	0.22	1.00	0.07	0.40	1.00	0.22	0.55	0.55
v/c Ratio	0.15	0.66	0.05	0.79	0.40	0.48	0.42	0.96	0.26	0.65	0.34	0.02
Control Delay	37.5	64.9	0.1	50.8	34.9	6.1	62.7	51.2	0.4	51.6	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	37.5	64.9	0.1	50.8	34.9	6.1	62.7	51.2	0.4	51.6	17.3	0.1
LOS	D	E	A	D	C	A	E	D	A	D	B	A
Approach Delay		47.8			23.1			43.2			28.6	
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: 34.7
 Intersection LOS: C
 Intersection Capacity Utilization 84.5%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 37: Powers & Bradley



Timings

39: Marksheffel & Bradley #1

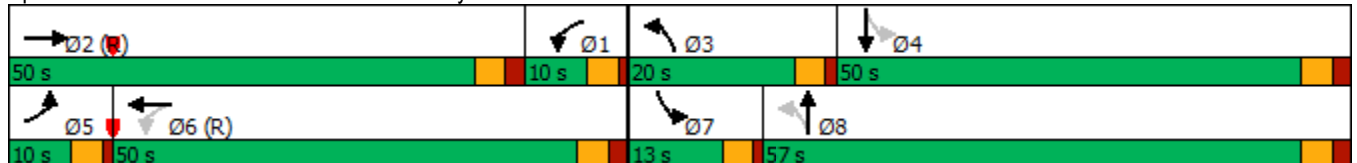
2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	446	400	151	95	604	285	253	600	50	140	275	354
Future Volume (vph)	446	400	151	95	604	285	253	600	50	140	275	354
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	10.0		9.0	10.0	
Total Split (s)	10.0	50.0		10.0	50.0		20.0	57.0		13.0	50.0	
Total Split (%)	7.7%	38.5%		7.7%	38.5%		15.4%	43.8%		10.0%	38.5%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lead		Lag	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	None		None	None	
Act Effct Green (s)	29.2	68.2	130.0	46.0	45.0	130.0	42.8	28.8	130.0	32.1	22.1	130.0
Actuated g/C Ratio	0.22	0.52	1.00	0.35	0.35	1.00	0.33	0.22	1.00	0.25	0.17	1.00
v/c Ratio	0.59	0.15	0.10	0.26	0.35	0.18	0.71	0.78	0.03	0.73	0.47	0.23
Control Delay	34.3	15.9	0.1	32.8	32.3	0.3	45.1	54.8	0.0	54.3	50.5	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	34.3	15.9	0.1	32.8	32.3	0.3	45.1	54.8	0.0	54.3	50.5	0.3
LOS	C	B	A	C	C	A	D	D	A	D	D	A
Approach Delay		21.7			23.1			49.0			28.1	
Approach LOS		C			C			D			C	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 97 (75%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 30.2
 Intersection LOS: C
 Intersection Capacity Utilization 63.7%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 39: Marksheffel & Bradley #1



Timings

41: Waterview Signal & Bradley/Bradley #1

2040 Total AM Peak Hour

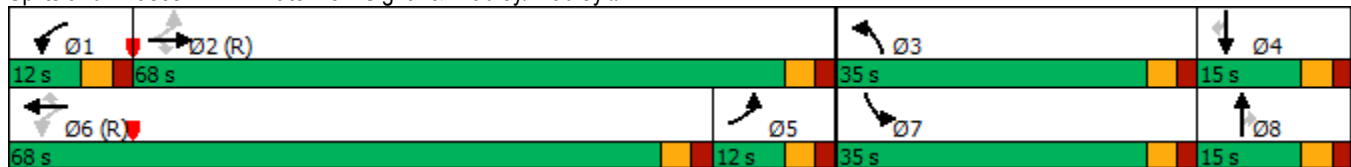
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	265	708	134	107	1040	43	260	16	125	70	14	59
Future Volume (vph)	265	708	134	107	1040	43	260	16	125	70	14	59
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		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)	12.0	68.0	68.0	12.0	68.0	68.0	35.0	15.0	15.0	35.0	15.0	15.0
Total Split (%)	9.2%	52.3%	52.3%	9.2%	52.3%	52.3%	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 Effct Green (s)	80.8	80.8	80.8	82.8	82.8	82.8	15.7	14.2	14.2	8.2	6.6	6.6
Actuated g/C Ratio	0.62	0.62	0.62	0.64	0.64	0.64	0.12	0.11	0.11	0.06	0.05	0.05
v/c Ratio	0.78	0.24	0.14	0.25	0.34	0.04	0.66	0.08	0.44	0.34	0.16	0.29
Control Delay	52.2	22.8	12.2	10.4	10.7	1.9	62.3	51.6	11.4	62.2	62.2	3.3
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	52.2	22.8	12.2	10.4	10.7	1.9	62.3	51.6	11.4	62.2	62.2	3.3
LOS	D	C	B	B	B	A	E	D	B	E	E	A
Approach Delay		28.5			10.3			46.0			38.0	
Approach LOS		C			B			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 74 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 23.9
 Intersection Capacity Utilization 61.4%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service B

Splits and Phases: 41: Waterview Signal & Bradley/Bradley #1



Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑↑↑			↑↑↑					↑			↑
Traffic Vol, veh/h	0	890	13	0	1134	232	0	0	37	0	0	56
Future Vol, veh/h	0	890	13	0	1134	232	0	0	37	0	0	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	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	937	14	0	1194	244	0	0	39	0	0	59

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	-	0	0	-	-	0	-	-	476	-	-	719
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	7.14	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.92	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	458	0	0	318
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	458	-	-	318
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13.6	18.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	458	-	-	-	-	318
HCM Lane V/C Ratio	0.085	-	-	-	-	0.185
HCM Control Delay (s)	13.6	-	-	-	-	18.9
HCM Lane LOS	B	-	-	-	-	C
HCM 95th %tile Q(veh)	0.3	-	-	-	-	0.7

HCM 6th Roundabout
 45: Waterview East N/S St & Retail Access/ Residential Access

2040 Total AM Peak Hour

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	97	62	318	277
Demand Flow Rate, veh/h	99	63	325	283
Vehicles Circulating, veh/h	142	410	97	29
Vehicles Exiting, veh/h	170	12	144	444
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.8	4.7	5.3	4.5
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	99	63	325	283
Cap Entry Lane, veh/h	1194	908	1250	1340
Entry HV Adj Factor	0.980	0.984	0.979	0.980
Flow Entry, veh/h	97	62	318	277
Cap Entry, veh/h	1169	894	1224	1313
V/C Ratio	0.083	0.069	0.260	0.211
Control Delay, s/veh	3.8	4.7	5.3	4.5
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	1

Timings

52: Bradley Heights/Federal Trade Zone & Bradley #1

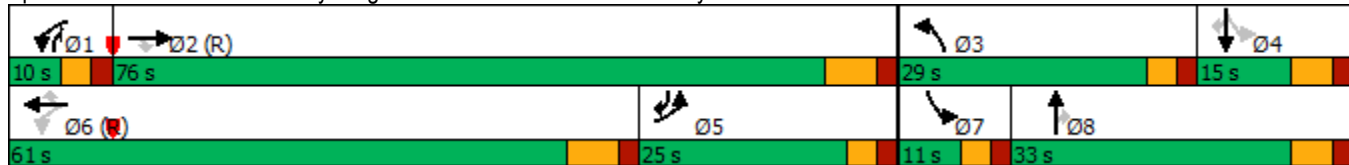
2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	452	225	201	790	200	500	40	451	100	35	75
Future Volume (vph)	250	452	225	201	790	200	500	40	451	100	35	75
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases			2	6		6			8	4		4
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	5
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	2.0	5.0
Minimum Split (s)	10.0	12.0	12.0	10.0	12.0	12.0	10.0	11.0	10.0	10.0	8.0	10.0
Total Split (s)	25.0	76.0	76.0	10.0	61.0	61.0	29.0	33.0	10.0	11.0	15.0	25.0
Total Split (%)	19.2%	58.5%	58.5%	7.7%	46.9%	46.9%	22.3%	25.4%	7.7%	8.5%	11.5%	19.2%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.0	3.0	3.0	4.0	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	7.0	7.0	5.0	7.0	7.0	5.0	6.0	5.0	5.0	6.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	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 Effct Green (s)	20.0	72.0	72.0	60.7	58.7	58.7	23.0	21.9	32.2	16.1	7.7	27.4
Actuated g/C Ratio	0.15	0.55	0.55	0.47	0.45	0.45	0.18	0.17	0.25	0.12	0.06	0.21
v/c Ratio	0.50	0.17	0.24	0.51	0.36	0.25	0.87	0.13	0.74	0.54	0.34	0.17
Control Delay	69.9	25.9	14.5	20.2	15.7	3.5	67.6	43.5	18.8	51.4	66.7	0.8
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	69.9	25.9	14.5	20.2	15.7	3.5	67.6	43.5	18.8	51.4	66.7	0.8
LOS	E	C	B	C	B	A	E	D	B	D	E	A
Approach Delay		35.0			14.4			44.4			35.9	
Approach LOS		C			B			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 28 (22%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 30.4
 Intersection LOS: C
 Intersection Capacity Utilization 58.3%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 52: Bradley Heights/Federal Trade Zone & Bradley #1



Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	349	811	3	0	24
Future Vol, veh/h	8	349	811	3	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	-	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	9	379	882	3	0	26

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	885	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.14	-	6.94
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.22	-	3.32
Pot Cap-1 Maneuver	760	-	0
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	760	-	562
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	760	-	-	-	562
HCM Lane V/C Ratio	0.011	-	-	-	0.046
HCM Control Delay (s)	9.8	-	-	-	11.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Timings
2: Grinnell & Powers

2040 Total PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↘↙	↑↑↑	↘↙	↑
Traffic Volume (vph)	2292	953	246	1395	656	218
Future Volume (vph)	2292	953	246	1395	656	218
Turn Type	NA	Free	Prot	NA	Prot	Free
Protected Phases	6		5	2	4	
Permitted Phases		Free				Free
Detector Phase	6		5	2	4	
Switch Phase						
Minimum Initial (s)	30.0		4.0	30.0	8.0	
Minimum Split (s)	38.0		9.5	38.0	21.5	
Total Split (s)	61.0		26.0	87.0	43.0	
Total Split (%)	46.9%		20.0%	66.9%	33.1%	
Yellow Time (s)	6.0		3.5	6.0	3.5	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	8.0		5.5	8.0	5.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effct Green (s)	53.3	113.7	13.7	72.5	27.6	113.7
Actuated g/C Ratio	0.47	1.00	0.12	0.64	0.24	1.00
v/c Ratio	1.01	0.61	0.61	0.45	0.80	0.14
Control Delay	52.4	1.8	54.8	11.6	48.7	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.4	1.8	54.8	11.6	48.7	0.2
LOS	D	A	D	B	D	A
Approach Delay	37.5			18.1	36.6	
Approach LOS	D			B	D	

Intersection Summary

Cycle Length: 130	
Actuated Cycle Length: 113.7	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.01	
Intersection Signal Delay: 31.8	Intersection LOS: C
Intersection Capacity Utilization 85.9%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 2: Grinnell & Powers



Timings

3: Grinnell Blvd. & Goldfield Drive

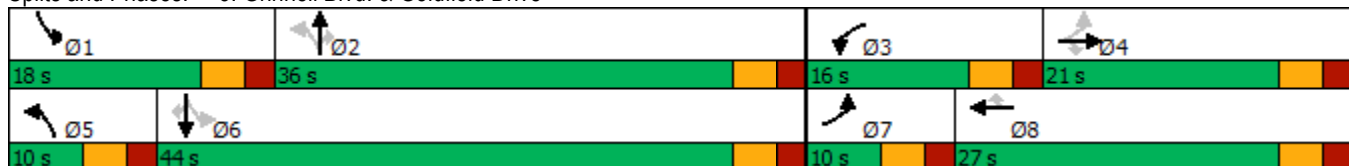
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	7	10	226	13	202	220	524	89	317	794	25
Future Volume (vph)	47	7	10	226	13	202	220	524	89	317	794	25
Turn Type	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Detector Phase	7	4	4	3	8	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	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0
Total Split (s)	10.0	21.0	21.0	16.0	27.0	27.0	10.0	36.0	36.0	18.0	44.0	44.0
Total Split (%)	11.0%	23.1%	23.1%	17.6%	29.7%	29.7%	11.0%	39.6%	39.6%	19.8%	48.4%	48.4%
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)	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	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	7.3	6.1	6.1	10.6	9.1	9.1	20.3	15.0	15.0	30.2	20.6	20.6
Actuated g/C Ratio	0.13	0.11	0.11	0.19	0.16	0.16	0.36	0.27	0.27	0.54	0.37	0.37
v/c Ratio	0.21	0.03	0.03	0.36	0.05	0.49	0.73	0.58	0.15	0.65	0.64	0.04
Control Delay	21.4	29.1	0.1	24.3	24.6	8.7	29.1	21.8	0.5	14.4	17.7	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	21.4	29.1	0.1	24.3	24.6	8.7	29.1	21.8	0.5	14.4	17.7	0.1
LOS	C	C	A	C	C	A	C	C	A	B	B	A
Approach Delay		18.7			17.2			21.4			16.4	
Approach LOS		B			B			C			B	

Intersection Summary

Cycle Length: 91
 Actuated Cycle Length: 56
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 18.3
 Intersection LOS: B
 Intersection Capacity Utilization 59.8%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 3: Grinnell Blvd. & Goldfield Drive



Timings

4: Grinnell Blvd. & Bradley Rd.

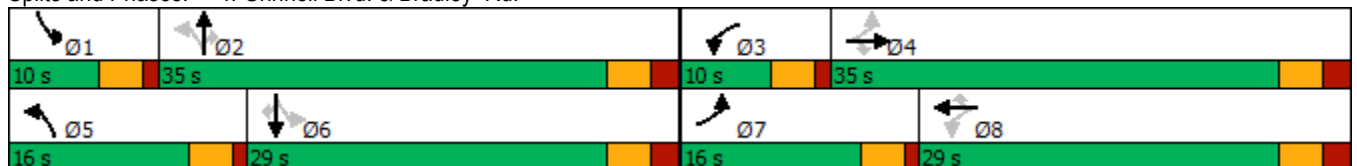
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	244	375	178	384	72	363	451	203	48	596	387
Future Volume (vph)	310	244	375	178	384	72	363	451	203	48	596	387
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	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	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	9.0	9.0
Total Split (s)	16.0	35.0	35.0	10.0	29.0	29.0	16.0	35.0	35.0	10.0	29.0	29.0
Total Split (%)	17.8%	38.9%	38.9%	11.1%	32.2%	32.2%	17.8%	38.9%	38.9%	11.1%	32.2%	32.2%
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)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	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)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	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	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	31.5	20.5	20.5	21.5	14.5	14.5	41.1	34.2	34.2	30.9	24.0	24.0
Actuated g/C Ratio	0.39	0.25	0.25	0.27	0.18	0.18	0.51	0.42	0.42	0.38	0.30	0.30
v/c Ratio	0.83	0.29	0.62	0.54	0.64	0.16	0.88	0.32	0.27	0.13	0.59	0.58
Control Delay	38.3	24.8	10.2	25.1	35.3	0.8	39.2	17.8	3.9	12.4	27.4	9.4
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	38.3	24.8	10.2	25.1	35.3	0.8	39.2	17.8	3.9	12.4	27.4	9.4
LOS	D	C	B	C	D	A	D	B	A	B	C	A
Approach Delay		23.4			28.5			22.7			19.9	
Approach LOS		C			C			C			B	

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 80.6
 Natural Cycle: 60
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 23.1
 Intersection LOS: C
 Intersection Capacity Utilization 79.4%
 ICU Level of Service D
 Analysis Period (min) 15

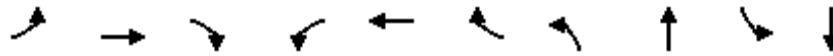
Splits and Phases: 4: Grinnell Blvd. & Bradley Rd.



Timings

5: Bradley Rd. & Goldfield Drive

2040 Total PM Peak Hour



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↗	↖	↗
Traffic Volume (vph)	120	209	139	5	291	49	267	182	33	214
Future Volume (vph)	120	209	139	5	291	49	267	182	33	214
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6		3	8	7	4
Permitted Phases	2		2	6		6	8		4	
Detector Phase	5	2	2	1	6	6	3	8	7	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
Minimum Split (s)	10.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	10.0	21.0
Total Split (s)	15.0	33.0	33.0	10.0	28.0	28.0	15.0	37.0	10.0	32.0
Total Split (%)	16.7%	36.7%	36.7%	11.1%	31.1%	31.1%	16.7%	41.1%	11.1%	35.6%
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)	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	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	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
Act Effct Green (s)	45.2	43.1	43.1	37.1	31.5	31.5	34.8	28.8	24.8	19.8
Actuated g/C Ratio	0.50	0.48	0.48	0.41	0.35	0.35	0.39	0.32	0.28	0.22
v/c Ratio	0.28	0.25	0.18	0.01	0.47	0.08	0.86	0.34	0.10	0.75
Control Delay	15.3	17.3	4.2	14.4	27.8	0.2	45.8	25.0	16.4	42.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.3	17.3	4.2	14.4	27.8	0.2	45.8	25.0	16.4	42.1
LOS	B	B	A	B	C	A	D	C	B	D
Approach Delay		12.8			23.7			37.2		39.4
Approach LOS		B			C			D		D

Intersection Summary

Cycle Length: 90

Actuated Cycle Length: 90

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

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 27.6

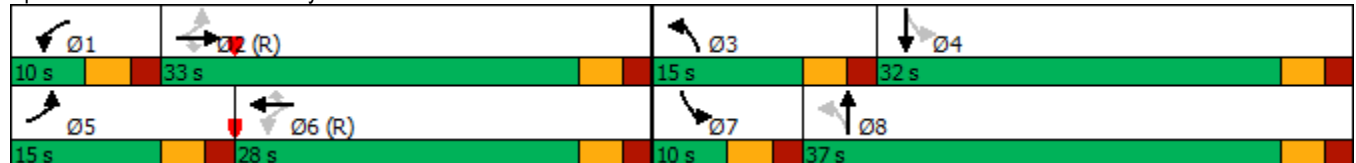
Intersection LOS: C

Intersection Capacity Utilization 68.9%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 5: Bradley Rd. & Goldfield Drive



HCM 6th TWSC
 22: Grinnell Blvd. & Three-Quarter Site Access

2040 Total PM Peak Hour

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↕	↗	↘	↕	↗
Traffic Vol, veh/h	0	0	243	0	0	227	0	647	127	244	894	60
Future Vol, veh/h	0	0	243	0	0	227	0	647	127	244	894	60
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	-	-	0	-	-	0	-	-	200	455	-	200
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	0	256	0	0	239	0	681	134	257	941	63

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	471	-	-	341	-	0	0	815	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	539	0	0	655	0	-	-	808	-	-
Stage 1	0	0	-	0	0	-	0	-	-	-	-	-
Stage 2	0	0	-	0	0	-	0	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	539	-	-	655	-	-	-	808	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	17.6		13.6		0		2.3	
HCM LOS	C		B					

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	539	655	808	-	-
HCM Lane V/C Ratio	-	-	0.475	0.365	0.318	-	-
HCM Control Delay (s)	-	-	17.6	13.6	11.5	-	-
HCM Lane LOS	-	-	C	B	B	-	-
HCM 95th %tile Q(veh)	-	-	2.5	1.7	1.4	-	-

Timings

37: Powers & Bradley #2

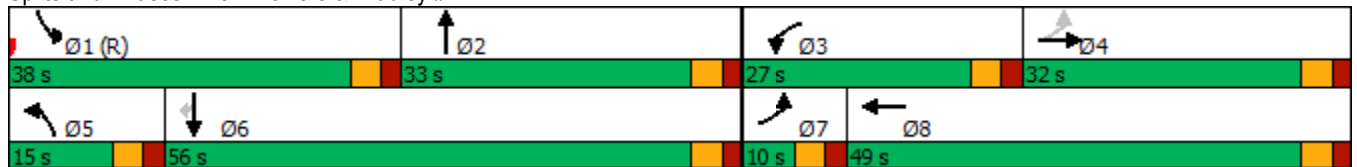
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	411	210	552	439	749	175	820	501	700	1700	110
Future Volume (vph)	71	411	210	552	439	749	175	820	501	700	1700	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	32.0		27.0	49.0		15.0	33.0		38.0	56.0	56.0
Total Split (%)	7.7%	24.6%		20.8%	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 Effct Green (s)	26.3	21.3	130.0	22.0	40.3	130.0	11.1	28.0	130.0	38.7	55.7	55.7
Actuated g/C Ratio	0.20	0.16	1.00	0.17	0.31	1.00	0.09	0.22	1.00	0.30	0.43	0.43
v/c Ratio	0.35	0.75	0.14	0.98	0.41	0.49	0.62	0.77	0.33	0.71	0.81	0.15
Control Delay	33.4	60.0	0.2	70.0	36.4	3.7	66.9	53.5	0.5	45.8	36.8	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	60.0	0.2	70.0	36.4	3.7	66.9	53.5	0.5	45.8	36.8	2.3
LOS	C	E	A	E	D	A	E	D	A	D	D	A
Approach Delay		39.1			33.0			37.4			37.8	
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: 0.98
 Intersection Signal Delay: 36.5
 Intersection LOS: D
 Intersection Capacity Utilization 81.6%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 37: Powers & Bradley #2



Timings

39: Marksheffel & Bradley #1

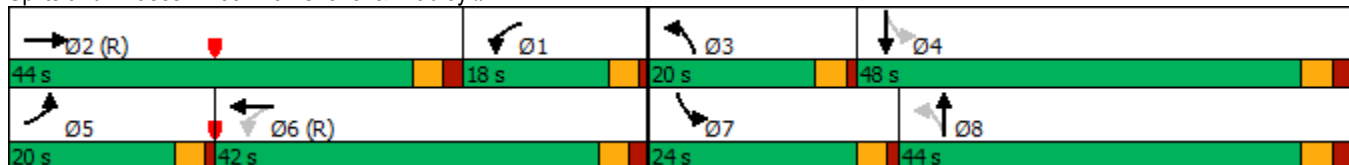
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↑↑↑	↗	↖	↑↑↑	↗	↖	↑↑	↗	↖	↑↑	↗
Traffic Volume (vph)	651	702	353	195	652	215	228	500	100	300	650	501
Future Volume (vph)	651	702	353	195	652	215	228	500	100	300	650	501
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	10.0		9.0	10.0	
Total Split (s)	20.0	44.0		18.0	42.0		20.0	44.0		24.0	48.0	
Total Split (%)	15.4%	33.8%		13.8%	32.3%		15.4%	33.8%		18.5%	36.9%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lead		Lag	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	None		None	None	
Act Effct Green (s)	29.3	52.3	130.0	38.0	37.0	130.0	43.0	26.7	130.0	50.4	30.4	130.0
Actuated g/C Ratio	0.23	0.40	1.00	0.29	0.28	1.00	0.33	0.21	1.00	0.39	0.23	1.00
v/c Ratio	0.86	0.35	0.23	0.63	0.46	0.14	0.84	0.70	0.06	0.87	0.80	0.32
Control Delay	56.9	17.6	0.3	54.6	39.5	0.2	56.1	53.1	0.1	53.1	54.7	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	56.9	17.6	0.3	54.6	39.5	0.2	56.1	53.1	0.1	53.1	54.7	0.5
LOS	E	B	A	D	D	A	E	D	A	D	D	A
Approach Delay		29.0			34.3			47.5			35.7	
Approach LOS		C			C			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 100 (77%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 35.1
 Intersection LOS: D
 Intersection Capacity Utilization 76.8%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 39: Marksheffel & Bradley #1



Timings

41: Waterview Signal & Bradley #2

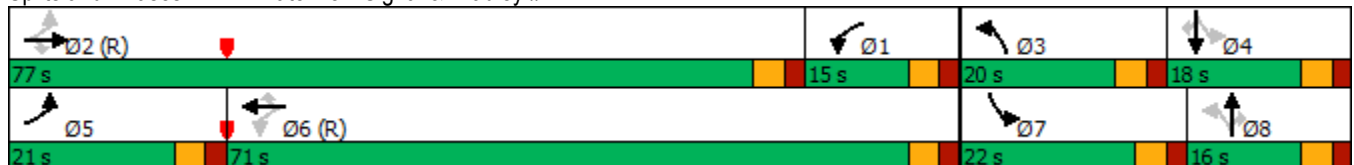
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑↑↑	↗	↖	↑↑↑	↗	↖↗	↑	↗	↖↗	↑	↗
Traffic Volume (vph)	352	849	411	304	1124	49	359	19	248	312	20	256
Future Volume (vph)	352	849	411	304	1124	49	359	19	248	312	20	256
Turn Type	pm+pt	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		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)	21.0	77.0	77.0	15.0	71.0	71.0	20.0	16.0	16.0	22.0	18.0	18.0
Total Split (%)	16.2%	59.2%	59.2%	11.5%	54.6%	54.6%	15.4%	12.3%	12.3%	16.9%	13.8%	13.8%
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 Effct Green (s)	75.8	75.8	75.8	66.0	66.0	66.0	23.6	8.8	8.8	24.9	9.5	9.5
Actuated g/C Ratio	0.58	0.58	0.58	0.51	0.51	0.51	0.18	0.07	0.07	0.19	0.07	0.07
v/c Ratio	0.97	0.30	0.39	0.84	0.46	0.06	0.66	0.16	0.80	0.56	0.16	0.82
Control Delay	57.3	14.3	5.3	53.8	18.9	1.5	49.8	58.9	29.1	46.6	57.1	30.9
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	57.3	14.3	5.3	53.8	18.9	1.5	49.8	58.9	29.1	46.6	57.1	30.9
LOS	E	B	A	D	B	A	D	E	C	D	E	C
Approach Delay		21.4			25.5			41.9			40.1	
Approach LOS		C			C			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 39 (30%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 28.3
 Intersection LOS: C
 Intersection Capacity Utilization 70.6%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 41: Waterview Signal & Bradley #2



HCM 6th TWSC
42: Waterview RIRO & Bradley #2/Bradley #1

2040 Total PM Peak Hour

Intersection												
Int Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑↑↑			↑↑↑					↑			↑
Traffic Vol, veh/h	0	1341	67	0	1251	241	0	0	26	0	0	226
Future Vol, veh/h	0	1341	67	0	1251	241	0	0	26	0	0	226
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	Yield	Yield	Yield
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16983	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	98	95	95	98	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1368	71	0	1277	254	0	0	27	0	0	238

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	-	0	0	-	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	0	-	0
Stage 1	0	-	-	0	-	0
Stage 2	0	-	-	0	-	0
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	0
Mov Cap-2 Maneuver	-	-	-	-	-	0
Stage 1	-	-	-	-	-	0
Stage 2	-	-	-	-	-	0

Approach	EB	WB	NB
HCM Control Delay, s	0	0	17.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR
Capacity (veh/h)	318	-	-	-	-
HCM Lane V/C Ratio	0.086	-	-	-	-
HCM Control Delay (s)	17.4	-	-	-	-
HCM Lane LOS	C	-	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-	-

HCM 6th Roundabout
 45: Waterview East N/S & Retail Access/Residential Access

2040 Total PM Peak Hour

Intersection				
Intersection Delay, s/veh	10.5			
Intersection LOS	B			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	491	42	267	799
Demand Flow Rate, veh/h	501	43	272	815
Vehicles Circulating, veh/h	427	705	487	55
Vehicles Exiting, veh/h	443	54	440	693
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.1	6.2	8.1	10.5
Approach LOS	B	A	A	B
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	501	43	272	815
Cap Entry Lane, veh/h	893	672	840	1305
Entry HV Adj Factor	0.980	0.976	0.981	0.980
Flow Entry, veh/h	491	42	267	799
Cap Entry, veh/h	875	656	823	1278
V/C Ratio	0.561	0.064	0.324	0.625
Control Delay, s/veh	12.1	6.2	8.1	10.5
LOS	B	A	A	B
95th %tile Queue, veh	4	0	1	5

Timings

52: Bradley Heights/Federal Trade Zone & Bradley #1

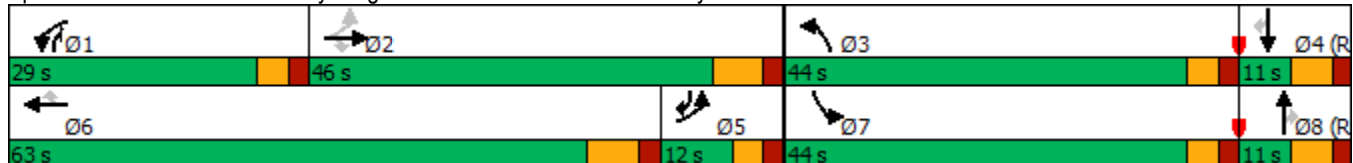
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	867	400	400	742	100	500	50	400	200	85	251
Future Volume (vph)	100	867	400	400	742	100	500	50	400	200	85	251
Turn Type	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2		2			6			8			4
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	5
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	2.0	5.0
Minimum Split (s)	10.0	12.0	12.0	10.0	12.0	12.0	10.0	11.0	10.0	10.0	8.0	10.0
Total Split (s)	12.0	46.0	46.0	29.0	63.0	63.0	44.0	11.0	29.0	44.0	11.0	12.0
Total Split (%)	9.2%	35.4%	35.4%	22.3%	48.5%	48.5%	33.8%	8.5%	22.3%	33.8%	8.5%	9.2%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.0	3.0	3.0	4.0	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	7.0	7.0	5.0	7.0	7.0	5.0	6.0	5.0	5.0	6.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	34.9	32.9	32.9	21.2	27.9	27.9	25.4	39.5	66.7	13.4	27.5	54.7
Actuated g/C Ratio	0.27	0.25	0.25	0.16	0.21	0.21	0.20	0.30	0.51	0.10	0.21	0.42
v/c Ratio	0.25	0.71	0.59	0.75	0.72	0.24	0.79	0.09	0.45	0.60	0.23	0.36
Control Delay	20.7	25.1	5.1	47.9	40.1	2.7	58.3	38.1	10.3	62.5	49.6	9.3
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	20.7	25.1	5.1	47.9	40.1	2.7	58.3	38.1	10.3	62.5	49.6	9.3
LOS	C	C	A	D	D	A	E	D	B	E	D	A
Approach Delay		18.9			39.6			37.0			35.6	
Approach LOS		B			D			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 3 (2%), Referenced to phase 4:SBT and 8:NBT, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 31.6
 Intersection Capacity Utilization 64.1%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service C

Splits and Phases: 52: Bradley Heights/Federal Trade Zone & Bradley #1



Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑			↗
Traffic Vol, veh/h	27	468	618	10	0	16
Future Vol, veh/h	27	468	618	10	0	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	-	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	29	509	672	11	0	17

Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	683	0	-	0	-	342
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	4.14	-	-	-	-	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	2.22	-	-	-	-	3.32
Pot Cap-1 Maneuver	906	-	-	-	0	654
Stage 1	-	-	-	-	0	-
Stage 2	-	-	-	-	0	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	906	-	-	-	-	654
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	906	-	-	-	654
HCM Lane V/C Ratio	0.032	-	-	-	0.027
HCM Control Delay (s)	9.1	-	-	-	10.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Timings
2: Grinnell & Powers

2017 Total Traffic
AM Peak Hour

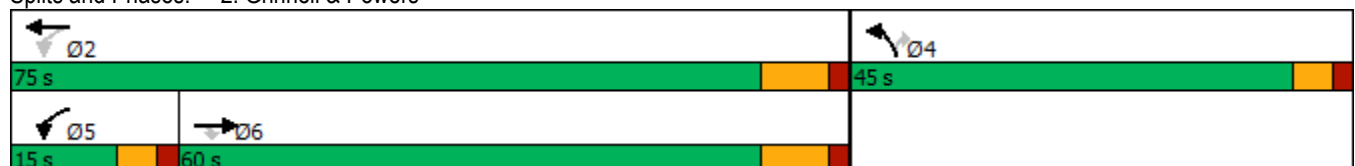


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	↓
Traffic Volume (vph)	667	272	148	1270	544	127
Future Volume (vph)	667	272	148	1270	544	127
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						
Minimum Initial (s)	30.0	30.0	4.0	30.0	8.0	8.0
Minimum Split (s)	38.0	38.0	10.0	38.0	22.0	22.0
Total Split (s)	60.0	60.0	15.0	75.0	45.0	45.0
Total Split (%)	50.0%	50.0%	12.5%	62.5%	37.5%	37.5%
Yellow Time (s)	6.0	6.0	3.5	6.0	3.5	3.5
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)	8.0	8.0	5.5	8.0	5.5	5.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None
Act Effct Green (s)	34.2	34.2	51.4	48.9	39.6	39.6
Actuated g/C Ratio	0.33	0.33	0.50	0.48	0.39	0.39
v/c Ratio	0.58	0.38	0.44	0.83	0.88	0.22
Control Delay	30.0	4.4	17.6	28.0	46.1	15.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	4.4	17.6	28.0	46.1	15.3
LOS	C	A	B	C	D	B
Approach Delay	22.6			26.9	40.2	
Approach LOS	C			C	D	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 102.1
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 28.7
 Intersection Capacity Utilization 79.2%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service D

Splits and Phases: 2: Grinnell & Powers



Intersection						
Int Delay, s/veh	4.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	91	146	525	25	49	371
Future Vol, veh/h	91	146	525	25	49	371
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	0	-	380	295	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	93	93	93	93	88	88
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	98	157	565	27	56	422

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1099	565	0	0	592	0
Stage 1	565	-	-	-	-	-
Stage 2	534	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	236	526	-	-	989	-
Stage 1	571	-	-	-	-	-
Stage 2	590	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	223	526	-	-	989	-
Mov Cap-2 Maneuver	223	-	-	-	-	-
Stage 1	538	-	-	-	-	-
Stage 2	590	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.8	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	223	526	989
HCM Lane V/C Ratio	-	-	0.439	0.298	0.056
HCM Control Delay (s)	-	-	33.2	14.7	8.9
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	2.1	1.2	0.2

Intersection

Int Delay, s/veh 3.1

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↑	↗	↘	↑	↘	
Traffic Vol, veh/h	48	26	0	145	91	5
Future Vol, veh/h	48	26	0	145	91	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	155	175	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	52	28	0	156	98	5

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	80	0	208	52
Stage 1	-	-	-	-	52	-
Stage 2	-	-	-	-	156	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1531	-	785	1021
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	877	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1531	-	785	1021
Mov Cap-2 Maneuver	-	-	-	-	785	-
Stage 1	-	-	-	-	976	-
Stage 2	-	-	-	-	877	-

Approach EB WB NB

HCM Control Delay, s 0 0 10.2
HCM LOS B

Minor Lane/Major Mvmt NBLn1 EBT EBR WBL WBT

Capacity (veh/h)	795	-	-	1531	-
HCM Lane V/C Ratio	0.13	-	-	-	-
HCM Control Delay (s)	10.2	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Timings
41: Waterview Full Access & Bradley Rd.

2017 Total Traffic
AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↙	↑↑	↖↗	↙
Traffic Volume (vph)	575	201	84	543	384	118
Future Volume (vph)	575	201	84	543	384	118
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 Effct Green (s)	64.2	64.2	73.1	73.1	16.9	16.9
Actuated g/C Ratio	0.64	0.64	0.73	0.73	0.17	0.17
v/c Ratio	0.28	0.20	0.16	0.23	0.72	0.34
Control Delay	11.4	5.2	4.9	4.9	46.4	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.4	5.2	4.9	4.9	46.4	9.0
LOS	B	A	A	A	D	A
Approach Delay	9.8			4.9	37.6	
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: 0.72
 Intersection Signal Delay: 15.5
 Intersection Capacity Utilization 44.0%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 41: Waterview Full Access & Bradley Rd.



Intersection						
Int Delay, s/veh	0.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	672	21	0	628	0	33
Future Vol, veh/h	672	21	0	628	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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	730	23	0	683	0	36

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	11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	632	-	-	-
HCM Lane V/C Ratio	0.057	-	-	-
HCM Control Delay (s)	11	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.2	-	-	-

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑	↗			↗
Traffic Vol, veh/h	10	63	171	1	0	30
Future Vol, veh/h	10	63	171	1	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	225	-	-	-	-	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	11	68	186	1	0	33

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	187	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	6.22
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	3.318
Pot Cap-1 Maneuver	1387	-	855
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1387	-	855
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1387	-	-	-	855
HCM Lane V/C Ratio	0.008	-	-	-	0.038
HCM Control Delay (s)	7.6	-	-	-	9.4
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

SimTraffic Performance Report

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 7:00

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	10.0	6.5	3.7	5.6	11.3	12.5	15.8	3.1	2.0	6.9	8.7	7.9

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 7:00

Lane	All
Movements Served	
Stop Del/Veh (s)	10.5

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 7:15

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	18.0	5.5	3.8	5.3	10.9	15.2	18.6	2.6	3.7	6.3	9.8	11.6

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 7:15

Lane	All
Movements Served	
Stop Del/Veh (s)	12.6

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 7:30

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	9.1	5.7	3.6	5.3	10.3	7.9	13.9	2.4	1.7	5.4	6.9	7.1

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 7:30

Lane	All
Movements Served	
Stop Del/Veh (s)	8.9

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 7:45

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	12.5	6.8	3.9	5.4	11.6	13.1	12.2	2.7	6.1	8.0	8.1	10.1

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 7:45

Lane	All
Movements Served	
Stop Del/Veh (s)	10.3

SimTraffic Performance Report

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	13.2	6.4	3.8	5.6	11.4	12.6	15.7	2.7	4.5	6.7	8.7	9.3

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	All
Movements Served	
Stop Del/Veh (s)	10.9

Total Zone Performance By Interval

Interval Start	7:00	7:15	7:30	7:45	All
Stop Del/Veh (s)	281.9	174.5	272.8	324.7	549.4

Timings
2: Grinnell & Powers

2017 Total Traffic
PM Peak Hour

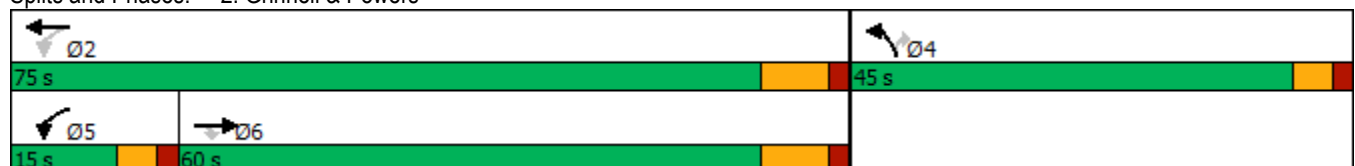
	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘	↘
Traffic Volume (vph)	1161	585	177	818	328	168
Future Volume (vph)	1161	585	177	818	328	168
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						
Minimum Initial (s)	30.0	30.0	4.0	30.0	8.0	8.0
Minimum Split (s)	38.0	38.0	10.0	38.0	22.0	22.0
Total Split (s)	60.0	60.0	15.0	75.0	45.0	45.0
Total Split (%)	50.0%	50.0%	12.5%	62.5%	37.5%	37.5%
Yellow Time (s)	6.0	6.0	3.5	6.0	3.5	3.5
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)	8.0	8.0	5.5	8.0	5.5	5.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Recall Mode	Min	Min	None	Min	None	None
Act Effct Green (s)	41.6	41.6	59.6	57.0	23.6	23.6
Actuated g/C Ratio	0.44	0.44	0.63	0.60	0.25	0.25
v/c Ratio	0.80	0.59	0.68	0.43	0.74	0.35
Control Delay	28.1	4.1	27.8	11.5	44.5	13.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.1	4.1	27.8	11.5	44.5	13.1
LOS	C	A	C	B	D	B
Approach Delay	20.0			14.4	33.9	
Approach LOS	C			B	C	

Intersection Summary

Cycle Length: 120
 Actuated Cycle Length: 94.5
 Natural Cycle: 70
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.80
 Intersection Signal Delay: 20.2
 Intersection Capacity Utilization 75.9%
 Analysis Period (min) 15

Intersection LOS: C
 ICU Level of Service D

Splits and Phases: 2: Grinnell & Powers



Intersection						
Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	56	70	426	83	119	643
Future Vol, veh/h	56	70	426	83	119	643
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	300	0	-	380	295	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	60	74	453	88	127	684

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1391	453	0	0	541
Stage 1	453	-	-	-	-
Stage 2	938	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209
Pot Cap-1 Maneuver	157	609	-	-	1033
Stage 1	642	-	-	-	-
Stage 2	382	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	138	609	-	-	1033
Mov Cap-2 Maneuver	138	-	-	-	-
Stage 1	563	-	-	-	-
Stage 2	382	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	28.5	0	1.4
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	138	609	1033
HCM Lane V/C Ratio	-	-	0.432	0.122	0.123
HCM Control Delay (s)	-	-	49.6	11.7	9
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	1.9	0.4	0.4

Intersection

Int Delay, s/veh 1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↗	↖	↑	↘	↙
Traffic Vol, veh/h	98	103	3	73	52	3
Future Vol, veh/h	98	103	3	73	52	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	155	175	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	105	111	3	78	56	3

Major/Minor

	Major1	Major2	Minor1		
Conflicting Flow All	0	0	216	0	189
Stage 1	-	-	-	-	105
Stage 2	-	-	-	-	84
Critical Hdwy	-	-	4.1	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.2	-	3.5
Pot Cap-1 Maneuver	-	-	1366	-	805
Stage 1	-	-	-	-	924
Stage 2	-	-	-	-	944
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1366	-	803
Mov Cap-2 Maneuver	-	-	-	-	803
Stage 1	-	-	-	-	922
Stage 2	-	-	-	-	944

Approach

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

Minor Lane/Major Mvmt

	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	810	-	-	1366	-
HCM Lane V/C Ratio	0.073	-	-	0.002	-
HCM Control Delay (s)	9.8	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Timings
37: Powers & Bradley Rd.

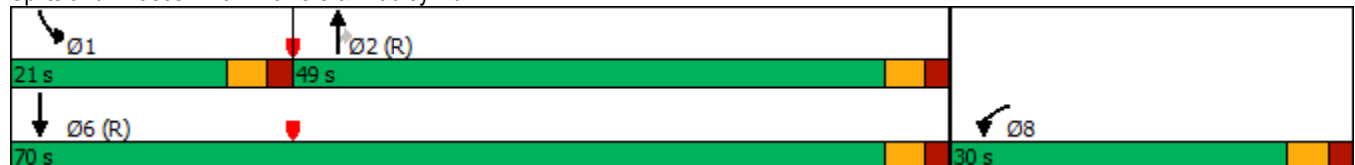
2017 Total Traffic
PM Peak Hour

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖↗	↖	↖↗	↖	↖↗	↖↗
Traffic Volume (vph)	440	551	287	608	632	492
Future Volume (vph)	440	551	287	608	632	492
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		49.0	49.0	21.0	70.0
Total Split (%)	30.0%		49.0%	49.0%	21.0%	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 Effct Green (s)	18.7	100.0	44.0	44.0	22.3	71.3
Actuated g/C Ratio	0.19	1.00	0.44	0.44	0.22	0.71
v/c Ratio	0.72	0.37	0.19	0.59	0.88	0.21
Control Delay	33.3	1.6	17.5	4.1	52.8	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	33.3	1.6	17.5	4.1	52.8	5.4
LOS	C	A	B	A	D	A
Approach Delay	15.7		8.4			32.0
Approach LOS	B		A			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: 0.88
 Intersection Signal Delay: 19.8
 Intersection Capacity Utilization 64.0%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 37: Powers & Bradley Rd.



Timings
41: Waterview Full Access & Bradley Rd.

2017 Total Traffic
PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↘	↑↑	↘↘	↘
Traffic Volume (vph)	678	561	248	456	535	185
Future Volume (vph)	678	561	248	456	535	185
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 Effct Green (s)	60.0	60.0	70.5	70.5	19.5	19.5
Actuated g/C Ratio	0.60	0.60	0.70	0.70	0.20	0.20
v/c Ratio	0.35	0.51	0.57	0.20	0.87	0.43
Control Delay	4.9	2.8	10.8	5.3	54.2	8.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.9	2.8	10.8	5.3	54.2	8.1
LOS	A	A	B	A	D	A
Approach Delay	4.0			7.3	42.4	
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: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 15.2
 Intersection Capacity Utilization 60.2%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service B

Splits and Phases: 41: Waterview Full Access & Bradley Rd.



Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑		↑↑		↑
Traffic Vol, veh/h	760	104	0	704	0	23
Future Vol, veh/h	760	104	0	704	0	23
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	826	113	0	765	0	25

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	413
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	588
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	588
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)	588	-	-	-
HCM Lane V/C Ratio	0.043	-	-	-
HCM Control Delay (s)	11.4	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.1	-	-	-

Intersection						
Int Delay, s/veh	1.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑	↗			↖
Traffic Vol, veh/h	34	161	75	2	0	20
Future Vol, veh/h	34	161	75	2	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	225	-	-	-	-	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	37	175	82	2	0	22

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	84	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	6.22
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	3.318
Pot Cap-1 Maneuver	1513	-	976
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1513	-	976
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1513	-	-	-	976
HCM Lane V/C Ratio	0.024	-	-	-	0.022
HCM Control Delay (s)	7.4	-	-	-	8.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

SimTraffic Performance Report

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 5:00

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	11.1	7.5	5.3	6.5	8.0	10.5	8.2	3.5	5.7	8.1	10.1	6.1

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #1 5:00

Lane	All
Movements Served	
Stop Del/Veh (s)	8.3

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 5:15

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	12.3	7.3	6.4	7.3	7.7	11.4	9.5	3.5	6.8	9.0	11.3	6.6

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #2 5:15

Lane	All
Movements Served	
Stop Del/Veh (s)	9.0

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 5:30

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	8.0	6.9	5.2	6.6	7.2	8.1	7.1	3.1	7.4	7.1	8.9	5.4

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #3 5:30

Lane	All
Movements Served	
Stop Del/Veh (s)	7.1

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 5:45

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	9.1	7.1	5.9	6.4	7.4	8.8	8.5	3.5	4.8	6.9	9.1	6.5

4: Grinnell Blvd. & Bradley Rd. Performance by lane Interval #4 5:45

Lane	All
Movements Served	
Stop Del/Veh (s)	7.7

SimTraffic Performance Report

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB	SB
Movements Served	L	T	R	L	TR	L	T	R	L	T	T	R
Stop Del/Veh (s)	10.4	7.4	5.8	6.7	7.7	10.0	8.6	3.5	5.2	8.1	10.2	6.3

4: Grinnell Blvd. & Bradley Rd. Performance by lane Entire Run

Lane	All
Movements Served	
Stop Del/Veh (s)	8.2

Total Zone Performance By Interval

Interval Start	5:00	5:15	5:30	5:45	All
Stop Del/Veh (s)	208.2	250.6	218.5	202.3	669.0

Timings
2: Grinnell & Powers

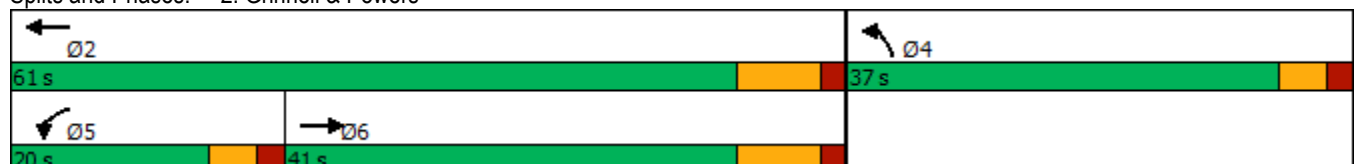
2040 Total AM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↘↙	↑↑↑	↘↙	↑
Traffic Volume (vph)	1178	441	179	2484	752	244
Future Volume (vph)	1178	441	179	2484	752	244
Turn Type	NA	Free	Prot	NA	Prot	Free
Protected Phases	6		5	2	4	
Permitted Phases		Free				Free
Detector Phase	6		5	2	4	
Switch Phase						
Minimum Initial (s)	30.0		4.0	30.0	8.0	
Minimum Split (s)	38.0		9.5	38.0	21.5	
Total Split (s)	41.0		20.0	61.0	37.0	
Total Split (%)	41.8%		20.4%	62.2%	37.8%	
Yellow Time (s)	6.0		3.5	6.0	3.5	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	8.0		5.5	8.0	5.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effct Green (s)	36.0	91.3	10.3	51.8	25.9	91.3
Actuated g/C Ratio	0.39	1.00	0.11	0.57	0.28	1.00
v/c Ratio	0.62	0.29	0.48	0.91	0.80	0.16
Control Delay	24.9	0.5	43.1	24.8	37.2	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.9	0.5	43.1	24.8	37.2	0.2
LOS	C	A	D	C	D	A
Approach Delay	18.2			26.1	28.1	
Approach LOS	B			C	C	

Intersection Summary

Cycle Length: 98
 Actuated Cycle Length: 91.3
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 24.1
 Intersection LOS: C
 Intersection Capacity Utilization 80.7%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 2: Grinnell & Powers



Timings

3: Grinnell Blvd. & Goldfield Drive

2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	89	12	22	131	4	231	272	648	27	88	598	5
Future Volume (vph)	89	12	22	131	4	231	272	648	27	88	598	5
Turn Type	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Detector Phase	7	4	4	3	8	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	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0
Total Split (s)	10.0	21.0	21.0	10.0	21.0	21.0	10.0	50.0	50.0	10.0	50.0	50.0
Total Split (%)	11.0%	23.1%	23.1%	11.0%	23.1%	23.1%	11.0%	54.9%	54.9%	11.0%	54.9%	54.9%
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	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	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	8.5	7.1	7.1	9.5	7.0	7.0	22.1	18.4	18.4	20.7	15.4	15.4
Actuated g/C Ratio	0.17	0.14	0.14	0.19	0.14	0.14	0.44	0.36	0.36	0.41	0.30	0.30
v/c Ratio	0.33	0.05	0.07	0.21	0.02	0.57	0.78	0.53	0.04	0.25	0.58	0.01
Control Delay	20.4	22.0	0.4	22.9	21.5	9.7	29.6	16.7	0.1	9.5	17.8	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	20.4	22.0	0.4	22.9	21.5	9.7	29.6	16.7	0.1	9.5	17.8	0.0
LOS	C	C	A	C	C	A	C	B	A	A	B	A
Approach Delay		17.0			14.5			19.9			16.6	
Approach LOS		B			B			B			B	

Intersection Summary

Cycle Length: 91

Actuated Cycle Length: 50.8

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.78

Intersection Signal Delay: 17.8

Intersection LOS: B

Intersection Capacity Utilization 55.7%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 3: Grinnell Blvd. & Goldfield Drive



Timings

4: Grinnell Blvd. & Bradley Rd.

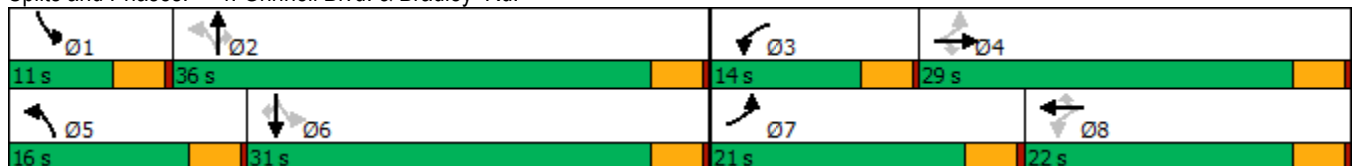
2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	256	247	275	140	573	122	353	568	76	34	500	217
Future Volume (vph)	256	247	275	140	573	122	353	568	76	34	500	217
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	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	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	21.0	29.0	29.0	14.0	22.0	22.0	16.0	36.0	36.0	11.0	31.0	31.0
Total Split (%)	23.3%	32.2%	32.2%	15.6%	24.4%	24.4%	17.8%	40.0%	40.0%	12.2%	34.4%	34.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
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)	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	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	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	34.3	21.9	21.9	25.2	16.5	16.5	33.4	27.5	27.5	23.5	17.2	17.2
Actuated g/C Ratio	0.45	0.29	0.29	0.33	0.22	0.22	0.44	0.36	0.36	0.31	0.23	0.23
v/c Ratio	0.64	0.26	0.44	0.33	0.79	0.25	0.91	0.47	0.12	0.11	0.66	0.43
Control Delay	22.1	22.4	5.4	16.1	37.8	1.9	46.7	22.2	0.4	14.5	31.5	6.5
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	22.1	22.4	5.4	16.1	37.8	1.9	46.7	22.2	0.4	14.5	31.5	6.5
LOS	C	C	A	B	D	A	D	C	A	B	C	A
Approach Delay		16.3			28.9			29.2			23.5	
Approach LOS		B			C			C			C	

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 76.2
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 24.9
 Intersection LOS: C
 Intersection Capacity Utilization 76.7%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 4: Grinnell Blvd. & Bradley Rd.



HCM 6th TWSC
 22: Grinnell Blvd. & Three-Quarter Site Access

2040 Total 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	0	0	194	0	0	100	0	896	73	106	498	16
Future Vol, veh/h	0	0	194	0	0	100	0	896	73	106	498	16
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	-	-	0	-	-	0	-	-	200	455	-	200
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	0	204	0	0	105	0	943	77	112	524	17

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	-	-	262	-	-	472	-	0	0	1020	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	737	0	0	538	0	-	-	676	-	-
Stage 1	0	0	-	0	0	-	0	-	-	-	-	-
Stage 2	0	0	-	0	0	-	0	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	737	-	-	538	-	-	-	676	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB			SB		
HCM Control Delay, s	11.7		13.3		0			1.9		
HCM LOS	B		B							

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	737	538	676	-	-
HCM Lane V/C Ratio	-	-	0.277	0.196	0.165	-	-
HCM Control Delay (s)	-	-	11.7	13.3	11.4	-	-
HCM Lane LOS	-	-	B	B	B	-	-
HCM 95th %tile Q(veh)	-	-	1.1	0.7	0.6	-	-

Timings
37: Powers & Bradley

2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	26	226	75	323	299	736	100	1900	403	477	925	19
Future Volume (vph)	26	226	75	323	299	736	100	1900	403	477	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	20.0		22.0	32.0		17.0	57.0		31.0	71.0	71.0
Total Split (%)	7.7%	15.4%		16.9%	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 Effct Green (s)	18.4	13.4	130.0	16.1	28.4	130.0	9.3	52.0	130.0	28.6	71.3	71.3
Actuated g/C Ratio	0.14	0.10	1.00	0.12	0.22	1.00	0.07	0.40	1.00	0.22	0.55	0.55
v/c Ratio	0.15	0.66	0.05	0.79	0.40	0.48	0.42	0.96	0.26	0.65	0.34	0.02
Control Delay	37.5	64.9	0.1	50.8	34.9	6.1	62.7	51.2	0.4	51.6	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	37.5	64.9	0.1	50.8	34.9	6.1	62.7	51.2	0.4	51.6	17.3	0.1
LOS	D	E	A	D	C	A	E	D	A	D	B	A
Approach Delay		47.8			23.1			43.2			28.6	
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: 34.7
 Intersection LOS: C
 Intersection Capacity Utilization 84.5%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 37: Powers & Bradley



Timings

39: Marksheffel & Bradley #1

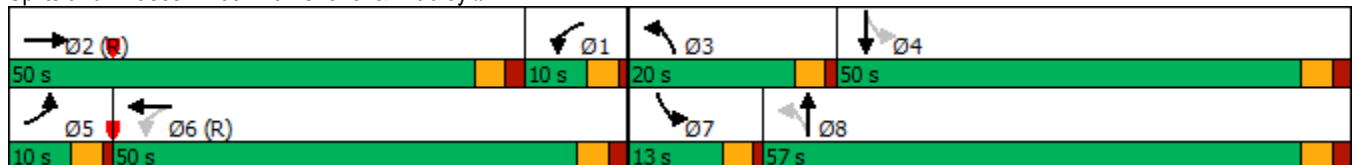
2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖↖	↑↑↑	↗	↖	↑↑↑	↗	↖	↑↑	↗	↖	↑↑	↗
Traffic Volume (vph)	446	400	151	95	604	285	253	600	50	140	275	354
Future Volume (vph)	446	400	151	95	604	285	253	600	50	140	275	354
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	10.0		9.0	10.0	
Total Split (s)	10.0	50.0		10.0	50.0		20.0	57.0		13.0	50.0	
Total Split (%)	7.7%	38.5%		7.7%	38.5%		15.4%	43.8%		10.0%	38.5%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lead		Lag	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	None		None	None	
Act Effct Green (s)	29.2	68.2	130.0	46.0	45.0	130.0	42.8	28.8	130.0	32.1	22.1	130.0
Actuated g/C Ratio	0.22	0.52	1.00	0.35	0.35	1.00	0.33	0.22	1.00	0.25	0.17	1.00
v/c Ratio	0.59	0.15	0.10	0.26	0.35	0.18	0.71	0.78	0.03	0.73	0.47	0.23
Control Delay	34.3	15.9	0.1	32.8	32.3	0.3	45.1	54.8	0.0	54.3	50.5	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	34.3	15.9	0.1	32.8	32.3	0.3	45.1	54.8	0.0	54.3	50.5	0.3
LOS	C	B	A	C	C	A	D	D	A	D	D	A
Approach Delay		21.7			23.1			49.0			28.1	
Approach LOS		C			C			D			C	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 97 (75%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 30.2
 Intersection LOS: C
 Intersection Capacity Utilization 63.7%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 39: Marksheffel & Bradley #1



Timings

41: Waterview Signal & Bradley/Bradley #1

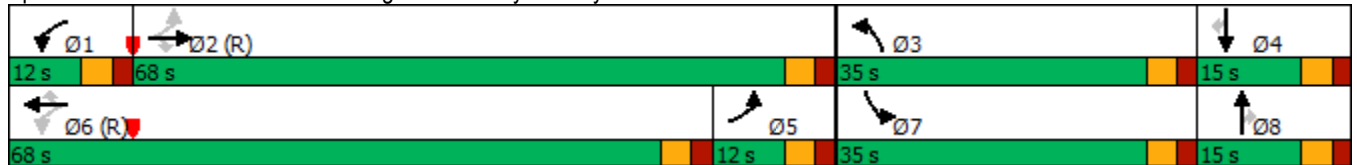
2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	265	708	134	107	1040	43	260	16	125	70	14	59
Future Volume (vph)	265	708	134	107	1040	43	260	16	125	70	14	59
Turn Type	pm+pt	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		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)	12.0	68.0	68.0	12.0	68.0	68.0	35.0	15.0	15.0	35.0	15.0	15.0
Total Split (%)	9.2%	52.3%	52.3%	9.2%	52.3%	52.3%	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 Effct Green (s)	80.8	80.8	80.8	82.8	82.8	82.8	15.7	14.2	14.2	8.2	6.6	6.6
Actuated g/C Ratio	0.62	0.62	0.62	0.64	0.64	0.64	0.12	0.11	0.11	0.06	0.05	0.05
v/c Ratio	0.78	0.24	0.14	0.25	0.34	0.04	0.66	0.08	0.44	0.34	0.16	0.29
Control Delay	52.2	22.8	12.2	10.4	10.7	1.9	62.3	51.6	11.4	62.2	62.2	3.3
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	52.2	22.8	12.2	10.4	10.7	1.9	62.3	51.6	11.4	62.2	62.2	3.3
LOS	D	C	B	B	B	A	E	D	B	E	E	A
Approach Delay		28.5			10.3			46.0			38.0	
Approach LOS		C			B			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 74 (57%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 23.9
 Intersection Capacity Utilization 61.4%
 Analysis Period (min) 15
 Intersection LOS: C
 ICU Level of Service B

Splits and Phases: 41: Waterview Signal & Bradley/Bradley #1



Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑↑↑			↑↑↑					↑			↑
Traffic Vol, veh/h	0	890	13	0	1134	232	0	0	37	0	0	56
Future Vol, veh/h	0	890	13	0	1134	232	0	0	37	0	0	56
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	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	937	14	0	1194	244	0	0	39	0	0	59

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	-	0	0	-	-	0	-	-	476	-	-	719
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	-	-	-	7.14	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	-	-	-	3.92	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	0	-	-	0	0	458	0	0	318
Stage 1	0	-	-	0	-	-	0	0	-	0	0	-
Stage 2	0	-	-	0	-	-	0	0	-	0	0	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	458	-	-	318
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	13.6	18.9
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR	SBLn1
Capacity (veh/h)	458	-	-	-	-	318
HCM Lane V/C Ratio	0.085	-	-	-	-	0.185
HCM Control Delay (s)	13.6	-	-	-	-	18.9
HCM Lane LOS	B	-	-	-	-	C
HCM 95th %tile Q(veh)	0.3	-	-	-	-	0.7

HCM 6th Roundabout
 45: Waterview East N/S St & Retail Access/ Residential Access

2040 Total AM Peak Hour

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	97	62	318	277
Demand Flow Rate, veh/h	99	63	325	283
Vehicles Circulating, veh/h	142	410	97	29
Vehicles Exiting, veh/h	170	12	144	444
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	3.8	4.7	5.3	4.5
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	99	63	325	283
Cap Entry Lane, veh/h	1194	908	1250	1340
Entry HV Adj Factor	0.980	0.984	0.979	0.980
Flow Entry, veh/h	97	62	318	277
Cap Entry, veh/h	1169	894	1224	1313
V/C Ratio	0.083	0.069	0.260	0.211
Control Delay, s/veh	3.8	4.7	5.3	4.5
LOS	A	A	A	A
95th %tile Queue, veh	0	0	1	1

Timings

52: Bradley Heights/Federal Trade Zone & Bradley #1

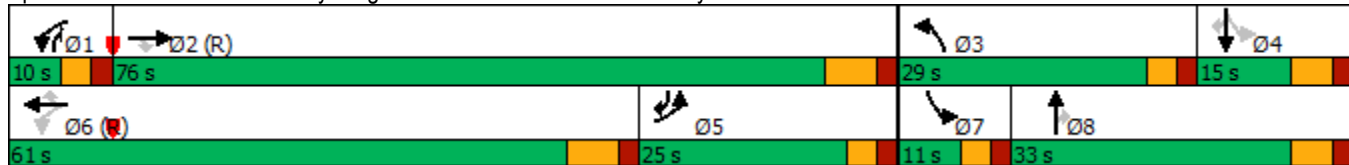
2040 Total AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	452	225	201	790	200	500	40	451	100	35	75
Future Volume (vph)	250	452	225	201	790	200	500	40	451	100	35	75
Turn Type	Prot	NA	Perm	pm+pt	NA	Perm	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases			2	6		6			8	4		4
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	5
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	2.0	5.0
Minimum Split (s)	10.0	12.0	12.0	10.0	12.0	12.0	10.0	11.0	10.0	10.0	8.0	10.0
Total Split (s)	25.0	76.0	76.0	10.0	61.0	61.0	29.0	33.0	10.0	11.0	15.0	25.0
Total Split (%)	19.2%	58.5%	58.5%	7.7%	46.9%	46.9%	22.3%	25.4%	7.7%	8.5%	11.5%	19.2%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.0	3.0	3.0	4.0	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	7.0	7.0	5.0	7.0	7.0	5.0	6.0	5.0	5.0	6.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	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 Effct Green (s)	20.0	72.0	72.0	60.7	58.7	58.7	23.0	21.9	32.2	16.1	7.7	27.4
Actuated g/C Ratio	0.15	0.55	0.55	0.47	0.45	0.45	0.18	0.17	0.25	0.12	0.06	0.21
v/c Ratio	0.50	0.17	0.24	0.51	0.36	0.25	0.87	0.13	0.74	0.54	0.34	0.17
Control Delay	69.9	25.9	14.5	20.2	15.7	3.5	67.6	43.5	18.8	51.4	66.7	0.8
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	69.9	25.9	14.5	20.2	15.7	3.5	67.6	43.5	18.8	51.4	66.7	0.8
LOS	E	C	B	C	B	A	E	D	B	D	E	A
Approach Delay		35.0			14.4			44.4			35.9	
Approach LOS		C			B			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 28 (22%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 30.4
 Intersection LOS: C
 Intersection Capacity Utilization 58.3%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 52: Bradley Heights/Federal Trade Zone & Bradley #1



Intersection						
Int Delay, s/veh	0.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	349	811	3	0	24
Future Vol, veh/h	8	349	811	3	0	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	-	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	9	379	882	3	0	26

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	885	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.14	-	6.94
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.22	-	3.32
Pot Cap-1 Maneuver	760	-	0
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	760	-	562
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	760	-	-	-	562
HCM Lane V/C Ratio	0.011	-	-	-	0.046
HCM Control Delay (s)	9.8	-	-	-	11.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Timings
2: Grinnell & Powers

2040 Total PM Peak Hour

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑	↑	↘↙	↑↑↑	↘↙	↑
Traffic Volume (vph)	2292	953	246	1395	656	218
Future Volume (vph)	2292	953	246	1395	656	218
Turn Type	NA	Free	Prot	NA	Prot	Free
Protected Phases	6		5	2	4	
Permitted Phases		Free				Free
Detector Phase	6		5	2	4	
Switch Phase						
Minimum Initial (s)	30.0		4.0	30.0	8.0	
Minimum Split (s)	38.0		9.5	38.0	21.5	
Total Split (s)	61.0		26.0	87.0	43.0	
Total Split (%)	46.9%		20.0%	66.9%	33.1%	
Yellow Time (s)	6.0		3.5	6.0	3.5	
All-Red Time (s)	2.0		2.0	2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	8.0		5.5	8.0	5.5	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Recall Mode	Min		None	Min	None	
Act Effct Green (s)	53.3	113.7	13.7	72.5	27.6	113.7
Actuated g/C Ratio	0.47	1.00	0.12	0.64	0.24	1.00
v/c Ratio	1.01	0.61	0.61	0.45	0.80	0.14
Control Delay	52.4	1.8	54.8	11.6	48.7	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	52.4	1.8	54.8	11.6	48.7	0.2
LOS	D	A	D	B	D	A
Approach Delay	37.5			18.1	36.6	
Approach LOS	D			B	D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 113.7
 Natural Cycle: 90
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 1.01
 Intersection Signal Delay: 31.8
 Intersection LOS: C
 Intersection Capacity Utilization 85.9%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 2: Grinnell & Powers



Timings

3: Grinnell Blvd. & Goldfield Drive

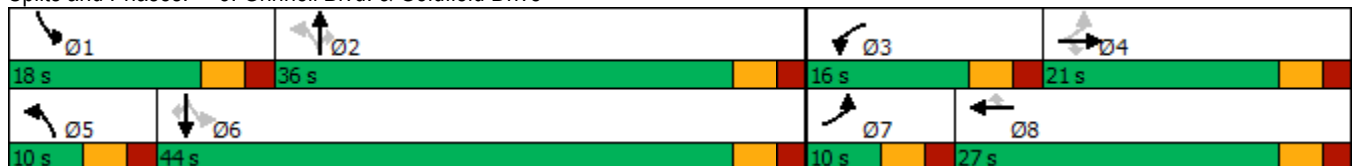
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	7	10	226	13	202	220	524	89	317	794	25
Future Volume (vph)	47	7	10	226	13	202	220	524	89	317	794	25
Turn Type	pm+pt	NA	Perm	Prot	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4			8	2		2	6		6
Detector Phase	7	4	4	3	8	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	4.0	4.0
Minimum Split (s)	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0	9.0	21.0	21.0
Total Split (s)	10.0	21.0	21.0	16.0	27.0	27.0	10.0	36.0	36.0	18.0	44.0	44.0
Total Split (%)	11.0%	23.1%	23.1%	17.6%	29.7%	29.7%	11.0%	39.6%	39.6%	19.8%	48.4%	48.4%
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)	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	None	None	None	None	None	None	Min	Min	None	Min	Min
Act Effct Green (s)	7.3	6.1	6.1	10.6	9.1	9.1	20.3	15.0	15.0	30.2	20.6	20.6
Actuated g/C Ratio	0.13	0.11	0.11	0.19	0.16	0.16	0.36	0.27	0.27	0.54	0.37	0.37
v/c Ratio	0.21	0.03	0.03	0.36	0.05	0.49	0.73	0.58	0.15	0.65	0.64	0.04
Control Delay	21.4	29.1	0.1	24.3	24.6	8.7	29.1	21.8	0.5	14.4	17.7	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	21.4	29.1	0.1	24.3	24.6	8.7	29.1	21.8	0.5	14.4	17.7	0.1
LOS	C	C	A	C	C	A	C	C	A	B	B	A
Approach Delay		18.7			17.2			21.4			16.4	
Approach LOS		B			B			C			B	

Intersection Summary

Cycle Length: 91
 Actuated Cycle Length: 56
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 18.3
 Intersection LOS: B
 Intersection Capacity Utilization 59.8%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 3: Grinnell Blvd. & Goldfield Drive



Timings

4: Grinnell Blvd. & Bradley Rd.

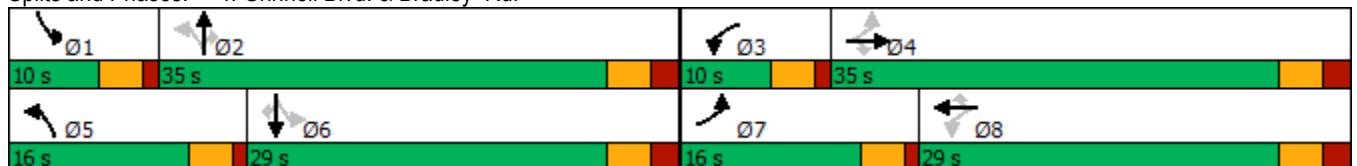
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	310	244	375	178	384	72	363	451	203	48	596	387
Future Volume (vph)	310	244	375	178	384	72	363	451	203	48	596	387
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	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	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	9.0	9.0
Total Split (s)	16.0	35.0	35.0	10.0	29.0	29.0	16.0	35.0	35.0	10.0	29.0	29.0
Total Split (%)	17.8%	38.9%	38.9%	11.1%	32.2%	32.2%	17.8%	38.9%	38.9%	11.1%	32.2%	32.2%
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)	1.0	2.0	2.0	1.0	2.0	2.0	1.0	2.0	2.0	1.0	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)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	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	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	31.5	20.5	20.5	21.5	14.5	14.5	41.1	34.2	34.2	30.9	24.0	24.0
Actuated g/C Ratio	0.39	0.25	0.25	0.27	0.18	0.18	0.51	0.42	0.42	0.38	0.30	0.30
v/c Ratio	0.83	0.29	0.62	0.54	0.64	0.16	0.88	0.32	0.27	0.13	0.59	0.58
Control Delay	38.3	24.8	10.2	25.1	35.3	0.8	39.2	17.8	3.9	12.4	27.4	9.4
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	38.3	24.8	10.2	25.1	35.3	0.8	39.2	17.8	3.9	12.4	27.4	9.4
LOS	D	C	B	C	D	A	D	B	A	B	C	A
Approach Delay		23.4			28.5			22.7			19.9	
Approach LOS		C			C			C			B	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 80.6	
Natural Cycle: 60	
Control Type: Semi Act-Uncoord	
Maximum v/c Ratio: 0.88	
Intersection Signal Delay: 23.1	Intersection LOS: C
Intersection Capacity Utilization 79.4%	ICU Level of Service D
Analysis Period (min) 15	

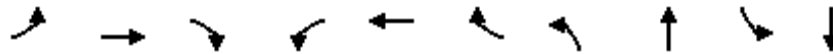
Splits and Phases: 4: Grinnell Blvd. & Bradley Rd.



Timings

5: Bradley Rd. & Goldfield Drive

2040 Total PM Peak Hour

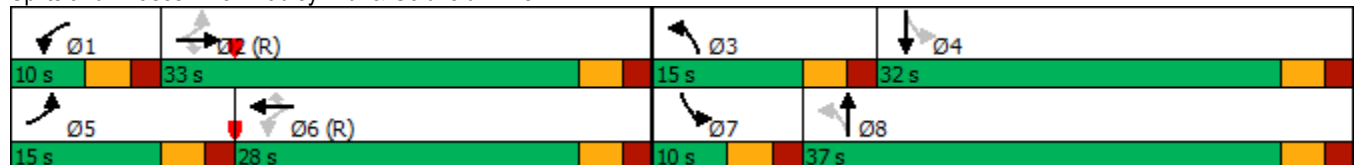


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↗	↖	↗
Traffic Volume (vph)	120	209	139	5	291	49	267	182	33	214
Future Volume (vph)	120	209	139	5	291	49	267	182	33	214
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	5	2		1	6		3	8	7	4
Permitted Phases	2		2	6		6	8		4	
Detector Phase	5	2	2	1	6	6	3	8	7	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
Minimum Split (s)	10.0	21.0	21.0	10.0	21.0	21.0	10.0	21.0	10.0	21.0
Total Split (s)	15.0	33.0	33.0	10.0	28.0	28.0	15.0	37.0	10.0	32.0
Total Split (%)	16.7%	36.7%	36.7%	11.1%	31.1%	31.1%	16.7%	41.1%	11.1%	35.6%
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)	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	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	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
Act Effct Green (s)	45.2	43.1	43.1	37.1	31.5	31.5	34.8	28.8	24.8	19.8
Actuated g/C Ratio	0.50	0.48	0.48	0.41	0.35	0.35	0.39	0.32	0.28	0.22
v/c Ratio	0.28	0.25	0.18	0.01	0.47	0.08	0.86	0.34	0.10	0.75
Control Delay	15.3	17.3	4.2	14.4	27.8	0.2	45.8	25.0	16.4	42.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	15.3	17.3	4.2	14.4	27.8	0.2	45.8	25.0	16.4	42.1
LOS	B	B	A	B	C	A	D	C	B	D
Approach Delay		12.8			23.7			37.2		39.4
Approach LOS		B			C			D		D

Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.86
 Intersection Signal Delay: 27.6
 Intersection LOS: C
 Intersection Capacity Utilization 68.9%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 5: Bradley Rd. & Goldfield Drive



HCM 6th TWSC
 22: Grinnell Blvd. & Three-Quarter Site Access

2040 Total PM Peak Hour

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↗			↗		↕	↗	↘	↕	↗
Traffic Vol, veh/h	0	0	243	0	0	227	0	647	127	244	894	60
Future Vol, veh/h	0	0	243	0	0	227	0	647	127	244	894	60
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	-	-	0	-	-	0	-	-	200	455	-	200
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	0	256	0	0	239	0	681	134	257	941	63

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	-	-	471	-	-	341	-	0	0	815	0	0
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy	-	-	6.94	-	-	6.94	-	-	-	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	-	-	-	-	-	-
Follow-up Hdwy	-	-	3.32	-	-	3.32	-	-	-	2.22	-	-
Pot Cap-1 Maneuver	0	0	539	0	0	655	0	-	-	808	-	-
Stage 1	0	0	-	0	0	-	0	-	-	-	-	-
Stage 2	0	0	-	0	0	-	0	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	539	-	-	655	-	-	-	808	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	17.6		13.6		0		2.3	
HCM LOS	C		B					

Minor Lane/Major Mvmt	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	539	655	808	-	-
HCM Lane V/C Ratio	-	-	0.475	0.365	0.318	-	-
HCM Control Delay (s)	-	-	17.6	13.6	11.5	-	-
HCM Lane LOS	-	-	C	B	B	-	-
HCM 95th %tile Q(veh)	-	-	2.5	1.7	1.4	-	-

Timings

37: Powers & Bradley #2

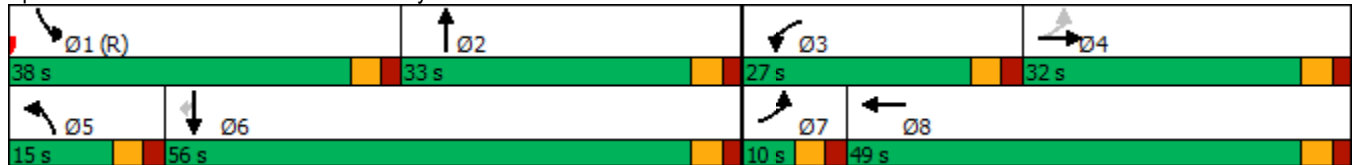
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	411	210	552	439	749	175	820	501	700	1700	110
Future Volume (vph)	71	411	210	552	439	749	175	820	501	700	1700	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	32.0		27.0	49.0		15.0	33.0		38.0	56.0	56.0
Total Split (%)	7.7%	24.6%		20.8%	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 Effct Green (s)	26.3	21.3	130.0	22.0	40.3	130.0	11.1	28.0	130.0	38.7	55.7	55.7
Actuated g/C Ratio	0.20	0.16	1.00	0.17	0.31	1.00	0.09	0.22	1.00	0.30	0.43	0.43
v/c Ratio	0.35	0.75	0.14	0.98	0.41	0.49	0.62	0.77	0.33	0.71	0.81	0.15
Control Delay	33.4	60.0	0.2	70.0	36.4	3.7	66.9	53.5	0.5	45.8	36.8	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	60.0	0.2	70.0	36.4	3.7	66.9	53.5	0.5	45.8	36.8	2.3
LOS	C	E	A	E	D	A	E	D	A	D	D	A
Approach Delay		39.1			33.0			37.4			37.8	
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: 0.98
 Intersection Signal Delay: 36.5
 Intersection LOS: D
 Intersection Capacity Utilization 81.6%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 37: Powers & Bradley #2



Timings

39: Marksheffel & Bradley #1

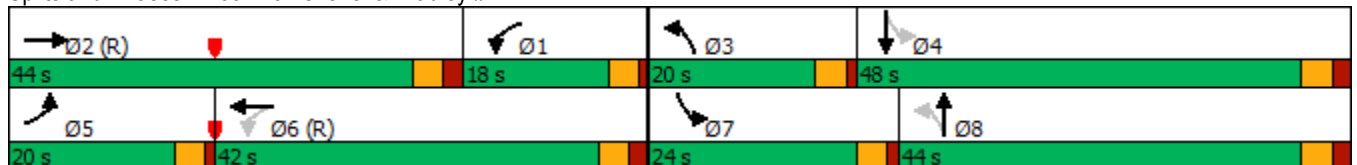
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	651	702	353	195	652	215	228	500	100	300	650	501
Future Volume (vph)	651	702	353	195	652	215	228	500	100	300	650	501
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	10.0		9.0	10.0	
Total Split (s)	20.0	44.0		18.0	42.0		20.0	44.0		24.0	48.0	
Total Split (%)	15.4%	33.8%		13.8%	32.3%		15.4%	33.8%		18.5%	36.9%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0		1.0	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)	4.0	5.0		4.0	5.0		4.0	5.0		4.0	5.0	
Lead/Lag	Lead	Lead		Lag	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	None		None	None	
Act Effct Green (s)	29.3	52.3	130.0	38.0	37.0	130.0	43.0	26.7	130.0	50.4	30.4	130.0
Actuated g/C Ratio	0.23	0.40	1.00	0.29	0.28	1.00	0.33	0.21	1.00	0.39	0.23	1.00
v/c Ratio	0.86	0.35	0.23	0.63	0.46	0.14	0.84	0.70	0.06	0.87	0.80	0.32
Control Delay	56.9	17.6	0.3	54.6	39.5	0.2	56.1	53.1	0.1	53.1	54.7	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	56.9	17.6	0.3	54.6	39.5	0.2	56.1	53.1	0.1	53.1	54.7	0.5
LOS	E	B	A	D	D	A	E	D	A	D	D	A
Approach Delay		29.0			34.3			47.5			35.7	
Approach LOS		C			C			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 100 (77%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 35.1
 Intersection LOS: D
 Intersection Capacity Utilization 76.8%
 ICU Level of Service D
 Analysis Period (min) 15

Splits and Phases: 39: Marksheffel & Bradley #1



Timings

41: Waterview Signal & Bradley #2

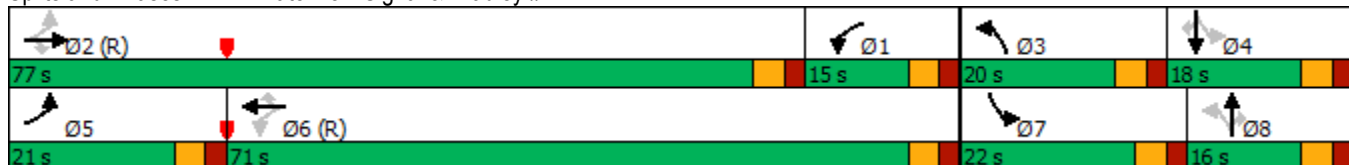
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	352	849	411	304	1124	49	359	19	248	312	20	256
Future Volume (vph)	352	849	411	304	1124	49	359	19	248	312	20	256
Turn Type	pm+pt	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		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)	21.0	77.0	77.0	15.0	71.0	71.0	20.0	16.0	16.0	22.0	18.0	18.0
Total Split (%)	16.2%	59.2%	59.2%	11.5%	54.6%	54.6%	15.4%	12.3%	12.3%	16.9%	13.8%	13.8%
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 Effct Green (s)	75.8	75.8	75.8	66.0	66.0	66.0	23.6	8.8	8.8	24.9	9.5	9.5
Actuated g/C Ratio	0.58	0.58	0.58	0.51	0.51	0.51	0.18	0.07	0.07	0.19	0.07	0.07
v/c Ratio	0.97	0.30	0.39	0.84	0.46	0.06	0.66	0.16	0.80	0.56	0.16	0.82
Control Delay	57.3	14.3	5.3	53.8	18.9	1.5	49.8	58.9	29.1	46.6	57.1	30.9
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	57.3	14.3	5.3	53.8	18.9	1.5	49.8	58.9	29.1	46.6	57.1	30.9
LOS	E	B	A	D	B	A	D	E	C	D	E	C
Approach Delay		21.4			25.5			41.9			40.1	
Approach LOS		C			C			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 39 (30%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 55
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.97
 Intersection Signal Delay: 28.3
 Intersection LOS: C
 Intersection Capacity Utilization 70.6%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 41: Waterview Signal & Bradley #2



HCM 6th TWSC
42: Waterview RIRO & Bradley #2/Bradley #1

2040 Total PM Peak Hour

Intersection												
Int Delay, s/veh	0.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑↑↑			↑↑↑					↑			↑
Traffic Vol, veh/h	0	1341	67	0	1251	241	0	0	26	0	0	226
Future Vol, veh/h	0	1341	67	0	1251	241	0	0	26	0	0	226
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	Yield	Yield	Yield
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	Yield
Storage Length	-	-	-	-	-	-	-	-	0	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	16983	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	98	95	95	98	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1368	71	0	1277	254	0	0	27	0	0	238

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	-	0	0	-	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	0	-	-	0	-	0
Stage 1	0	-	-	0	-	0
Stage 2	0	-	-	0	-	0
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	0
Mov Cap-2 Maneuver	-	-	-	-	-	0
Stage 1	-	-	-	-	-	0
Stage 2	-	-	-	-	-	0

Approach	EB	WB	NB
HCM Control Delay, s	0	0	17.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT	WBR
Capacity (veh/h)	318	-	-	-	-
HCM Lane V/C Ratio	0.086	-	-	-	-
HCM Control Delay (s)	17.4	-	-	-	-
HCM Lane LOS	C	-	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-	-

HCM 6th Roundabout
 45: Waterview East N/S & Retail Access/Residential Access

2040 Total PM Peak Hour

Intersection				
Intersection Delay, s/veh	10.5			
Intersection LOS	B			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	491	42	267	799
Demand Flow Rate, veh/h	501	43	272	815
Vehicles Circulating, veh/h	427	705	487	55
Vehicles Exiting, veh/h	443	54	440	693
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.1	6.2	8.1	10.5
Approach LOS	B	A	A	B
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	501	43	272	815
Cap Entry Lane, veh/h	893	672	840	1305
Entry HV Adj Factor	0.980	0.976	0.981	0.980
Flow Entry, veh/h	491	42	267	799
Cap Entry, veh/h	875	656	823	1278
V/C Ratio	0.561	0.064	0.324	0.625
Control Delay, s/veh	12.1	6.2	8.1	10.5
LOS	B	A	A	B
95th %tile Queue, veh	4	0	1	5

Timings

52: Bradley Heights/Federal Trade Zone & Bradley #1

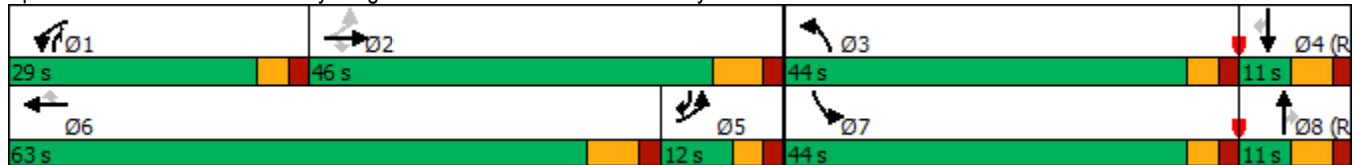
2040 Total PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	867	400	400	742	100	500	50	400	200	85	251
Future Volume (vph)	100	867	400	400	742	100	500	50	400	200	85	251
Turn Type	pm+pt	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	5	2		1	6		3	8	1	7	4	5
Permitted Phases	2		2			6			8			4
Detector Phase	5	2	2	1	6	6	3	8	1	7	4	5
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	2.0	5.0
Minimum Split (s)	10.0	12.0	12.0	10.0	12.0	12.0	10.0	11.0	10.0	10.0	8.0	10.0
Total Split (s)	12.0	46.0	46.0	29.0	63.0	63.0	44.0	11.0	29.0	44.0	11.0	12.0
Total Split (%)	9.2%	35.4%	35.4%	22.3%	48.5%	48.5%	33.8%	8.5%	22.3%	33.8%	8.5%	9.2%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	4.0	3.0	3.0	4.0	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	7.0	7.0	5.0	7.0	7.0	5.0	6.0	5.0	5.0	6.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lead	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	34.9	32.9	32.9	21.2	27.9	27.9	25.4	39.5	66.7	13.4	27.5	54.7
Actuated g/C Ratio	0.27	0.25	0.25	0.16	0.21	0.21	0.20	0.30	0.51	0.10	0.21	0.42
v/c Ratio	0.25	0.71	0.59	0.75	0.72	0.24	0.79	0.09	0.45	0.60	0.23	0.36
Control Delay	20.7	25.1	5.1	47.9	40.1	2.7	58.3	38.1	10.3	62.5	49.6	9.3
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	20.7	25.1	5.1	47.9	40.1	2.7	58.3	38.1	10.3	62.5	49.6	9.3
LOS	C	C	A	D	D	A	E	D	B	E	D	A
Approach Delay		18.9			39.6			37.0			35.6	
Approach LOS		B			D			D			D	

Intersection Summary

Cycle Length: 130
 Actuated Cycle Length: 130
 Offset: 3 (2%), Referenced to phase 4:SBT and 8:NBT, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 31.6
 Intersection LOS: C
 Intersection Capacity Utilization 64.1%
 ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 52: Bradley Heights/Federal Trade Zone & Bradley #1



Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	27	468	618	10	0	16
Future Vol, veh/h	27	468	618	10	0	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	-	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	29	509	672	11	0	17

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	683	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.14	-	6.94
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.22	-	3.32
Pot Cap-1 Maneuver	906	-	654
Stage 1	-	-	0
Stage 2	-	-	0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	906	-	654
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	906	-	-	-	654
HCM Lane V/C Ratio	0.032	-	-	-	0.027
HCM Control Delay (s)	9.1	-	-	-	10.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection: 2: Grinnell & Powers

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	
Directions Served	T	T	T	R	L	L	T	T	T	L	L	
Maximum Queue (ft)	313	284	220	77	128	176	426	429	412	288	307	
Average Queue (ft)	223	190	123	13	67	74	260	266	242	180	200	
95th Queue (ft)	298	267	206	47	114	131	374	380	370	257	276	
Link Distance (ft)	411	411	411				772	772	772		880	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	450				475	475					315	
Storage Blk Time (%)							0					0
Queuing Penalty (veh)							0					0

Intersection: 22: Grinnell Blvd. & Three-Quarter Site Access

Movement	EB	WB	NB	NB	SB
Directions Served	R	R	T	R	L
Maximum Queue (ft)	88	63	4	20	97
Average Queue (ft)	46	25	0	1	39
95th Queue (ft)	77	45	3	9	76
Link Distance (ft)	379	406	643		
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			200	455	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Zone Summary

Zone wide Queuing Penalty: 1

Intersection: 2: Grinnell & Powers

Movement	EB	EB	EB	EB	B12	B12	B12	WB	WB	WB	WB	WB
Directions Served	T	T	T	R	T	T	T	L	L	T	T	T
Maximum Queue (ft)	522	524	520	411	625	630	639	318	318	307	261	210
Average Queue (ft)	487	480	465	377	471	435	425	176	175	146	147	111
95th Queue (ft)	525	530	553	546	769	762	825	313	307	239	222	192
Link Distance (ft)	411	411	411		580	580	580			772	772	772
Upstream Blk Time (%)	49	41	22	4	14	8	26					
Queuing Penalty (veh)	0	0	0	0	0	0	0					
Storage Bay Dist (ft)				450				475	475			
Storage Blk Time (%)			22	4						0		
Queuing Penalty (veh)			214	34						0		

Intersection: 2: Grinnell & Powers

Movement	NB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	283	288	231
Average Queue (ft)	180	195	41
95th Queue (ft)	263	278	157
Link Distance (ft)		880	880
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	315		
Storage Blk Time (%)	0	0	
Queuing Penalty (veh)	0	0	

Intersection: 22: Grinnell Blvd. & Three-Quarter Site Access

Movement	EB	WB	NB	SB
Directions Served	R	R	R	L
Maximum Queue (ft)	156	136	32	128
Average Queue (ft)	64	49	3	59
95th Queue (ft)	113	94	18	108
Link Distance (ft)	379	406		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			200	455
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 248