George Washington Way/ Columbia Point Drive Intersection Traffic Study

November 19, 2013

Prepared for:
City of Richland

Prepared by:

J-U-B ENGINEERS, Inc.
2810 W. Clearwater Avenue, Suite 201
Kennewick, Washington 99336

George Washington Way/ Columbia Point Drive Intersection Traffic Study

November 19, 2013

Spencer Montgomery
Vijay Kornala, PE, PTOE
Lori Labrum, PE, PTOE
Rick Door, PE

J-U-B ENGINEERS, Inc.
2810 W. Clearwater Avenue, Suite 201
Kennewick, Washington 99336

Table of Contents

Introduction and Background 1
Existing Conditions 3
Roadway Characteristics 3
Crash History 5
Traffic Volumes 5
Traffic Operational Analysis 7
Future Conditions 9
2032 Traffic Forecasts 9
2032 Traffic Operations 10
Alternatives Analysis 12
Alternatives Development 12
Detailed Traffic Operations Analysis 13
Additional Alternative 21
Weaving Analysis 21
Summary 25

DRAFT

List of Figures

Figure 1. Vicinity Map 2
Figure 2. Existing Lane Configuration 4
Figure 3. Existing (2012) Traffic Volumes 6
Figure 4. 2032 Forecast Peak Hour Traffic Volumes 11
Figure 5. Alternative 2 - Traditional Intersection Improvements 14
Figure 6. Alternative 3 – Separate T Intersections 15
Figure 7. Alternative 9B – Thru-U Intersection, Roundabout at Columbia Point Drive 16
Figure 8. Alternative 10 – Separate T Intersection to the North 22
Figure 9. Weaving Analysis 24

List of Tables

Table 1. Summary of Annual Crashes 5
Table 2. Most Common First Collision Type 5
Table 3. Level of Service Criteria for Intersections 7
Table 4. Existing Traffic Operations at George Washington Way/Columbia Point Drive 8
Table 5. 2032 Traffic Operations at George Washington Way/Columbia Point Drive 10
Table 6. 2032 AM Level of Service and Queue Comparison for Detailed Traffic Operations Analysis 17
Table 7. 2032 PM Level of Service and Queue Comparison for Detailed Traffic Operations Analysis 18
Table 8. 2032 Traffic Operations for Alternative 10 – Separate T Intersection to the North 23

Appendices

Appendix A – Traffic Counts
Appendix B – Level of Service Worksheets For Existing and Future No-Build Conditions
Appendix C – Initial Alternatives Considered
Appendix D – Synchro results of 9 Alternatives
Appendix E – Calibration Report of VISSIM model.

DRAFT

Introduction and Background

George Washington Way in the City of Richland, Washington is a major north-south principal arterial roadway. It provides one of two routes into the City from the south, along with SR 240, and is second only to SR 240 in the amount of traffic it serves in the City. George Washington Way is heavily congested especially during the PM peak hour due in large part to commuter traffic from the Hanford site north of the City. Southbound traffic in the evening frequently backs up from the southernmost portion of the corridor at Columbia Point Drive, immediately north of the George Washington Way interchange with I-182/SR240, north into the central portion of the City.

The intersection of George Washington Way/Columbia Point Drive at the southern end of the corridor also has the highest number of crashes in the City. In an effort to reduce the number of crashes, the City eliminated the permissive phase of the traffic signal at that intersection in 2008. This has resulted in fewer crashes, however it has also resulted in increased delays, especially southbound in the evening.

Through this study the City of Richland has sought to determine if there are feasible improvements to the intersection that would improve the flow of traffic in the corridor without the extensive costs associated with grade separation. An extensive evaluation of alternatives has been prepared and evaluated from a traffic operations perspective. It is anticipated that once feasible options have been identified future studies will be performed that address geometric issues, right-of-way needs, costs and other issues.

The study area includes George Washington Way north of the interchange of SR 240/I-182 on the south end, to north of Comstock Street. A vicinity map depicting the study area is shown in Figure 1.

DRAFT

GEORGE WASHINGTON WAY COLUMBIA POINT STUDY AREA

REUSE OF DRAWINGS

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE: 30-13-044_C-801X
JUB PROJ. #: 30-13-044
DRAWN BY: IA
DESIGN BY: VKK
CHECKED BY: LLL
LAST UPDATED: 10/23/2013

J-U-B ENGINEERS, INC.

GEORGE WASHINGTON WAY, COLUMBIA PT.
TRAFFIC STUDY - RICHLAND, WA

PROJECT VICINITY MAP

FIGURE 1

Plot Date:10/23/2013 10:55 AM Plotted By: Mary M. Wilkinson
Date Created: 10/17/2013 \\SLCFILES\PUBLIC\PROJECTS\JUB\KENNEWICK OFFICE\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-13-044_C-801X.DWG

Existing Conditions

This section will document existing conditions with respect to roadway characteristics, crash history, traffic volumes and traffic operations at study intersections.

Roadway Characteristics

Key roadways are described below, while study intersection lane geometry is shown in Figure 2.

George Washington Way (GWW) is a north-south principal arterial roadway that extends from I-182/SR 240 on the south several miles to the north, passing through the heart of the City of Richland and providing access to the Science and Technology Park at the north and to the Department of Energy Hanford Site. At the south end of the corridor it has 3 through lanes in each direction and a two-way left-turn lane. The speed limit is 35 MPH. North of Columbia Point Drive there are sidewalks on both sides of the street.

Columbia Point Drive (CPD) is an east-west collector roadway. In the study area CPD has 5 lanes with 2 through lanes in each direction and a two-way left-turn lane. The speed limit is 25 MPH with curb, gutter, sidewalks and street lights.

I-182 is an east-west limited access Interstate Freeway with a speed limit of 70 MPH and three lanes in each direction plus acceleration and deceleration lanes at interchanges. In the vicinity of the study area it provides a concurrent interchange at Exit 5 with GWW to the north and SR 240 to the south. The nearest interchange to the west is at Exit 4 for SR 240 to the north. The nearest interchange to the east is Exit 7, across the Columbia River in Pasco at Road 100.

SR 240 is generally an east-west principal arterial roadway, and functions as a limited access freeway in the vicinity of the study area. It is coincident with Interstate 182 to the west but is independent south of GWW. It has 8 lanes and has access limited to interchanges to the south. The speed limit was raised to 60 MPH upon completion of the widening project to 8 lanes in recent years.

Aaron Drive is an arterial collector that has 2 lanes at its' eastern terminus at GWW, but widens to 5 lanes where it parallels I-182. (It was formerly SR 240 prior to the construction of the Interstate in the 1980's). Aaron Drive has a 90 degree turn to the south to parallel GWW and has a significant curve to the west to also parallel I-182. The speed limit is 40 MPH and sidewalk is only provided on the west side.

Comstock Street is an east-west neighborhood collector west of GWW, while to the east it is a local roadway. It has a single lane in each direction, and left turn lanes at intersections, with a speed limit of 25 MPH. There are sidewalks on both sides east of GWW but none to the west.

Adams Street is a 2 lane local roadway with a single lane in each direction. It connects to Aaron Drive immediately west of GWW. There are no sidewalks and the speed limit is 25 MPH.

Benham Street is also a 2 lane local roadway with a single lane in each direction. It connects to GWW north of Aaron Drive. There are no sidewalks and the speed limit is 25 MPH

DRAFT

Plot Date: 10/23/2013 11:20 AM Plotted By: Mary M. Wilkinson
Date Created: 6/6/2013 F:\PROJECT\JUB\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-12-022_GC-000.DWG

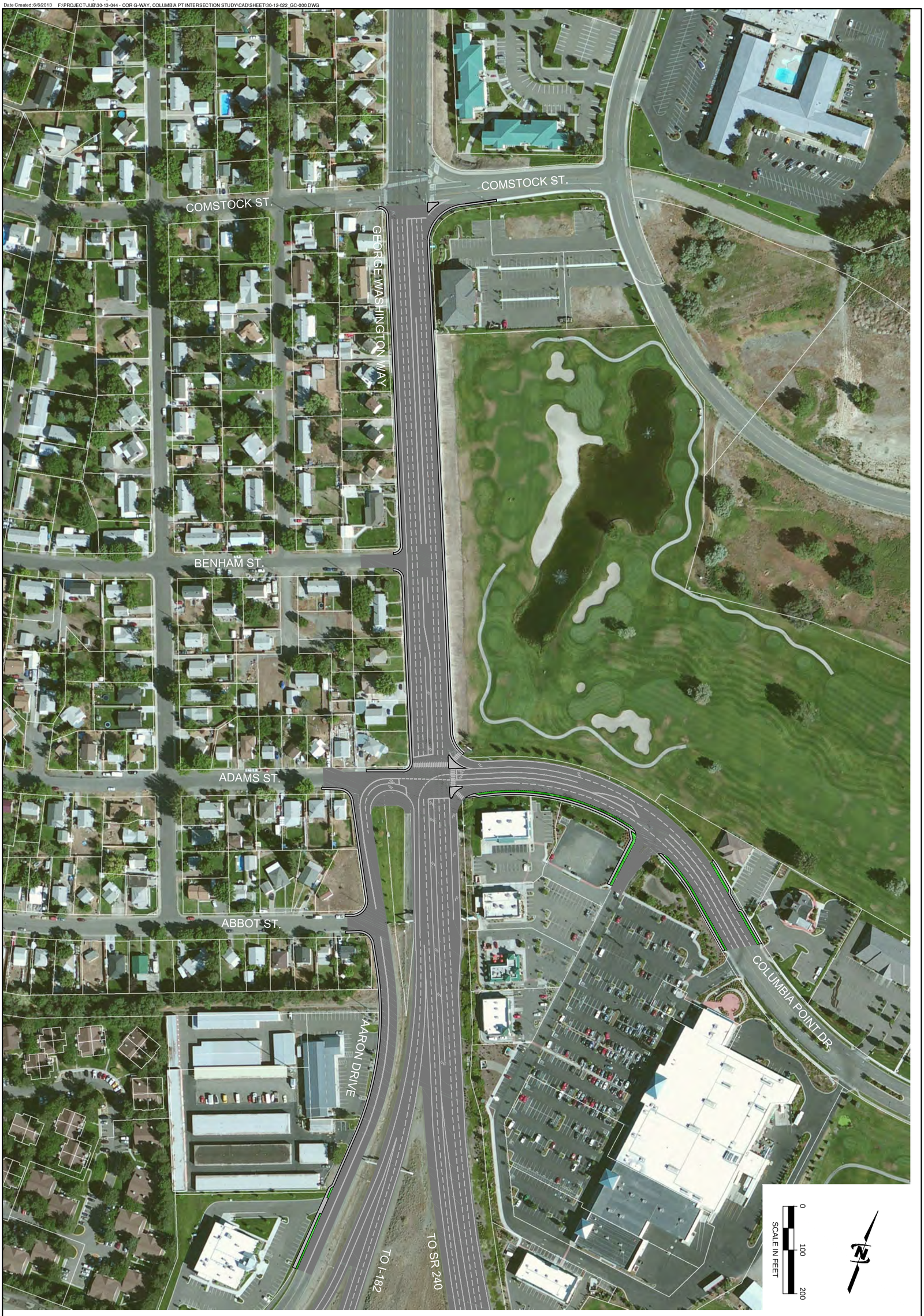


FIGURE 2

FILE: 30-12-022_GC-000
JUB PROJ. # 30-12-022
DRAWN BY: MA
DESIGN BY: MW
CHECKED BY: MW
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 10/23/2013

GEORGE WASHINGTON WAY, COLUMBIA PT.
TRAFFIC STUDY - RICHLAND, WA

EXISTING LANE CONFIGURATION

REUSE OF DRAWINGS
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

REVISION

NO.	DESCRIPTION	BY	APR.	DATE

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

J-U-B ENGINEERS, INC.
2810 W. Clearwater Ave.
Suite 201
Kennewick, WA 99336
Phone: 509.783.2144
Fax: 509.736.0790
www.jub.com

J-U-B ENGINEERS, INC.

Crash History

Crash records were researched during the 5 year period of 2006 – 2010. A summary of annual crashes by location within the study area is shown in Table 1. It is clear from the crash history that the elimination of the permitted left turn phase at the intersection of George Washington Way/Columbia Point had a direct result in in reducing the number of crashes at that intersection in 2009.

Table 1. Summary of Annual Crashes

Year	GW Way/ Columbia Point Dr	GW Way/ Benham	GW Way/ Comstock	Columbia Point Dr east of/ GW Way	Total
2006	30	8	8	3	49
2007	35	2	8	3	48
2008	34	2	7	2	45
2009	19	4	10	0	33
2010	18	5	7	1	31
Total	136	21	40	9	206

Table 2 shows the most common first collision type for the study area as well. It should be noted that of the 206 crashes that occurred within the study area during the 5 year period that 74 or 36% resulted in some type of injury.

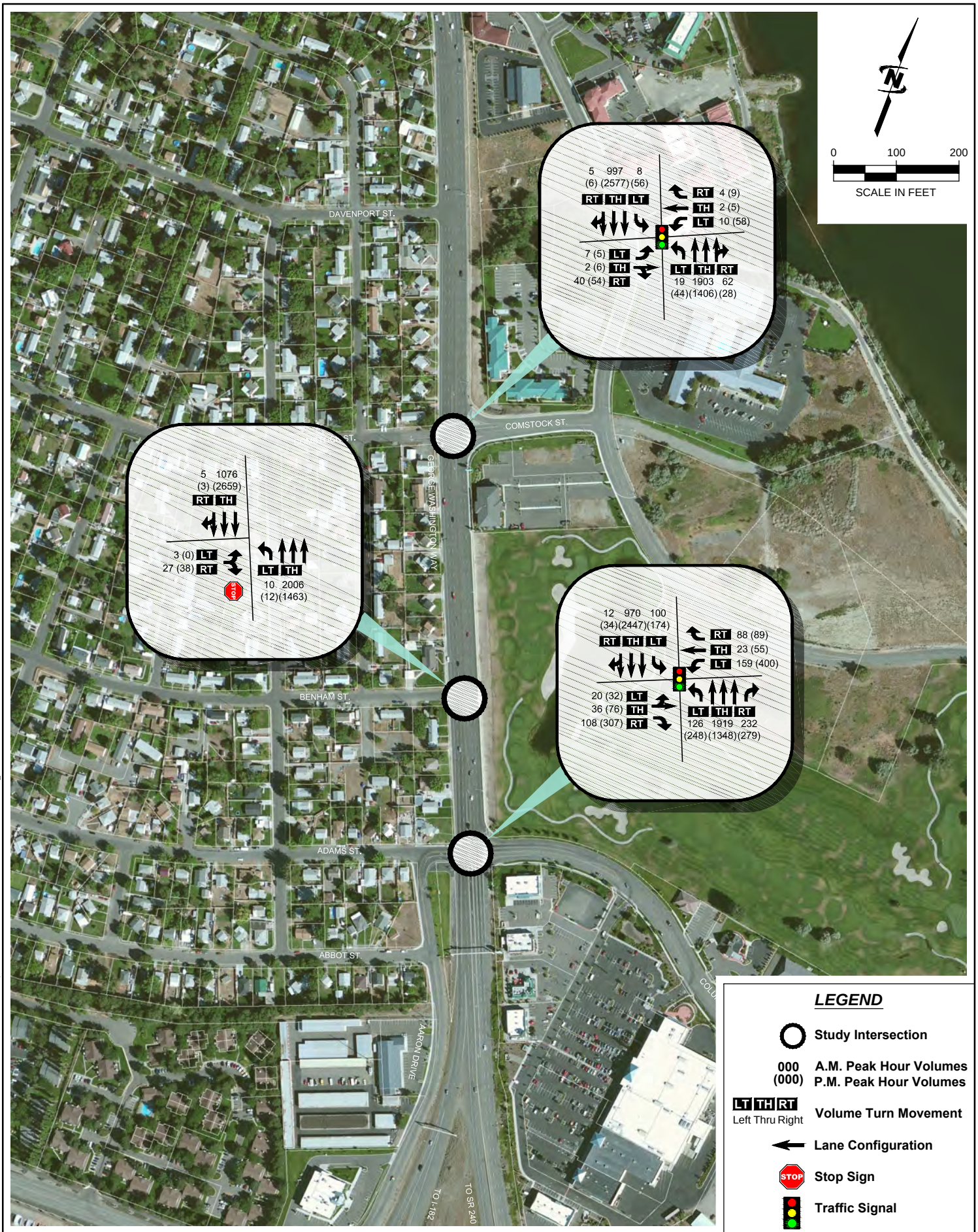
Table 2. Most Common First Collision Type

Collision Type	Total Crashes	Percent
Same direction one stopped- rear end	61	29.6%
Opposite direction one left turn one straight	54	26.2%
Entering at angle	25	12.1%
Same direction both moving - rear end	19	9.2%
Same direction – sideswipe	11	5.4%
Both turning right – sideswipe	10	4.9%
All others	26	12.6%
Total	**206**	**100%**

Traffic Volumes

Weekday peak period intersection turning movement volumes were collected at study intersections from 6:30 – 8:30 AM and 4:00 – 6:00 PM on May 23, 2012 using traffic count videos. Queue data were also collected for critical movements in order to calibrate the traffic model. The AM peak hour occurred between 7:30 – 8:30 AM while the evening peak occurred between 4:30 – 5:30 PM. The AM and PM peak hour traffic volumes are shown in Figure 3, with the peak period data included in Appendix A.

DRAFT



LEGEND

- Study Intersection
- 000 (000) — A.M. Peak Hour Volumes / P.M. Peak Hour Volumes
- LT TH RT (Left Thru Right) — Volume Turn Movement
- Lane Configuration
- STOP — Stop Sign
- Traffic Signal

REUSE OF DRAWINGS

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE: 30-13-044_GC-003-2012 TM
JUB PROJ. #: 30-13-044
DRAWN BY: IA
DESIGN BY: VKK
CHECKED BY: LLL
LAST UPDATED: 10/23/2013

J-U-B ENGINEERS, INC.

GEORGE WASHINGTON WAY, COLUMBIA PT. TRAFFIC STUDY - RICHLAND, WA

EXISTING (2012) TRAFFIC VOLUMES

FIGURE 3

Plot Date: 10/23/2013 11:28 AM Plotted By: Mary M. Wilkinson
Date Created: 10/17/2013 \\SLCFILES\PUBLIC\PROJECTS\JUB\KENNEWICK OFFICE\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-13-044_GC-003-2012 TM.DWG

Traffic Operational Analysis

The analysis of Level-of-Service (LOS) is a means of quantitatively describing the quality of operational conditions of a roadway segment or intersection and the perception by motorists and passengers. Service levels are identified by letter designation, A – F, with LOS "A" representing the best operating conditions and LOS "F" the worst. Each LOS represents a range of operating conditions and one or more measures of effectiveness (MOE's) are used to quantify the LOS of a roadway element. For intersections the MOE used is average control delay (seconds) per vehicle. While there are several methodologies for estimating the LOS of intersections, the most commonly used is presented in the Highway Capacity Manual and is the methodology used in this study (HCM 2010). The Highway Capacity Manual LOS criteria for signalized and unsignalized intersections are summarized in Table 3. The minimum acceptable Level of Service for the City of Richland and the Tri-Cities Metropolitan Area as adopted by the Benton Franklin Council of Governments is LOS D.

Table 3. Level of Service Criteria for Intersections

Level of Service (LOS)	Average Control Delay (seconds/vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	< =10	< =10
B	>10 - < 20	>10 - < 15
C	>20 - < 35	>15 - < 25
D	>35 - < 55	>25 - < 35
E	>55 - < 80	>35 - < 50
F	>80	>50

Source: *Highway Capacity Manual 2000*, Transportation Research Board, National Research Council, Washington, D.C., 2010.

An initial evaluation of existing traffic operations was performed for the AM and PM peak hours using SYNCHRO modeling software. This software accounts for existing lane configurations as well as traffic signal timings that were provided by the City of Richland. Table 4 shows the results of the analysis including estimated queue lengths and delay for each movement as well as overall average intersection delay.

The results of the analysis indicate that at the intersection of GWW/CPD the AM peak hour functions with overall average vehicle delay of 32.8 seconds for Level of Service C while the PM peak has significantly more delay of 104.7 seconds for LOS "F". Only the eastbound right turn movement has LOS "F" in the AM, however there are 6 different movements during the PM that function at LOS "F", which is not surprising given that there is 45% more traffic during the PM peak hour (5489 PM trips, 3788 AM trips at GWW/CPD). The northbound queue in the morning is nearly 900 feet and the southbound queue is over 1400 feet in the evening, backing up past the signal at Comstock Street. Other intersection in the study area were evaluated and function with less delay than the GWW/CPD intersection.

DRAFT

Table 4. Existing Traffic Operations at George Washington Way/Columbia Point Drive

Time Period		AM				PM			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	126	63.1	160	E	248	104.6	422	F
	NBT	1914	39.4	736	D	1348	34.9	477	D
	NBR	232	0.2	0	A	279	0.3	0	A
	SBL	100	44.6	129	D	174	87.1	301	F
	SBT	970	18.3	216	B	2447	166.4	1405	F
	SBR	12				34			
	EBL	20	64.3	85	E	32	87.5	206	F
	EBT	36				76			
	EBR	108	84.9	73	F	307	58.3	197	E
	WBL	159	62.6	135	E	400	110	463	F
	WBT	23	62.2	106	E	55	108.9	426	F
	WBR	88	13.4	39	B	89	12.4	54	B
	Overall		**32.8**		**C**		**104.7**		**F**

DRAFT

Future Conditions

This section will discuss the methodology of forecasting future traffic volumes and the anticipated traffic operations without improvements.

2032 Traffic Forecasts

For this traffic study a 20 year forecast of traffic volumes at study intersections was created in order to prepare and evaluate alternative sets of improvements to service the traffic volumes. The methodology to prepare those forecasts is presented below.

As a tool in preparing the Regional Transportation Plan, the Benton Franklin Council of Governments maintains a set of regional computerized transportation models. The model is developed using current traffic data and land uses in the region (representing year 2010) using Transportation Analysis Zones (TAZs) that are defined with various attributes describing the number and type of households and employees as well as other land uses within each zone. The model is calibrated for existing conditions using Federal Highway Administration procedures and methods. Once calibrated, changes in assumptions for future land uses and roadway networks can be made to determine the potential impacts of developments and/or roadway scenarios. Land use assumptions representing future conditions are developed to determine various impacts on the roadway network at a regional level. The future year model representing the year 2030 developed by BFCOG represents the best land use and roadway assumptions available at the time it was created.

It must be recognized that although traffic models are calibrated within acceptable ranges, the model is a tool in transportation planning and traffic forecasting. The BFCOG model is a PM peak hour model that provides roadway segment volumes (not specific turn movement volumes). Professional judgment should be used in interpreting model outputs. To arrive at reasonable estimates of traffic volumes for the year 2032 the following steps were taken:

- The 2030 model was compared to the 2010 model to determine the growth in traffic between the two models. Growth rates for the various roadway segments being evaluated for this study were determined and applied to the year 2012 ground counts. Although each segment varied, the overall intersection growth rate was approximately 125%, or slightly over 1% per year for the 20 year timeframe.

  Although this growth rate is quite modest, the resulting traffic volumes are substantial and given current traffic operations it is unlikely that GWW could carry such traffic; and that a traffic operations analysis would reveal the need for unrealistic roadway improvements such as grade separation or widening of GWW to 8 lanes. Model capacities were also discussed with BFCOG and City staff. It was agreed that the model capacities are somewhat aggressive, and given that only GWW and SR 240 provide access from central Richland to south Richland, traffic volumes will tend to balance between the two facilities. In the particular case of GWW it could be said that the forecast volumes in the model represent the demand during the PM peak hour, but that in practice some future volumes would likely shift their time of travel or travel mode such that the actual volumes will be somewhat lower. The project team and City staff agreed that a reasonable growth rate would be to use approximately half of that predicted by the model for north-south trips on GWW, amounting to approximately 300 additional southbound through vehicles and 220 northbound through vehicles.

DRAFT

- Development activity in the Columbia Point area of Richland has been very active in recent years, thus adjustments were made to the volumes on the east leg of both the CPD and Comstock Street to account for growth that had already occurred since the 2010 model calibration that was accounted for in the 2012 ground counts.
- 2012 turning movement volumes were used to convert the segment growth rates into turn volumes, accounting for the inbound and outbound percentage of traffic from each leg of the intersections.
- A similar process was used for the AM peak volumes.

The resulting traffic volumes at the study intersections are shown in Figure 4.

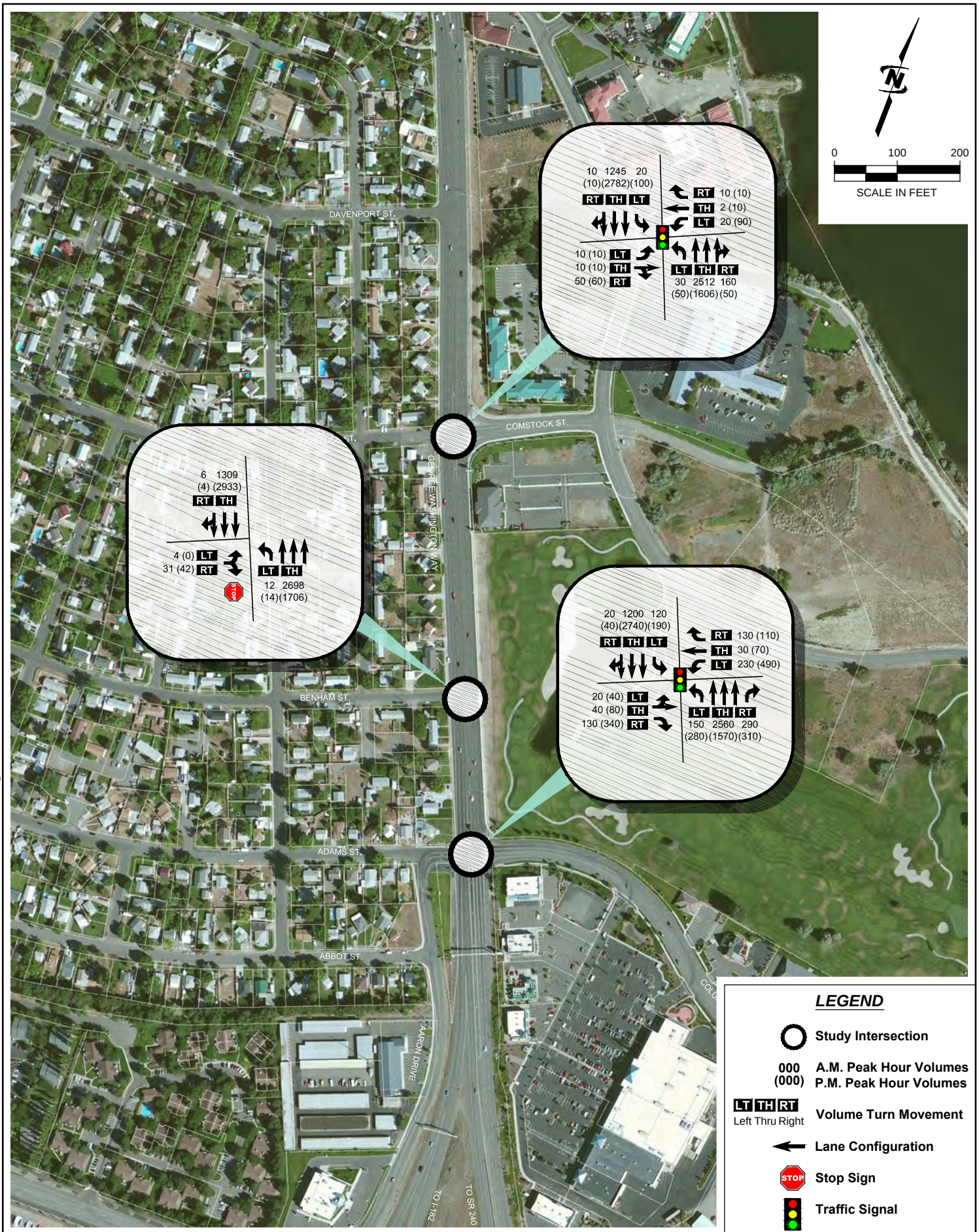
2032 Traffic Operations

Future traffic volumes were input into the Synchro model using the existing lane configurations to determine anticipated delay and queue lengths without improvements to the study intersections. Modifications were made to the signal timing to optimize intersection performance and coordinate traffic flow through the signals on GWW to the extent feasible given the high traffic volumes. The results of the analysis are shown in Table 5, with capacity worksheets included in Appendix B.

Table 5. 2032 Traffic Operations at George Washington Way/Columbia Point Drive

Time Period		AM				PM			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	150	66.5	188	E	280	131.4	510	F
	NBT	2560	175.8	1165	F	1570	39.1	594	D
	NBR	290	0.3	0	A	310	0.3	0	A
	SBL	120	45	150	D	190	96.4	349	F
	SBT	1200	21.7	271	C	2740	236.6	1671	F
	SBR	20				40			
	EBL	20	65.2	90	E	40	89.3	244	F
	EBT	40				80			
	EBR	130	15	33	B	340	86	294	F
	WBL	230	64.8	182	E	490	176.3	602	F
	WBT	30	64.5	142	E	70	177.4	567	F
	WBR	130	11.5	44	B	110	16.1	72	B
	Overall		**104.1**		**F**		**145**		**F**

The results of the capacity analysis show that both the AM and PM peak hours will function with poor level of service F, with average vehicle delay nearly 2-1/2 minutes in the evening peak. Queue lengths will clearly be longer than the existing conditions, with the southbound queue extending from CPD a few hundred feet past Comstock Street in the PM peak. The westbound queue on CPD will extend past the main entrance to the WINCO shopping center.



LEGEND

- Study Intersection
- 000 A.M. Peak Hour Volumes
- (000) P.M. Peak Hour Volumes
- LT TH RT Left Thru Right — Volume Turn Movement
- Lane Configuration
- STOP Stop Sign
- Traffic Signal

REUSE OF DRAWINGS

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE: 30-13-044_GC-004-2032 TM
JUB PROJ. #: 30-13-044
DRAWN BY: IA
DESIGN BY: VKK
CHECKED BY: LLL
LAST UPDATED: 10/23/2013

J-U-B ENGINEERS, INC.

GEORGE WASHINGTON WAY, COLUMBIA PT. TRAFFIC STUDY - RICHLAND, WA

2032 FORECAST PEAK HOUR TRAFFIC VOLUMES

FIGURE 4

Plot Date: 10/23/2013 11:30 AM Plotted By: Mary M. Wilkinson
Date Created: 10/17/2013 \\SLCFILES\PUBLIC\PROJECTS\JUB\KENNEWICK OFFICE\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-13-044_GC-004-2032 TM.DWG

Alternatives Analysis

This section will discuss the initial development and analysis of alternatives, the detailed traffic operations analysis of alternatives and additional evaluation to respond to issues and concerns raised later in the process.

Alternatives Development

The project team evaluated the future No-Build traffic operations as discussed earlier and considered ways that delay could be reduced, either by adding lanes or eliminating certain movements from the main intersection of GWW/CPD. A total of 18 alternatives were considered and are listed in Appendix C. Several of the most promising alternatives were initially evaluated using Synchro, similar to the No-Build scenario:

- Alternative 1 – No Build, existing lane configurations
- Alternative 2 – Traditional Intersection Improvements, adds through lanes and 2nd left turn lanes on GWW and an additional lane on CPD
- Alternative 3 – Separate T-Intersections for east-west connections, with new intersection to the south
- Alternative 4 – Convert to Continuous Flow Intersection (CFI), with GWW left turns made prior to CPD at two new intersections
- Alternative 5 – Thru-U Turn Intersections North and South of Main Intersection, with GWW left turns made after CPD
- Alternative 5B – Thru–U Turn and CFI Intersection north of GWW/CPD
- Alternative 6 – CFI for southbound left turns and Roundabout at CPD/Shopping Center Access for northbound left turns
- Alternative 7 – Thru-U Intersections with No Left turns at Main Intersection
- Alternative 8 – High-T at main intersection plus Thru-U Turn intersections
- Alternative 9 – New Thru-U/CFI Intersection and Roundabout at CPD/Shopping Center Access

A summary table of the results of the Synchro analysis, a visual depiction of each alternative from Synchro, a more detailed description of each alternative with a listing of pros and cons are all included in the Appendix D.

The results of the Syncrho analysis were reviewed with City staff. Those alternatives not providing overall LOS "D" or better were eliminated from more detailed evaluation through microsimulation. It was determined to perform a more detailed microsimulation using VISSIM software for four of the alternatives for two reasons:

1) a more detailed evaluation would yield results with better accuracy with respect to delay and queue lengths from a corridor perspective, and
2) since some of the alternatives are unconventional, results could ultimately be presented to decision-makers and the public to help understand the differences between the alternatives and visualize how they would operate.

Four alternatives were selected for further evaluation as described below:

DRAFT

- Alternative 1: No-Build - although this alternative fails with respect to Level of Service, it provides a good comparison of what may happen with respect to delay and queueing without improvements to the existing roadway network.
- Alternative 2: Extra Lanes – shows what could be achieved and the extra width required for traditional improvements.
- Alternative 3: Split T Intersections – traditional in the sense that no movements are restricted, but would require significant coordination with WSDOT to create a new intersection to the south of CPD closer to I-182.
- Alternative 9B: Northbound Thru–U and new roundabout on CPD – best operations of the nontraditional options. This alternative restricts movements but reduces delay. This alternative was modified (and called 9B) to not include the southbound continuous flow lane configuration (left turns at a new intersection prior to CPD). It was determined that no additional capacity was gained by moving the southbound left turn during the PM peak. Another factor was that the opposing northbound through movement in Alternative 9 functions at LOS "B".

Alternatives 2, 3 and 9 are shown in Figures 5, 6 and 7 respectively.

Detailed Traffic Operations Analysis

Prior to completing the microsimulation for each of the alternatives, a calibrated model of existing conditions was prepared. To simulate the existing conditions, the VISSIM model was constructed using an aerial photograph of the roadway network as the background. The number of lanes, location of lane additions, lane drops, speed limits and other roadway geometry were input in the model to reflect the field conditions. The existing AM and PM VISSIM models were calibrated to reflect the field measurements for existing queue lengths and delay. Pedestrians were also included in the evaluation and phases of the signal cycles accommodate pedestrian crossings. Closer evaluation of this issue and pedestrian safety may be warranted as alternatives are refined

The traffic volumes and queue lengths were collected from the traffic count videos and used to calibrate the base model following the FHWA Traffic Analysis Toolbox Volume III: *Guidelines for Applying Traffic Microsimulation Modeling Software*. The VISSIM Model Calibration documentation is provided in Appendix D. The calibrated existing 2012 AM and PM peak hour VISSIM models meet the calibration and validation criteria. The calibrated VISSIM models accurately represent the field-measured traffic conditions with respect to the traffic delay and queue lengths. The improvement Alternatives selected for 2032 traffic conditions were analyzed using the calibrated VISSIM model.

A summary of the results of the AM peak hour analysis including delay and queue lengths for all intersections associated with each alternative, including the No-Build Alternative, are shown in Table 6, with the PM results summarized in Table 7. A discussion of each alternative follows Table 7. The results of the analysis were used to prepare separate videos that could be used to observe both traffic operations and queueing.

DRAFT

Plot Date: 10/23/2013 11:21 AM Plotted By: Mary M. Wilkinson
Date Created: 6/6/2013 F:\PROJECT\JUB\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-12-022_GC-002.DWG

FIGURE 5

FILE: 30-12-022_GC-002
JUB PROJ. # 30-12-022
DRAWN BY: MA
DESIGN BY: MW
CHECK BY: MW
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 10/23/2013

GEORGE WASHINGTON WAY, COLUMBIA PT.
TRAFFIC STUDY - RICHLAND, WA

ALTERNATIVE 2
TRADITIONAL INTERSECTION IMPROVEMENTS

REUSE OF DRAWINGS
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

REVISION

NO.	DESCRIPTION	BY	APR.	DATE

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

J-U-B ENGINEERS, INC.
2810 W. Clearwater Ave.
Suite 201
Kennewick, WA 99336
Phone: 509.783.2144
Fax: 509.736.0790
www.jub.com

J-U-B ENGINEERS, INC.

Plot Date: 10/23/2013 11:22 AM Plotted By: Mary M. Wilkinson
Date Created: 6/6/2013 F:\PROJECT\JUB\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-12-022_GC-003.DWG

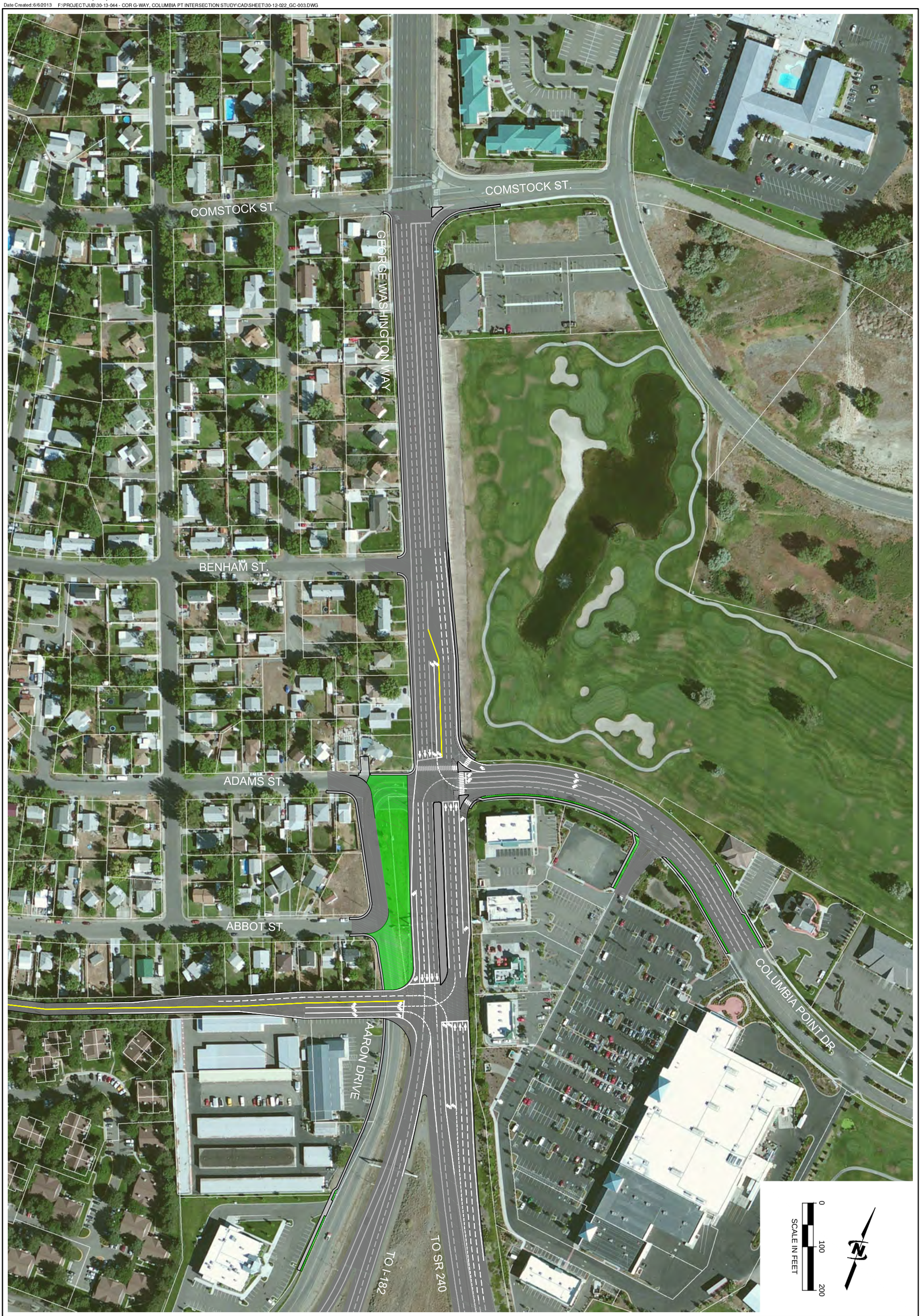


FIGURE 6

FILE: 30-12-022_GC-003
JUB PROJ. # 30-12-022
DRAWN BY: MA
DESIGN BY: MW
CHECK BY: MW
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 10/23/2013

GEORGE WASHINGTON WAY, COLUMBIA PT.
TRAFFIC STUDY - RICHLAND, WA

ALTERNATIVE 3
SEPARATE-T INTERSECTIONS

REUSE OF DRAWINGS
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

REVISION

NO.	DESCRIPTION	BY	APR.	DATE

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

J-U-B ENGINEERS, INC.
2810 W. Clearwater Ave.
Suite 201
Kennewick, WA 99336
Phone: 509.783.2144
Fax: 509.736.0790
www.jub.com

J-U-B ENGINEERS, INC.

Plot Date: 10/23/2013 11:23 AM Plotted By: Mary M. Wilkinson
Date Created: 6/6/2013 F:\PROJECT\JUB\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-12-022_GC-09B.DWG

FIGURE 7

FILE: 30-12-022_GC-09B
JUB PROJ. # 30-12-022
DRAWN BY: MA
DESIGN BY: MW
CHECK BY: MW
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 10/23/2013

GEORGE WASHINGTON WAY, COLUMBIA PT.
TRAFFIC STUDY - RICHLAND, WA

ALTERNATIVE 9B
THRU-U INTERSECTION-ROUNDABOUT AT COLUMBIA POINT DR.

REUSE OF DRAWINGS
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

REVISION

NO.	DESCRIPTION	BY	APR.	DATE

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

J-U-B ENGINEERS, INC.
2810 W. Clearwater Ave.
Suite 201
Kennewick, WA 99336
Phone: 509.783.2144
Fax: 509.736.0790
www.jub.com

J-U-B ENGINEERS, INC.

Table 6. 2032 AM Level of Service and Queue Comparison of Alternatives

for Detailed Traffic Operations Analysis

AM PEAK

Alternative		0				1				2			
Description		2012 Existing				2032 No-Build				2032 Additional Lanes (Adding 1 NBL, 1SBL,1 SBT,1SBR,1 EBL, 1 WBT)			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	126	41.9	109	D	140	42.8	115	D	140	68	111	E
	NBT	1914	21	285	C	2240	27.6	497	C	2240	14.6	301	B
	NBR	232	3.9	0	A	260	6.6	0	A	260	7.1	0	A
	SBL	100	39.9	89	D	110	42	97	D	110	64.4	72	E
	SBT	970	17.2	139	B	1090	18.8	165	B	1090	9.9	116	A
	SBR	12	14.8	138	B	13	13.7	164	B	13	2.9	0	A
	EBL	20	54.7	118	D	20	58.1	109	E	20	92.2	148	F
	EBT	36	50.7	118	D	40	51.9	109	D	40	95.3	148	F
	EBR	108	10	0	A	120	9.6	0	A	120	17	0	B
	WBL	159	41.4	90	D	190	42.9	139	D	190	66.3	145	E
	WBT	23	41.4	90	D	30	44.9	139	D	30	56	48	E
	WBR	88	5.6	0	A	110	7.4	0	A	110	4.5	0	A
	Overall		**21**		**C**		**25.1**		**C**		**19**		**B**

Alternative		3							
Description		2032 Separate T-Intersections							
		GW Way/Columbia Point				GW Way/New at Shelterbelt			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	-	-	-	-	140	55.4	78	E
	NBT	2260	9.2	242	A	2500	5.2	97	A
	NBR	300	3.3	22	A	-	-	-	-
	SBL	110	52	65	D	-	-	-	-
	SBT	1103	3.9	69	A	1280	5.1	70	A
	SBR	-	-	-	-	43	2.6	0	A
	EBL	-	-	-	-	60	67.3	123	E
	EBT	-	-	-	-	-	-	-	-
	EBR	-	-	-	-	120	43.6	123	D
	WBL	220	50.1	129	D	-	-	-	-
	WBT	-	-	-	-	-	-	-	-
	WBR	110	6.7	0	A	-	-	-	-
	Overall		**10.6**		**B**		**8.8**		**A**

Alternative		9B											
Description		2032 Thru-U with no Left Turn (3 Intersections North Thru U, Main Intersection, Roundabout)											
		GW/North Thru-U				GW/Columbia Point				Roundabout			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	330	22.7	142	C	-	-	-	-	188	1.8	0	A
	NBT	2370	0	0	A	2380	23.3	495	C	-	-	-	-
	NBR	-	-	-	-	260	7.4	0	A	10	1.8	0	A
	SBL	-	-	-	-	110	36.8	68	D	-	-	-	-
	SBT	1213	13.1	193	B	1280	1.5	22	A	-	-	-	-
	SBR	-	-	-	-	153	14.5	52	B	-	-	-	-
	EBL	-	-	-	-	-	-	-	-	20	2.3	0	A
	EBT	-	-	-	-	60	50.1	90	D	185	3.9	0	A
	EBR	-	-	-	-	120	5.3	0	A	226	3.8	0	A
	WBL	-	-	-	-	-	-	-	-	7	1.3	0	A
	WBT	-	-	-	-	30	51.1	69	D	142	1.8	0	A
	WBR	-	-	-	-	320	22.5	127	C	-	-	-	-
	Overall		**15.6**		**B**		**16.5**		**B**		**2.8**		**A**

Table 7. 2032 PM Level of Service and Queue Comparison of Alternatives

for Detailed Traffic Operations Analysis

PM PEAK

Alternative		0				1				2			
Description		2012 Existing				2032 No-Build				2032 Additional Lanes (Adding 1 NBL, 1SBL,1 SBT, 1SBR, 1 EBL, 1 WBT)			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	248	104.1	528	F	280	144.7	843	F	280	76.3	193	E
	NBT	1348	30.2	304	C	1570	35.5	410	D	1570	29.5	351	C
	NBR	279	3.2	0	A	310	6.5	0	A	310	8.7	0	A
	SBL	174	115.5	174	F	190	143.3	1011	F	190	51.2	114	D
	SBT	2447	113.7	1335	F	2740	124.2	1335	F	2740	30.7	1256	C
	SBR	34	107.9	1334	F	40	107.5	1334	F	40	19.2	0	B
	EBL	32	115.5	199	F	40	138.5	658	F	40	61.9	138	E
	EBT	76	105.1	199	F	80	121.2	658	F	80	84.7	138	F
	EBR	307	69.1	700	E	340	60.2	707	E	340	55.7	603	E
	WBL	400	86	483	F	490	339	1183	F	490	67.3	383	E
	WBT	55	87.9	483	F	70	343.7	1183	F	70	57.5	90	E
	WBR	89	6	0	A	110	198.6	35	F	110	4.0	0	A
	Overall		**77.8**		**E**		**107.3**		**F**		**36.9**		**D**

Alternative		3							
Description		2032 Separate T-Intersections (1st - GW/Columbia, 2nd - GW/Abbot)							
		GW Way/Columbia Point				GW Way/Abbot			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	-	-	-	-	280	59.6	151	E
	NBT	1610	14.6	209	B	1880	5.7	84	A
	NBR	390	6.3	29	A	-	-	-	-
	SBL	190	53.2	101	D	-	-	-	-
	SBT	2780	14.5	1314	B	3230	11.4	290	B
	SBR	-	-	-	-	110	3.6	0	A
	EBL	-	-	-	-	120	65	154	E
	EBT	-	-	-	-	-	-	-	-
	EBR	-	-	-	-	340	38.8	161	D
	WBL	560	54.8	341	D	-	-	-	-
	WBT	-	-	-	-	-	-	-	-
	WBR	110	5.6	0	A	-	-	-	-
	Overall		**19**		**B**		**14.3**		**B**

Alternative		9B											
Description		2032 Thru-U with no Left Turn (3 Intersections North Thru U, Main Intersection, Roundabout)											
		GW/North Thru-U				GW/Columbia Point				Roundabout			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	770	56.4	468	E	-	-	-	-	281	6.7	0	A
	NBT	1720	0	0	A	1850	22.6	353	C	-	-	-	-
	NBR	-	-	-	-	310	7.5	0	A	17	4.2	0	A
	SBL	-	-	-	-	190	79.2	125	E	-	-	-	-
	SBT	2970	12.2	537	B	3230	5.7	154	A	-	-	-	-
	SBR	-	-	-	-	320	13.4	20	B	-	-	-	-
	EBL	-	-	-	-	-	-	-	-	40	6	0	A
	EBT	-	-	-	-	120	47.9	115	D	174	8.4	0	A
	EBR	-	-	-	-	340	32.4	287	C	406	8.1	0	A
	WBL	-	-	-	-	-	-	-	-	7	15.1	31	B
	WBT	-	-	-	-	70	34.2	66	C	389	9.9	31	A
	WBR	-	-	-	-	640	32.8	343	C	-	-	-	-
	Overall		**21**		**C**		**17.1**		**B**		**8.3**		**A**

Alternative 1: The No-Build alternative is shown in Figure 2 earlier in this report. This alternative was prepared in to represent a future baseline condition from which the analysis results of the other alternatives could be compared and have a visual simulation of conditions with forecast volumes on the existing roadway network. As shown in Tables 6 and 7, the AM and PM peak hour delay at the GWW/CPD intersection is unacceptable, with over 107 seconds of average vehicle delay during the PM peak hour.

Alternative 2: Figure 5 illustrates Alternative 2 which maintains traditional signal operations for the GWW/CPD intersection, but increases the number of lanes to achieve a LOS "D" or better during the 2032 AM and PM peak hours. Significant right-of-way would be needed in this alternative to accommodate additional lanes on GWW. The required improvements at the George Washington Way/Columbia Point Drive intersection include the following:

- Dual northbound and southbound left-turn lanes
- One additional southbound thru lane
- An exclusive southbound right-turn lane
- Dual westbound left-turn lanes and a separate westbound thru lane
- An additional lane eastbound for an exclusive left-turn lane

In Alternative 2, the GWW/CPD intersection is anticipated to operate at an overall LOS "B" in the 2032 AM peak hour and LOS "D" during the PM peak hour. However, the eastbound thru and left-turn movements are anticipated to operate at LOS "F" during the PM peak hour. The southbound thru movement queue is anticipated to be 903 feet, a reduction of over 400 feet from the 1335 foot queue in the No-Build scenario.

Alternative 3: shown in Figure 6 separates the eastbound and westbound approaches of the GWW/CPD intersection by creating two separate T-intersections: GWW/CPD (without Aaron Drive), and a new intersection south of existing Aaron Drive location. The turning movements on the west leg (Aaron Drive) of the intersection would be moved to the new intersection. This new intersection would be approximately 430 feet south of the main intersection. This alternative would maintain traditional signal operations at the two separated intersections.

The following improvements would be required at the existing and proposed and intersections.
George Washington Way/Columbia Point Drive:

- Eliminate eastbound leg (Aaron Drive)
- Dual southbound left-turn lane
- Convert the existing westbound shared left/thru lane to an exclusive left-turn lane (2 total)

Proposed George Washington Way/New Street:

- Create eastbound leg aligning with the City owned shelter belt south of Abbot Street with:
    - 3 eastbound lanes, one for left-turns, one for right-turns and one shared for both movements
- Dual northbound left-turn lanes
- Traffic signal

Under Alternative 3, the GWW/CPD and the new intersection are anticipated to operate at an overall LOS "B" or better during 2032 AM and PM peak hours with acceptable LOS for individual movements. The southbound thru movement queue, however, is anticipated to be 1314 feet, which is excessive and is not a significant reduction from the 1335 foot queue in the No-Build scenario. It is recognized that the new intersection falls within the limited access area of the I-182 interchange.

Alternative 9B: shown in Figure 7 this alternative involves the installation of a new Thru-U intersection approximately 750 feet north of the main intersection and a roundabout at the CPD/Shopping Center Access. The new intersection would be signalized for only the southbound thru movement and the northbound U-turn movement. All left-turn movements, except the southbound left-turn movement, at the main intersection would be eliminated. The northbound left-turn would be made as a U-turn at the Thru-U Turn intersection followed by southbound right turn at Aaron Drive. The westbound left-turn would make a westbound right-turn followed by a U-turn at the Thru-U intersection. The eastbound left-turn would travel east thru the main intersection and make a U-turn at the roundabout followed by a right-turn onto GWW.

In this alternative, unlike Alternative 3, the traffic operations will have no added interference with I 182 and SR 240 ramps. However, the northbound left-turns and the side street left-turns will have longer travel distances. Significant right-of-way on the east side of George Washington Way would be required to accommodate the transitions for the U-turns. The following improvements would be required at the proposed and existing intersections.
Existing George Washington Way/Columbia Point Drive:

- Dual southbound left-turn lanes
- One additional southbound thru lane
- An exclusive southbound right-turn lane
- Reconfigure the westbound approach to include one thru lane and dual right turn lanes
- Convert the eastbound shared left/thru lane to one thru lane

Proposed Thru-U Intersection

- Two northbound U-turn lanes at the Thru-U intersection

Existing Columbia Point Drive/Shopping Center Access:

- Install a single lane roundabout

As shown in Tables 6 and 7, the GWW/CPD intersection is anticipated to operate at LOS "B" during 2032 AM and PM peak hours with acceptable LOS for each individual movement. The Thru-U intersection is anticipated to function at LOS "B" in 2032 AM peak hour and LOS C in 2032 PM peak hour. The proposed roundabout at the Columbia Point Drive/Shopping Center Access intersection is anticipated to operate at LOS "A" during the 2032 AM and PM peak hour. With alternative there is a significant reduction in the southbound queue at the main intersection, going from 1335 feet in the No-Build Scenario to 154 feet in Alternative 9B. The southbound thru movement queue at the Thru-U intersection is 537 feet, which is still a significant reduction from the No-Build Scenario.

DRAFT

Additional Alternative

Alternative 3, using traditional traffic movements without restricting left-turns and causing out of route movements, gains operational advantages by splitting the left-turns and creating two T intersections where opposing side-street left-turns can occur at the same time, leaving valuable green time in the signal cycle for the southbound through movement. It is understood, however, that Alternative 3 has some challenges that would require additional analysis:

1) It creates a new intersection within the limited access area of I-182 and would require additional evaluation and approvals from the Washington State Department of Transportation and the Federal Highway Administration.
2) The potential decrease in the weaving distance from the I-182 westbound to northbound GWW left-turn.

A new alternative, Alternative 10 shown in Figure 8 was prepared that combines the advantages of Alternative 3 but eliminates the two issues identified above. This alternative places a new T intersection to the north of CPD rather than the south, at a distance sufficient to accommodate the back to back left turns associated with the northbound left-turns currently made at Aaron Drive and the southbound left-turns at Columbia Point Drive.

An operational analysis was completed for Alternative 10 using Synchro to determine the delay and LOS that could be achieved and the resulting queue lengths. The results of this analysis for the AM and PM peak hours in year 2032 are shown in Table 8.

Weaving Analysis

As mentioned above, Alternative 3 creates a new intersection closer to the I-182/SR 240 intersection with GWW, potentially decreasing the length available for weaving, particularly for the westbound I-182 ramp to the left turn from GWW to Aaron Drive movement. An evaluation of these merge and diverge movements comprised of a weaving analysis is shown in Figure 9. Figure 9 was prepared to better understand the available weaving distances and the queue lengths under various scenarios. Figure 9 shows the distances from the beginning of the weaving area for westbound I-182 to the northbound left turn at Aaron Drive/Columbia Point Drive. It also shows the existing PM peak hour queues as well as the anticipated 2032 queue lengths shown in Table 7 for the northbound movements. Figure 9 also shows what the queue lengths and weaving distances are for Alternative 3 with the new T-intersection south of Columbia Point Drive.

As shown in Figure 9, although the projected available weaving distance for Alternative 3 is 90 feet less 656’ – 564’ than the existing weaving distance, it is 140 longer than the projected weaving distance in the No-Build Alternative. The No-Build Alternative will have queues from the northbound left turn to Aaron Drive that will impede travel for the northbound through traffic during the PM peak hour.

DRAFT

Plot Date: 10/23/2013 11:23 AM Plotted By: Mary M. Wilkinson
Date Created: 6/6/2013 F:\PROJECT\JUB\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-12-022_GC-X.DWG

FIGURE 8

FILE: 30-12-022_GC-X
JUB PROJ. # 30-12-022
DRAWN BY: MA
DESIGN BY: MW
CHECK BY: MW
ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY
LAST UPDATED: 10/23/2013

GEORGE WASHINGTON WAY, COLUMBIA PT.
TRAFFIC STUDY - RICHLAND, WA

ALTERNATIVE 10
SEPARATE T INTERSECTION TO THE NORTH

REUSE OF DRAWINGS
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

REVISION

NO.	DESCRIPTION	BY	APR.	DATE

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

J-U-B ENGINEERS, INC.
2810 W. Clearwater Ave.
Suite 201
Kennewick, WA 99336
Phone: 509.783.2144
Fax: 509.736.0790
www.jub.com

J-U-B ENGINEERS, INC.

Table 8. 2032 Traffic Operations for Alternative 10 – Separate T Intersection to the North

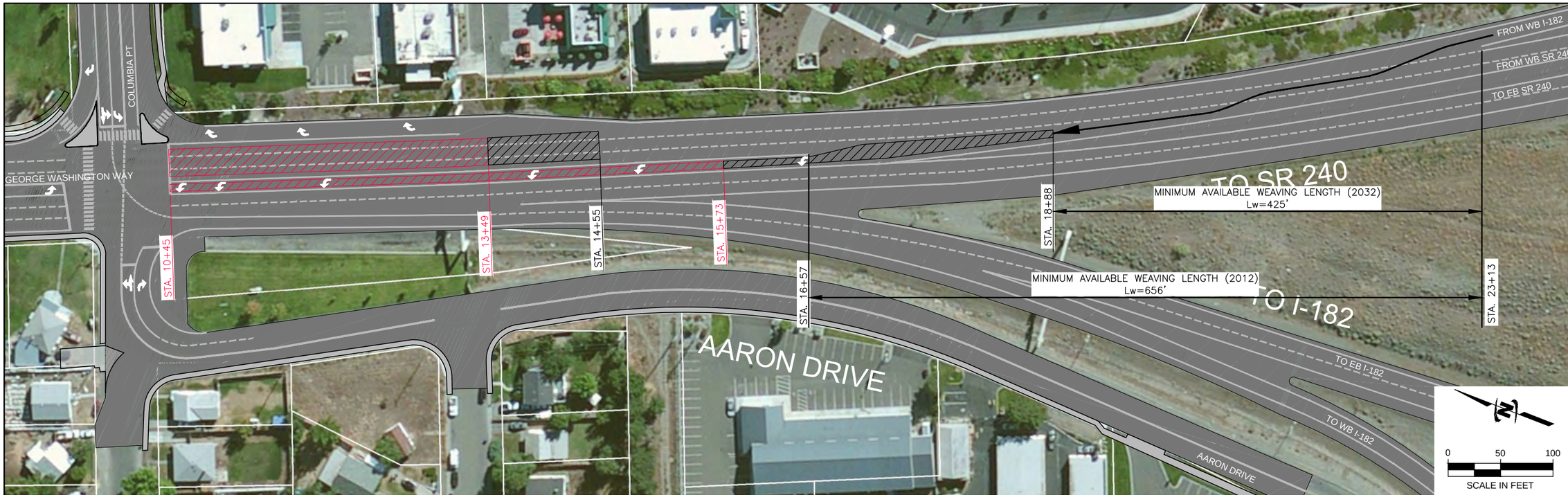
AM Peak Hour

MOEs		GW Way/Columbia Point				GW Way/New North of Benham			
		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	-	-	-	-	192	54.6	124	D
	NBT	2710	25.6	918	C	2678	0.6	10	A
	NBR	290	0.3	0	A	-	-	7	-
	SBL	160	72.4	129	E	-	-	-	-
	SBT	1330	1.2	28	A	1289	7.9	159	A
	SBR	-	-	-	-	26	7.9	159	A
	EBL	-	-	-	-	24	76	59	E
	EBT	-	-	-	-	-	-	-	-
	EBR	-	-	-	-	201	31.2	103	C
	WBL	230	73.4	165	E	-	-	-	-
	WBT	-	-	-	-	-	-	-	-
	WBR	160	0.2	0	A	-	-	-	-
	Overall		**20.1**		**C**		**7.0**		**A**

PM Peak Hour

MOEs		GW Way/Columbia Point				GW Way/New North of Benham			
		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
Movement	NBL	-	-	-	-	364	51	217	D
	NBT	1850	27.1	525	C	1666	0.6	8	A
	NBR	310	0.3	0	A	-	-	-	-
	SBL	270	46.7	146	D	-	-	-	-
	SBT	3080	4.6	115	A	2888	12.7	304	B
	SBR	-	-	-	-	44	12.9	304	B
	EBL	-	-	-	-	40	58	67	E
	EBT	-	-	-	-	-	-	-	-
	EBR	-	-	-	-	462	39.5	240	D
	WBL	490	58.3	263	E	-	-	-	-
	WBT	-	-	-	-	-	-	-	-
	WBR	180	0.1	0	A	-	-	-	-
	Overall		**17.5**		**B**		**14.2**		**B**

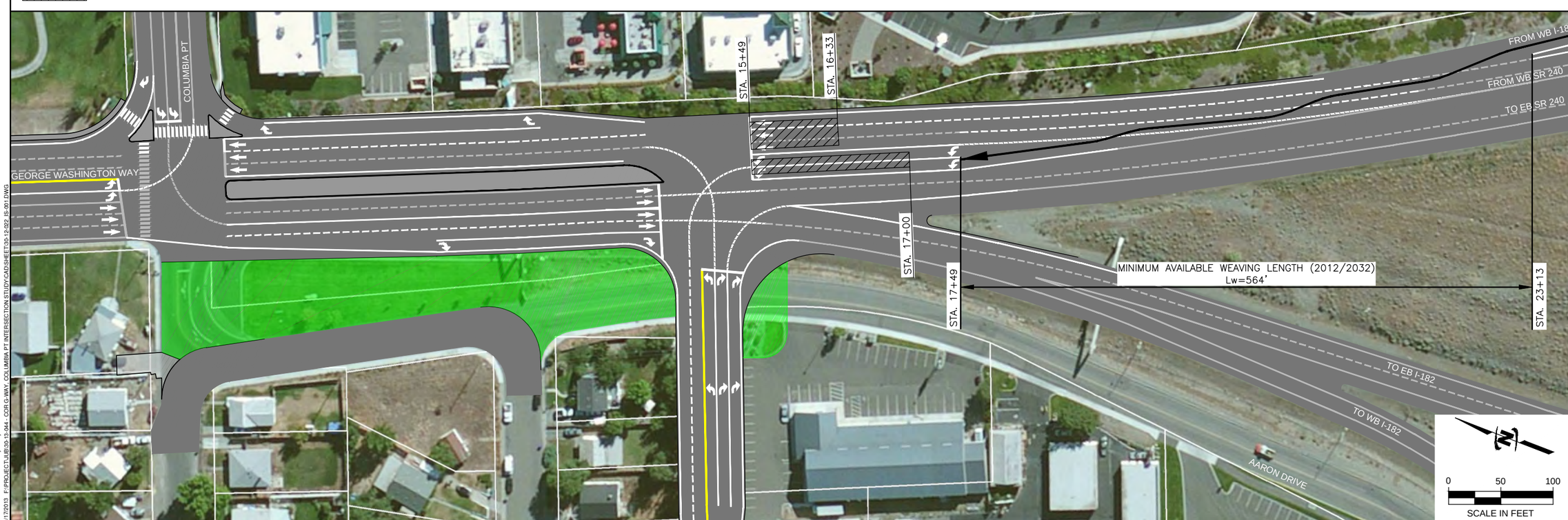
DRAFT



2012 QUEUE (PM)

2032 QUEUE (PM)

EXISTING / NO-BUILD



2032 QUEUE (PM)

PROPOSED OFFSET T (ALTERNATIVE 3)

Plot Date: 10/23/2013 11:24 AM Plotted By: Mary M. Wilkinson
Date Created: 6/17/2013 F:\PROJECT\JUB\30-13-044 - COR G-WAY, COLUMBIA PT INTERSECTION STUDY\CAD\SHEET\30-12-022_IS-001.DWG

J-U-B ENGINEERS, INC.

J-U-B ENGINEERS, INC.
2810 W. Clearwater Ave.
Suite 201
Kennewick, WA 99336
Phone: 509.783.2144
Fax: 509.736.0790
www.jub.com

PRELIMINARY PLANS

NOT FOR CONSTRUCTION

REUSE OF DRAWINGS

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF **J-U-B ENGINEERS, Inc.** AND IS NOT TO BE USED, IN WHOLE OR PART, FOR ANY OTHER PROJECT WITHOUT THE EXPRESS WRITTEN AUTHORIZATION OF **J-U-B ENGINEERS, Inc.**

NO.	REVISION DESCRIPTION	BY	APR.	DATE

GEORGE WASHINGTON WAY, COLUMBIA PT. TRAFFIC STUDY - RICHLAND, WA

WEAVING ANALYSIS

FILE : 30-12-022_IS-001
JUB PROJ. # : 30-12-022
DRAWN BY: MMW
DESIGN BY: BBH
CHECKED BY:

ONE INCH
AT FULL SIZE, IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 10/23/2013

FIGURE 9

Summary

The intersection with the highest delay and greatest number of accidents in the City of Richland is the intersection of George Washington Way/Columbia Point Drive. This study was undertaken to evaluate existing traffic operations, forecast future traffic volumes and the anticipated traffic operations and determine if feasible alternatives exist that can reduce delay without the high cost of grade separation.

Several initial alternatives were evaluated and compared using Synchro software. The results of the initial analysis were reviewed with City staff and 4 alternatives were selected for more detailed analysis to better understand the resulting traffic operations. Microsimiulation videos of these options were prepared as well.

- Alternative 1: No-Build - although this alternative fails with respect to Level of Service, it provides a good comparison of what may happen with respect to delay and queueing without improvements to the existing roadway network.
- Alternative 2: Additional Lanes – Illustrates what could be achieved and the extra width required for traditional improvements.
- Alternative 3: Split T Intersections – traditional in the sense that no movements are restricted, but would require significant coordination with WSDOT to create a new intersection to the south of CPD closer to I-182.
- Alternative 9B: Northbound Thru–U and new roundabout on CPD – best operations of the non-traditional options. It has movements restricted, but provides for reduction in vehicle delay at the intersection.

Each alternative has positive features as well as drawbacks with respect to benefits and impacts. It is anticipated that the results of this traffic operations analysis will be incorporated into additional evaluation that will likely include the following as well as other issues:

- right-of-way impacts
- costs
- pedestrian impacts
- coordination with I-182 interchange
- long-term maximum capacity
- public acceptability

DRAFT

Appendix A

Traffic Counts

L2 Data Collection

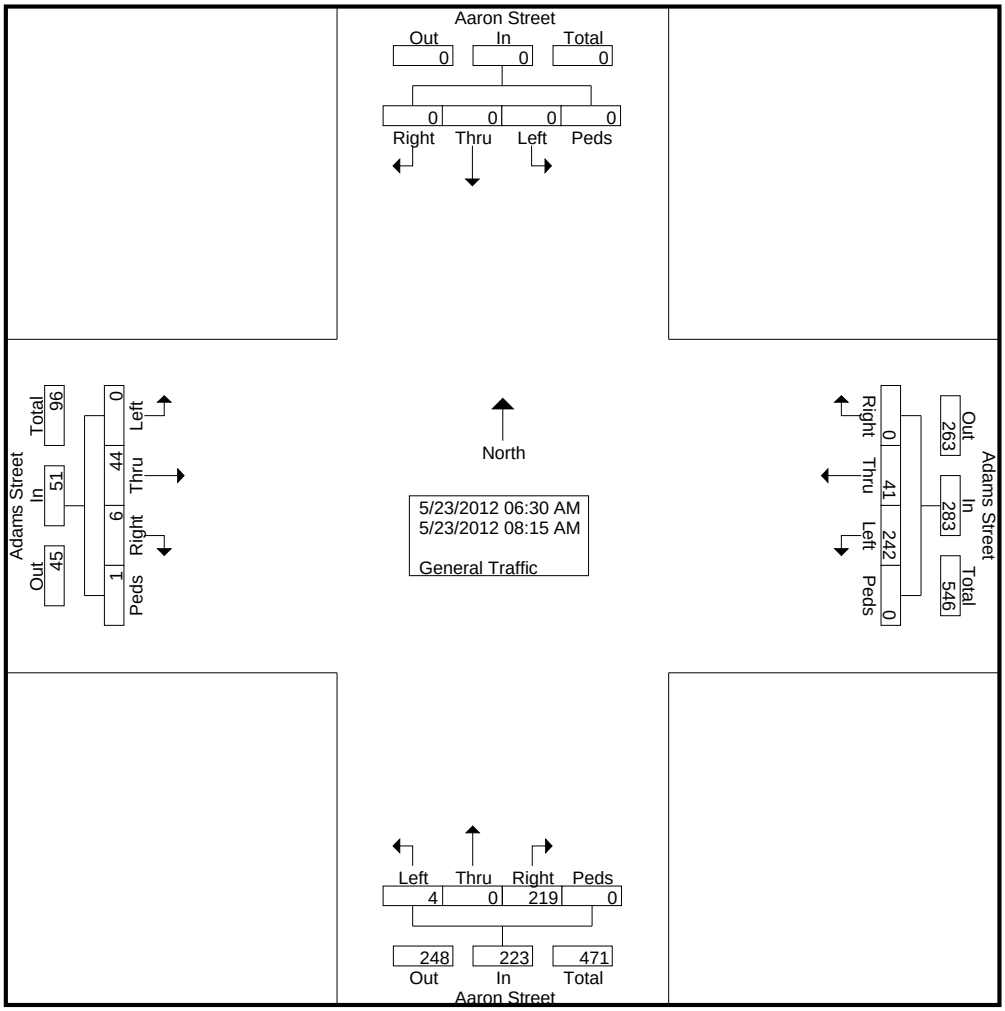
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: Aaron Drive / Adams Street
City, State: Richland, Washington
Control: Stop Sign

File Name : Aaron and Adams AM
Site Code : 3
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	Aaron Street From North					Adams Street From East					Aaron Street From South					Adams Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:30 AM	0	0	0	0	0	0	0	20	0	20	19	0	0	0	19	3	1	0	1	5	44
06:45 AM	0	0	0	0	0	0	3	43	0	46	14	0	0	0	14	1	4	0	0	5	65
Total	0	0	0	0	0	0	3	63	0	66	33	0	0	0	33	4	5	0	1	10	109
07:00 AM	0	0	0	0	0	0	3	24	0	27	26	0	0	0	26	0	5	0	0	5	58
07:15 AM	0	0	0	0	0	0	3	26	0	29	23	0	1	0	24	0	6	0	0	6	59
07:30 AM	0	0	0	0	0	0	8	23	0	31	32	0	1	0	33	0	7	0	0	7	71
07:45 AM	0	0	0	0	0	0	8	42	0	50	28	0	1	0	29	0	4	0	0	4	83
Total	0	0	0	0	0	0	22	115	0	137	109	0	3	0	112	0	22	0	0	22	271
08:00 AM	0	0	0	0	0	0	6	31	0	37	43	0	1	0	44	2	6	0	0	8	89
08:15 AM	0	0	0	0	0	0	10	33	0	43	34	0	0	0	34	0	11	0	0	11	88
Grand Total	0	0	0	0	0	0	41	242	0	283	219	0	4	0	223	6	44	0	1	51	557
Apprch %	0	0	0	0		0	14.5	85.5	0		98.2	0	1.8	0		11.8	86.3	0	2		
Total %	0	0	0	0	0	0	7.4	43.4	0	50.8	39.3	0	0.7	0	40	1.1	7.9	0	0.2	9.2	



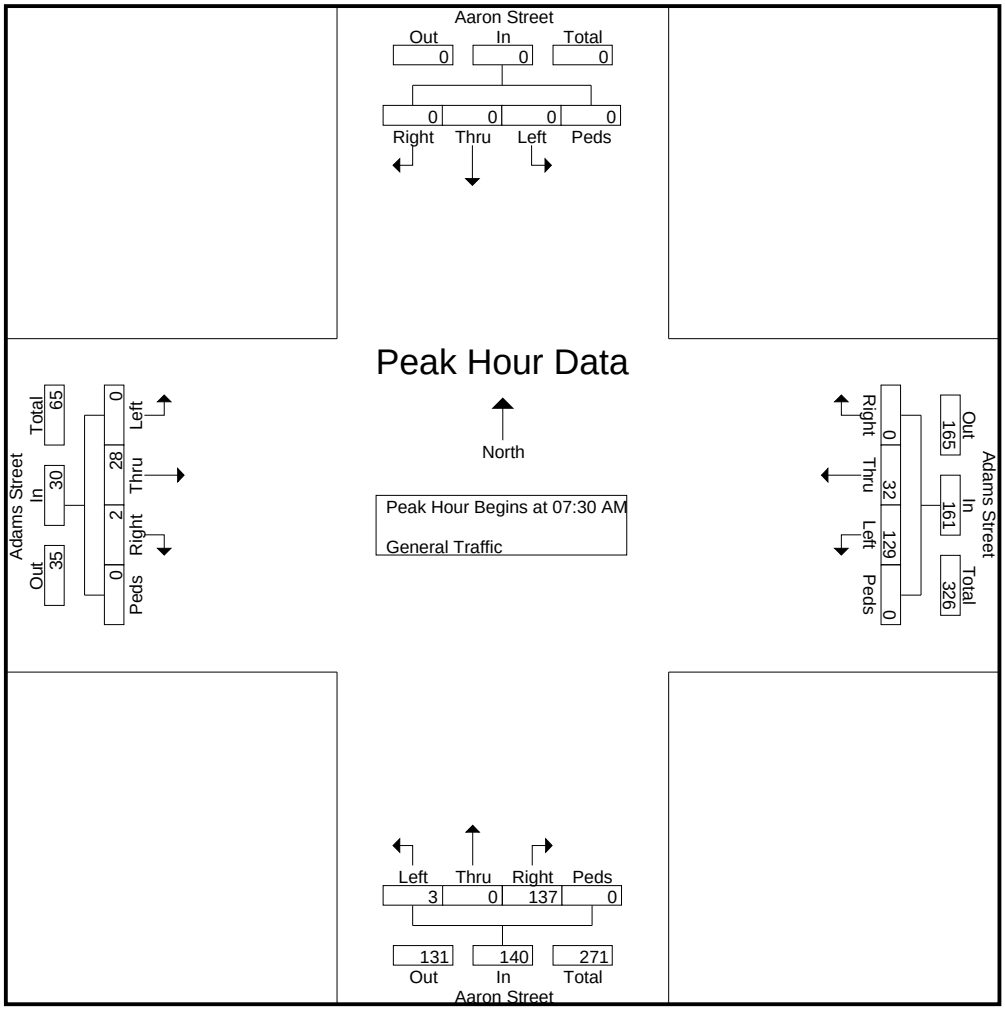
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: Aaron Drive / Adams Street
City, State: Richland, Washington
Control: Stop Sign

File Name : Aaron and Adams AM
Site Code : 3
Start Date : 5/23/2012
Page No : 2

	Aaron Street From North					Adams Street From East					Aaron Street From South					Adams Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	8	23	0	31	32	0	**1**	0	33	0	7	0	0	7	71
07:45 AM	0	0	0	0	0	0	8	**42**	0	**50**	28	0	1	0	29	0	4	0	0	4	83
08:00 AM	0	0	0	0	0	0	6	31	0	37	**43**	0	1	0	**44**	**2**	6	0	0	8	**89**
08:15 AM	0	0	0	0	0	0	**10**	33	0	43	34	0	0	0	34	0	**11**	0	0	**11**	88
Total Volume	0	0	0	0	0	0	32	129	0	161	137	0	3	0	140	2	28	0	0	30	331
% App. Total	0	0	0	0		0	19.9	80.1	0		97.9	0	2.1	0		6.7	93.3	0	0		
PHF	.000	.000	.000	.000	.000	.000	.800	.768	.000	.805	.797	.000	.750	.000	.795	.250	.636	.000	.000	.682	.930



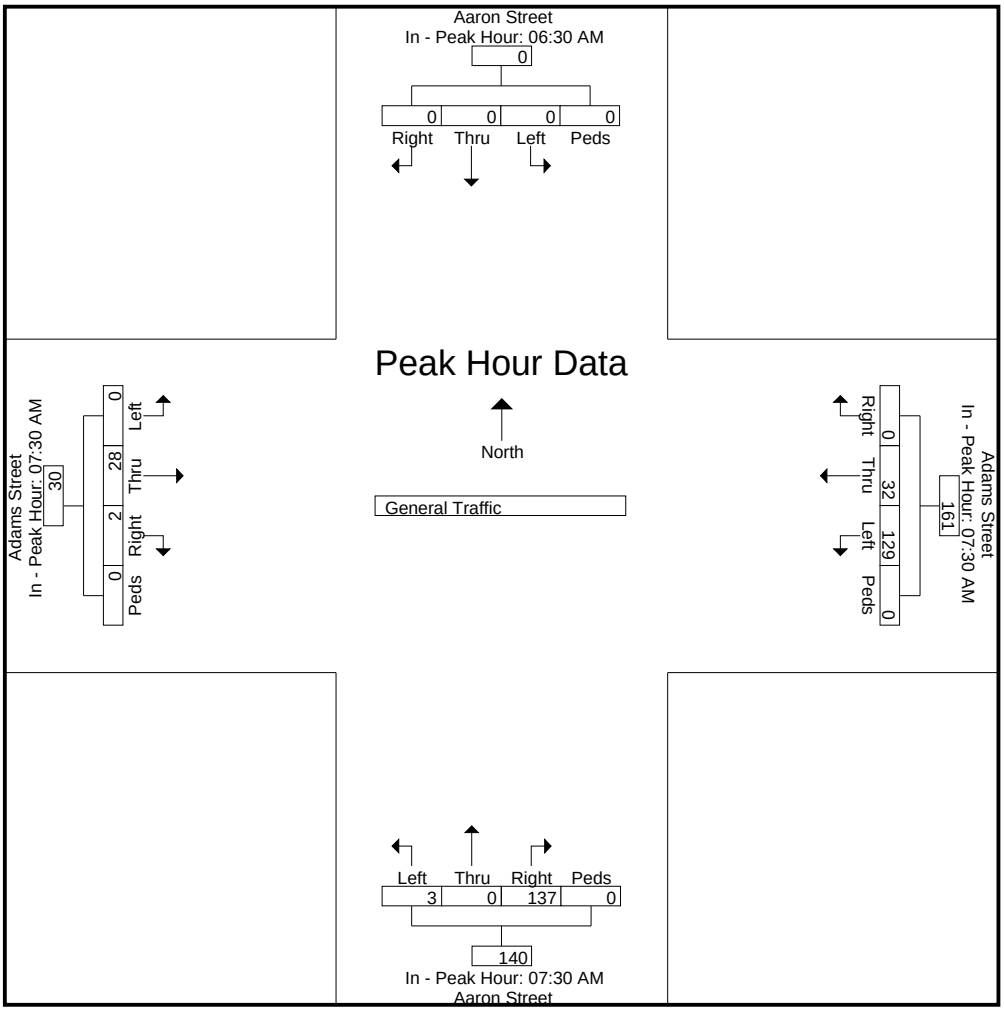
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: Aaron Drive / Adams Street
City, State: Richland, Washington
Control: Stop Sign

File Name : Aaron and Adams AM
Site Code : 3
Start Date : 5/23/2012
Page No : 3

	Aaron Street From North					Adams Street From East					Aaron Street From South					Adams Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	06:30 AM					07:30 AM					07:30 AM					07:30 AM					
+0 mins.	0	0	0	0	0	0	8	23	0	31	32	0	**1**	0	33	0	7	0	0	7	
+15 mins.	0	0	0	0	0	0	8	**42**	0	**50**	28	0	1	0	29	0	4	0	0	4	
+30 mins.	0	0	0	0	0	0	6	31	0	37	**43**	0	1	0	**44**	**2**	6	0	0	8	
+45 mins.	0	0	0	0	0	0	**10**	33	0	43	34	0	0	0	34	0	**11**	0	0	**11**	
Total Volume	0	0	0	0	0	0	32	129	0	161	137	0	3	0	140	2	28	0	0	30	
% App. Total	0	0	0	0		0	19.9	80.1	0		97.9	0	2.1	0		6.7	93.3	0	0		
PHF	.000	.000	.000	.000	.000	.000	.800	.768	.000	.805	.797	.000	.750	.000	.795	.250	.636	.000	.000	.682	



L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: Aaron Drive / Adams Street
City, State: Richland, Washington
Control: Stop Sign

File Name : Aaron and Adams AM
Site Code : 3
Start Date : 5/23/2012
Page No : 4

Image 1

L2 Data Collection

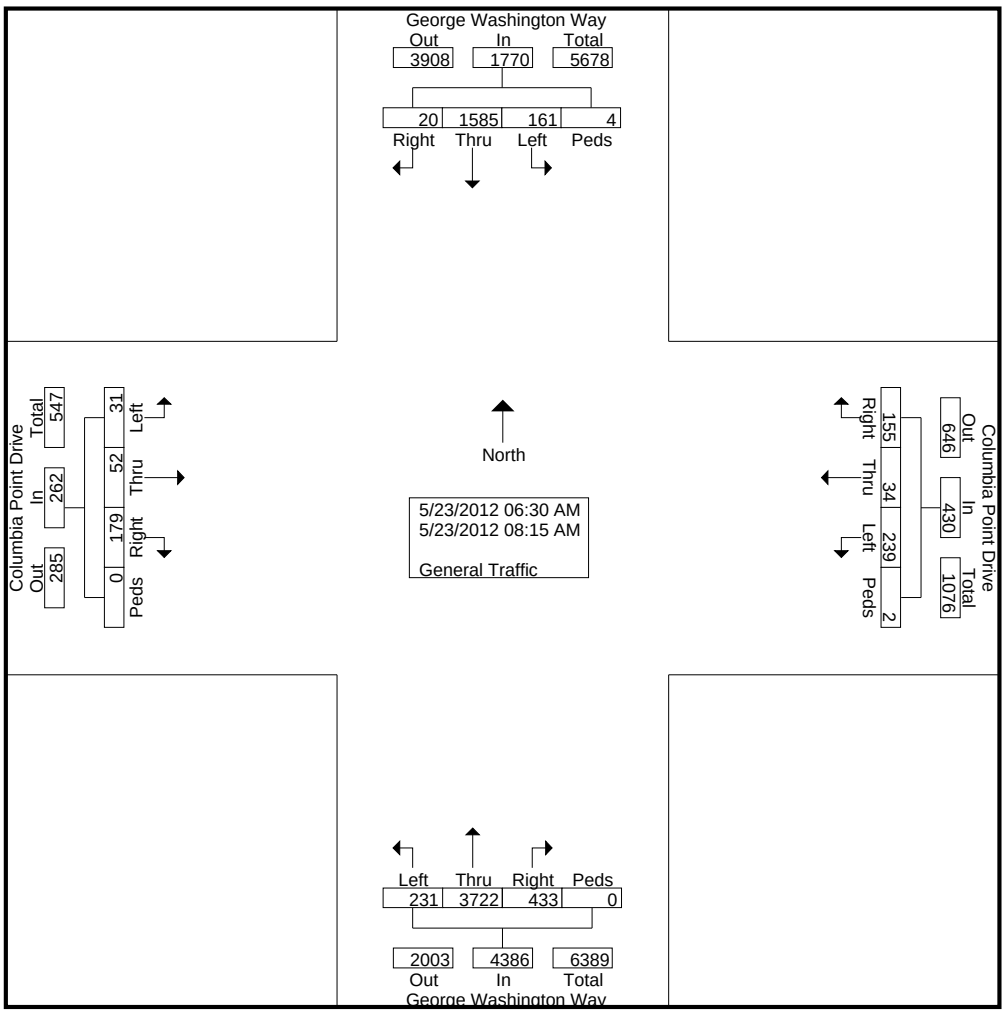
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Columbia
City, State: Richland, Washington
Control: Signalized

File Name : GW and Columbia AM
Site Code : 4
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	George Washington Way From North					Columbia Point Drive From East					George Washington Way From South					Columbia Point Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:30 AM	1	146	10	2	159	11	3	14	0	28	38	469	17	0	524	12	4	4	0	20	731
06:45 AM	2	150	16	0	168	15	5	20	1	41	52	530	40	0	622	12	2	3	0	17	848
Total	3	296	26	2	327	26	8	34	1	69	90	999	57	0	1146	24	6	7	0	37	1579
07:00 AM	2	139	20	0	161	14	3	22	0	39	57	384	22	0	463	25	5	2	0	32	695
07:15 AM	3	180	15	0	198	27	0	24	0	51	54	420	26	0	500	22	5	2	0	29	778
07:30 AM	0	241	23	0	264	19	8	36	0	63	52	503	25	0	580	28	7	4	0	39	946
07:45 AM	6	291	25	2	324	27	3	38	1	69	63	564	39	0	666	23	4	4	0	31	1090
Total	11	851	83	2	947	87	14	120	1	222	226	1871	112	0	2209	98	21	12	0	131	3509
08:00 AM	2	217	23	0	242	21	8	42	0	71	55	437	27	0	519	36	11	3	0	50	882
08:15 AM	4	221	29	0	254	21	4	43	0	68	62	415	35	0	512	21	14	9	0	44	878
Grand Total	20	1585	161	4	1770	155	34	239	2	430	433	3722	231	0	4386	179	52	31	0	262	6848
Apprch %	1.1	89.5	9.1	0.2		36	7.9	55.6	0.5		9.9	84.9	5.3	0		68.3	19.8	11.8	0		
Total %	0.3	23.1	2.4	0.1	25.8	2.3	0.5	3.5	0	6.3	6.3	54.4	3.4	0	64	2.6	0.8	0.5	0	3.8	



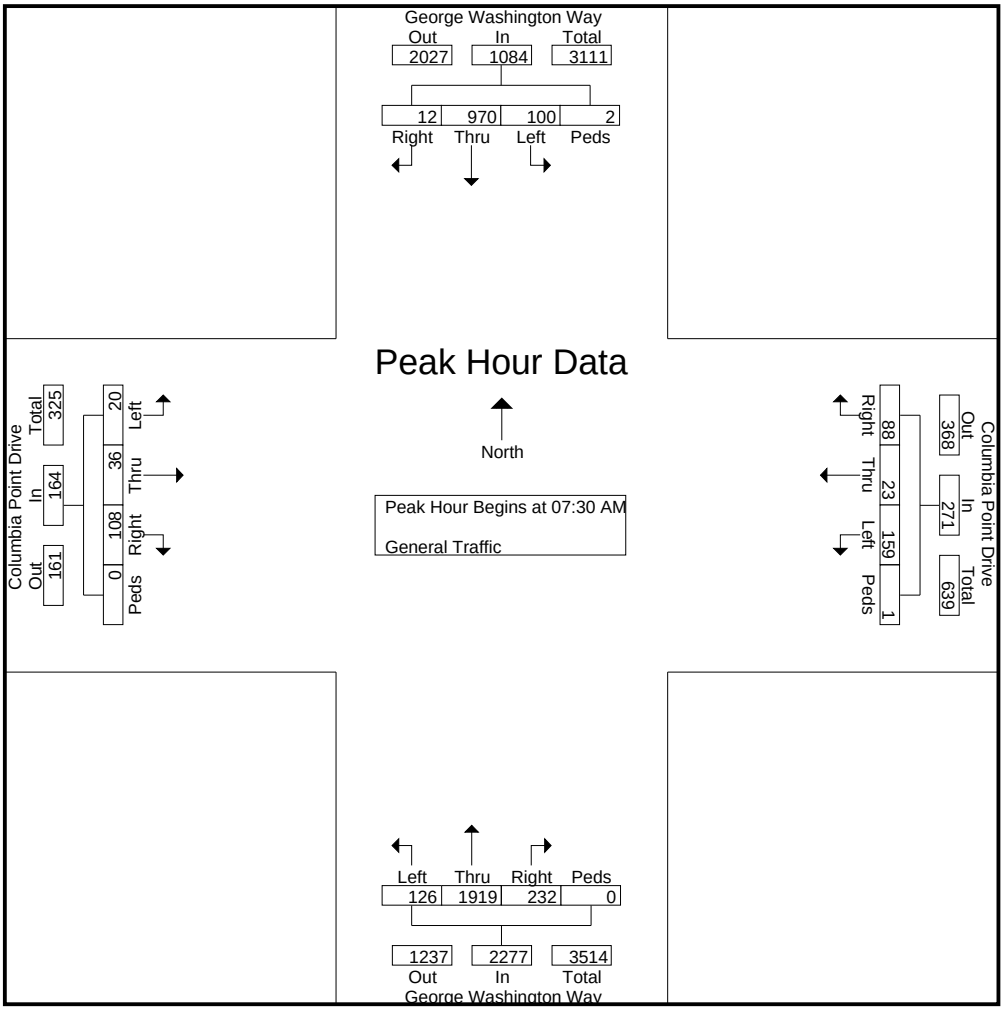
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Columbia
City, State: Richland, Washington
Control: Signalized

File Name : GW and Columbia AM
Site Code : 4
Start Date : 5/23/2012
Page No : 2

	George Washington Way From North					Columbia Point Drive From East					George Washington Way From South					Columbia Point Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	241	23	0	264	19	**8**	36	0	63	52	503	25	0	580	28	7	4	0	39	946
07:45 AM	**6**	**291**	25	**2**	**324**	**27**	3	38	**1**	69	**63**	**564**	**39**	0	**666**	23	4	4	0	31	**1090**
08:00 AM	2	217	23	0	242	21	8	42	0	**71**	55	437	27	0	519	**36**	11	3	0	**50**	882
08:15 AM	4	221	**29**	0	254	21	4	**43**	0	68	62	415	35	0	512	21	**14**	**9**	0	44	878
Total Volume	12	970	100	2	1084	88	23	159	1	271	232	1919	126	0	2277	108	36	20	0	164	3796
% App. Total	1.1	89.5	9.2	0.2		32.5	8.5	58.7	0.4		10.2	84.3	5.5	0		65.9	22	12.2	0		
PHF	.500	.833	.862	.250	.836	.815	.719	.924	.250	.954	.921	.851	.808	.000	.855	.750	.643	.556	.000	.820	.871



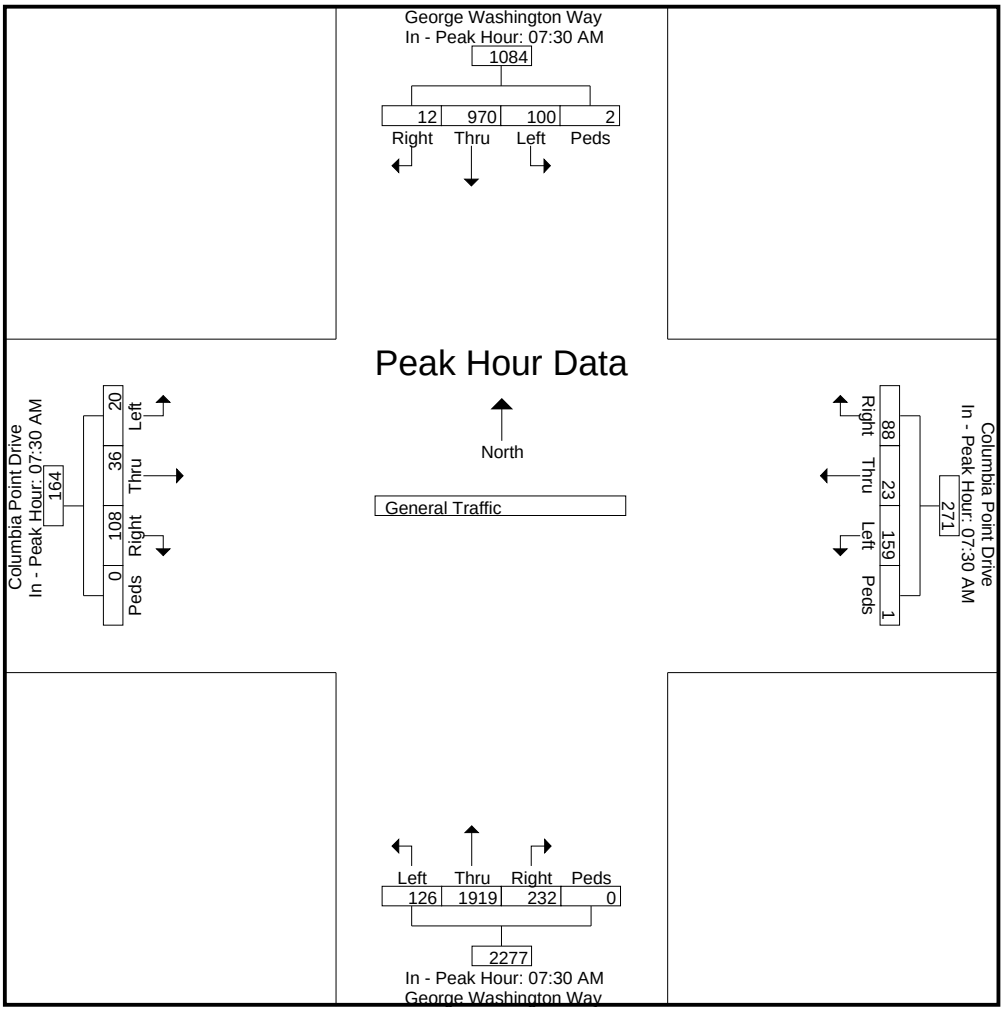
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Columbia
City, State: Richland, Washington
Control: Signalized

File Name : GW and Columbia AM
Site Code : 4
Start Date : 5/23/2012
Page No : 3

	George Washington Way From North					Columbia Point Drive From East					George Washington Way From South					Columbia Point Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:30 AM					07:30 AM					07:30 AM					07:30 AM					
+0 mins.	0	241	23	0	264	19	**8**	36	0	63	52	503	25	0	580	28	7	4	0	39	
+15 mins.	**6**	**291**	25	**2**	**324**	**27**	3	38	**1**	69	**63**	**564**	**39**	0	**666**	23	4	4	0	31	
+30 mins.	2	217	23	0	242	21	8	42	0	**71**	55	437	27	0	519	**36**	11	3	0	**50**	
+45 mins.	4	221	**29**	0	254	21	4	**43**	0	68	62	415	35	0	512	21	**14**	**9**	0	44	
Total Volume	12	970	100	2	1084	88	23	159	1	271	232	1919	126	0	2277	108	36	20	0	164	
% App. Total	1.1	89.5	9.2	0.2		32.5	8.5	58.7	0.4		10.2	84.3	5.5	0		65.9	22	12.2	0		
PHF	.500	.833	.862	.250	.836	.815	.719	.924	.250	.954	.921	.851	.808	.000	.855	.750	.643	.556	.000	.820	



L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Columbia
City, State: Richland, Washington
Control: Signalized

File Name : GW and Columbia AM
Site Code : 4
Start Date : 5/23/2012
Page No : 4

Image 1

L2 Data Collection

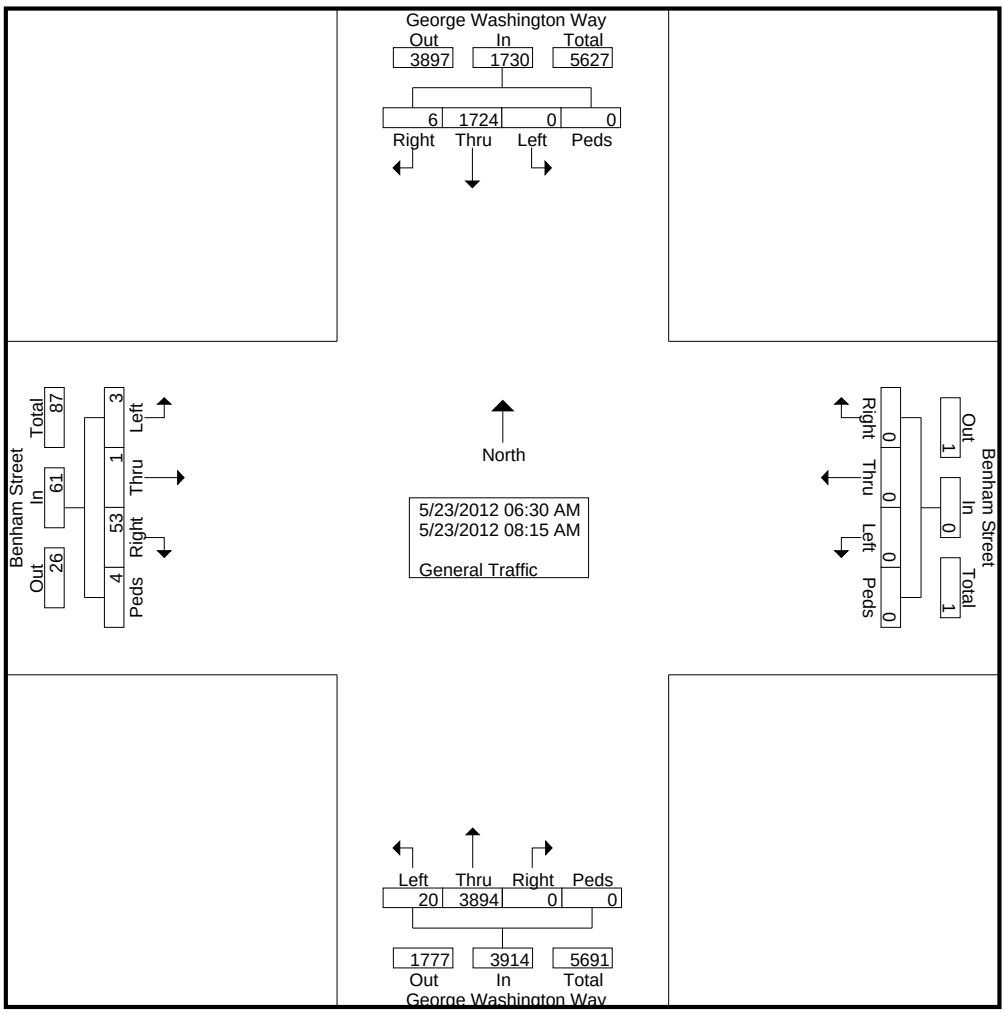
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: George Washington / Benham
City, State: Richland, Washington
Control: Stop Sign

File Name : GW and Benham AM
Site Code : 2
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	George Washington Way From North					Benham Street From East					George Washington Way From South					Benham Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:30 AM	1	158	0	0	159	0	0	0	0	0	0	511	2	0	513	5	0	1	0	6	678
06:45 AM	0	146	0	0	146	0	0	0	0	0	0	534	4	0	538	4	0	0	0	4	688
Total	1	304	0	0	305	0	0	0	0	0	0	1045	6	0	1051	9	0	1	0	10	1366
07:00 AM	0	151	0	0	151	0	0	0	0	0	0	392	1	0	393	6	0	0	0	6	550
07:15 AM	0	193	0	0	193	0	0	0	0	0	0	451	3	0	454	11	0	0	0	11	658
07:30 AM	2	281	0	0	283	0	0	0	0	0	0	543	2	0	545	10	0	1	0	11	839
07:45 AM	1	311	0	0	312	0	0	0	0	0	0	596	0	0	596	9	0	1	0	10	918
Total	3	936	0	0	939	0	0	0	0	0	0	1982	6	0	1988	36	0	2	0	38	2965
08:00 AM	1	240	0	0	241	0	0	0	0	0	0	453	4	0	457	6	0	0	2	8	706
08:15 AM	1	244	0	0	245	0	0	0	0	0	0	414	4	0	418	2	1	0	2	5	668
Grand Total	6	1724	0	0	1730	0	0	0	0	0	0	3894	20	0	3914	53	1	3	4	61	5705
Apprch %	0.3	99.7	0	0		0	0	0	0		0	99.5	0.5	0		86.9	1.6	4.9	6.6		
Total %	0.1	30.2	0	0	30.3	0	0	0	0	0	0	68.3	0.4	0	68.6	0.9	0	0.1	0.1	1.1	



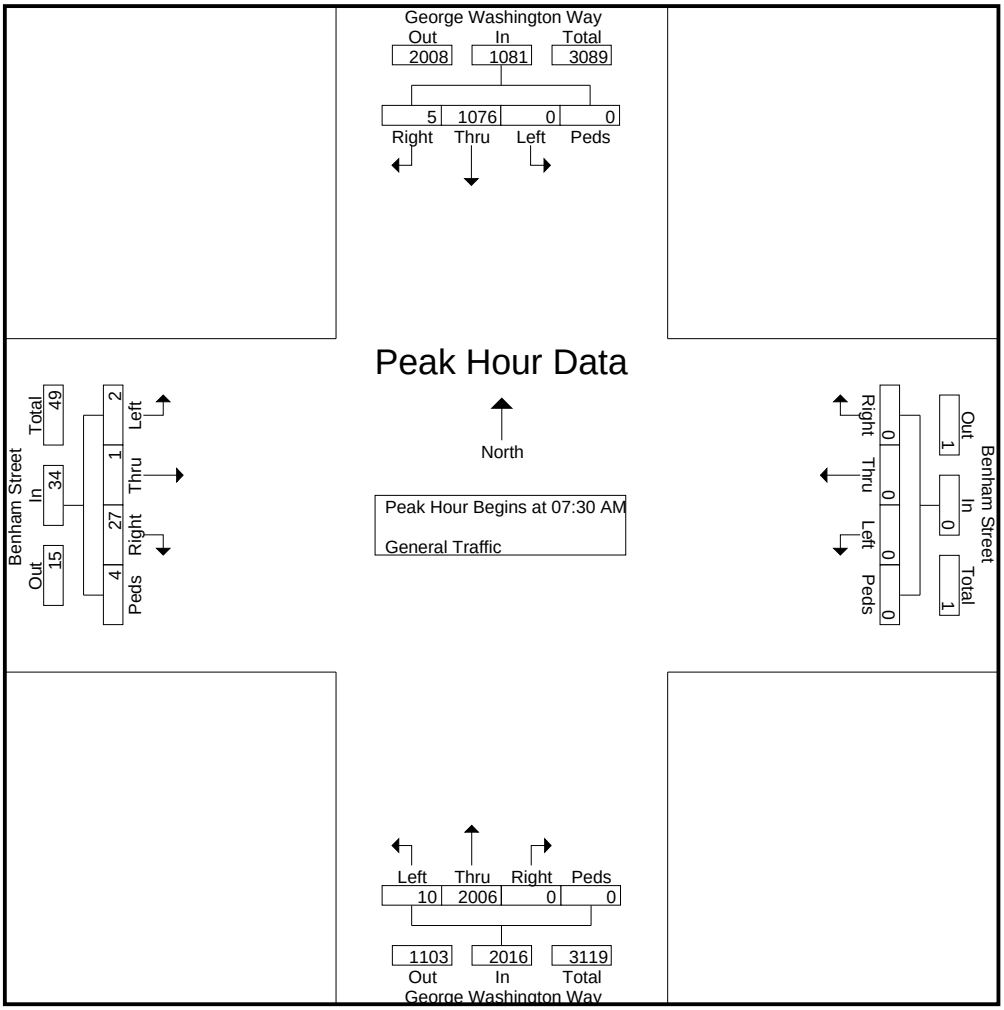
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: George Washington / Benham
City, State: Richland, Washington
Control: Stop Sign

File Name : GW and Benham AM
Site Code : 2
Start Date : 5/23/2012
Page No : 2

	George Washington Way From North					Benham Street From East					George Washington Way From South					Benham Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**2**	281	0	0	283	0	0	0	0	0	0	543	2	0	545	**10**	0	**1**	0	**11**	839
07:45 AM	1	**311**	0	0	**312**	0	0	0	0	0	0	**596**	0	0	**596**	9	0	1	0	10	**918**
08:00 AM	1	240	0	0	241	0	0	0	0	0	0	453	**4**	0	457	6	0	0	**2**	8	706
08:15 AM	1	244	0	0	245	0	0	0	0	0	0	414	4	0	418	2	**1**	0	2	5	668
Total Volume	5	1076	0	0	1081	0	0	0	0	0	0	2006	10	0	2016	27	1	2	4	34	3131
% App. Total	0.5	99.5	0	0		0	0	0	0		0	99.5	0.5	0		79.4	2.9	5.9	11.8		
PHF	.625	.865	.000	.000	.866	.000	.000	.000	.000	.000	.000	.841	.625	.000	.846	.675	.250	.500	.500	.773	.853



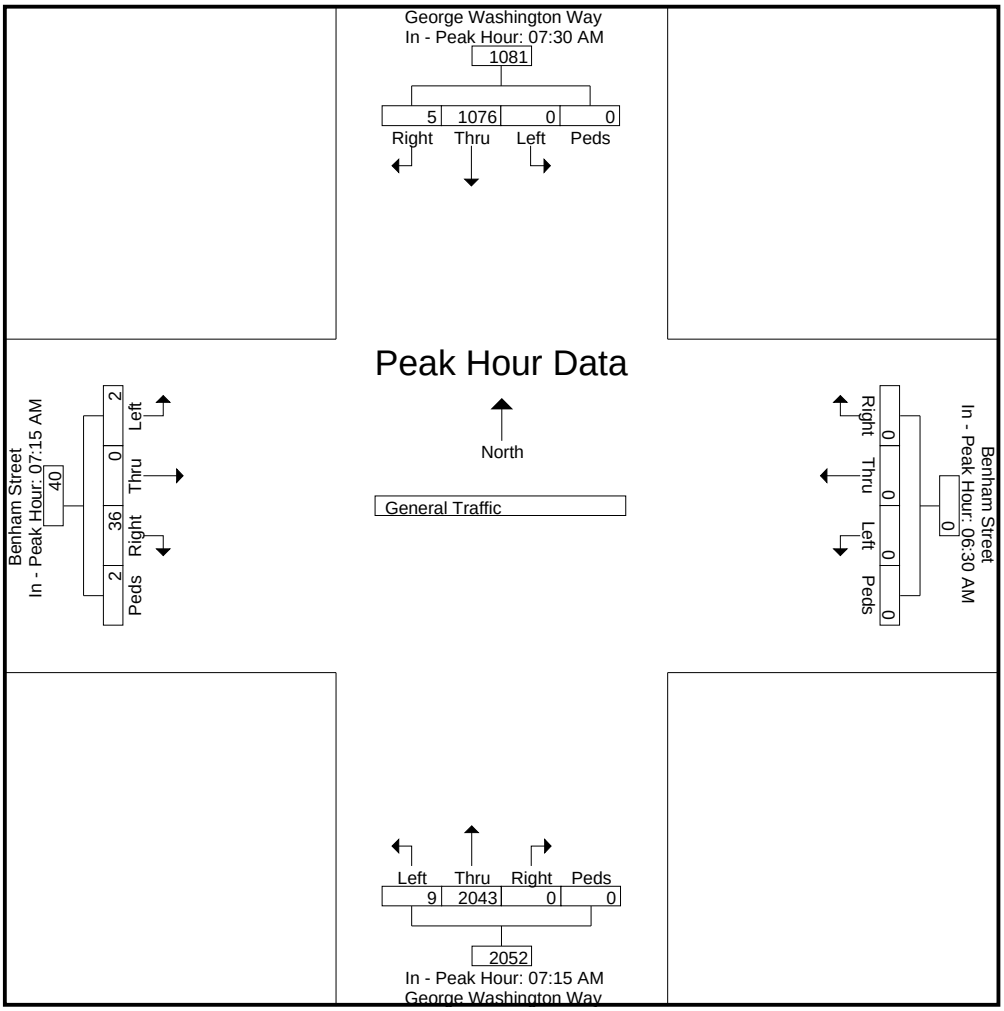
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: George Washington / Benham
City, State: Richland, Washington
Control: Stop Sign

File Name : GW and Benham AM
Site Code : 2
Start Date : 5/23/2012
Page No : 3

	George Washington Way From North					Benham Street From East					George Washington Way From South					Benham Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:30 AM					06:30 AM					07:15 AM					07:15 AM					
+0 mins.	**2**	281	0	0	283	0	0	0	0	0	0	451	3	0	454	**11**	0	0	0	**11**	
+15 mins.	1	**311**	0	0	**312**	0	0	0	0	0	0	543	2	0	545	10	0	**1**	0	11	
+30 mins.	1	240	0	0	241	0	0	0	0	0	0	**596**	0	0	**596**	9	0	1	0	10	
+45 mins.	1	244	0	0	245	0	0	0	0	0	0	453	**4**	0	457	6	0	0	**2**	8	
Total Volume	5	1076	0	0	1081	0	0	0	0	0	0	2043	9	0	2052	36	0	2	2	40	
% App. Total	0.5	99.5	0	0		0	0	0	0		0	99.6	0.4	0		90	0	5	5		
PHF	.625	.865	.000	.000	.866	.000	.000	.000	.000	.000	.000	.857	.563	.000	.861	.818	.000	.500	.250	.909	



L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: George Washington / Benham
City, State: Richland, Washington
Control: Stop Sign

File Name : GW and Benham AM
Site Code : 2
Start Date : 5/23/2012
Page No : 4

Image 1

L2 Data Collection

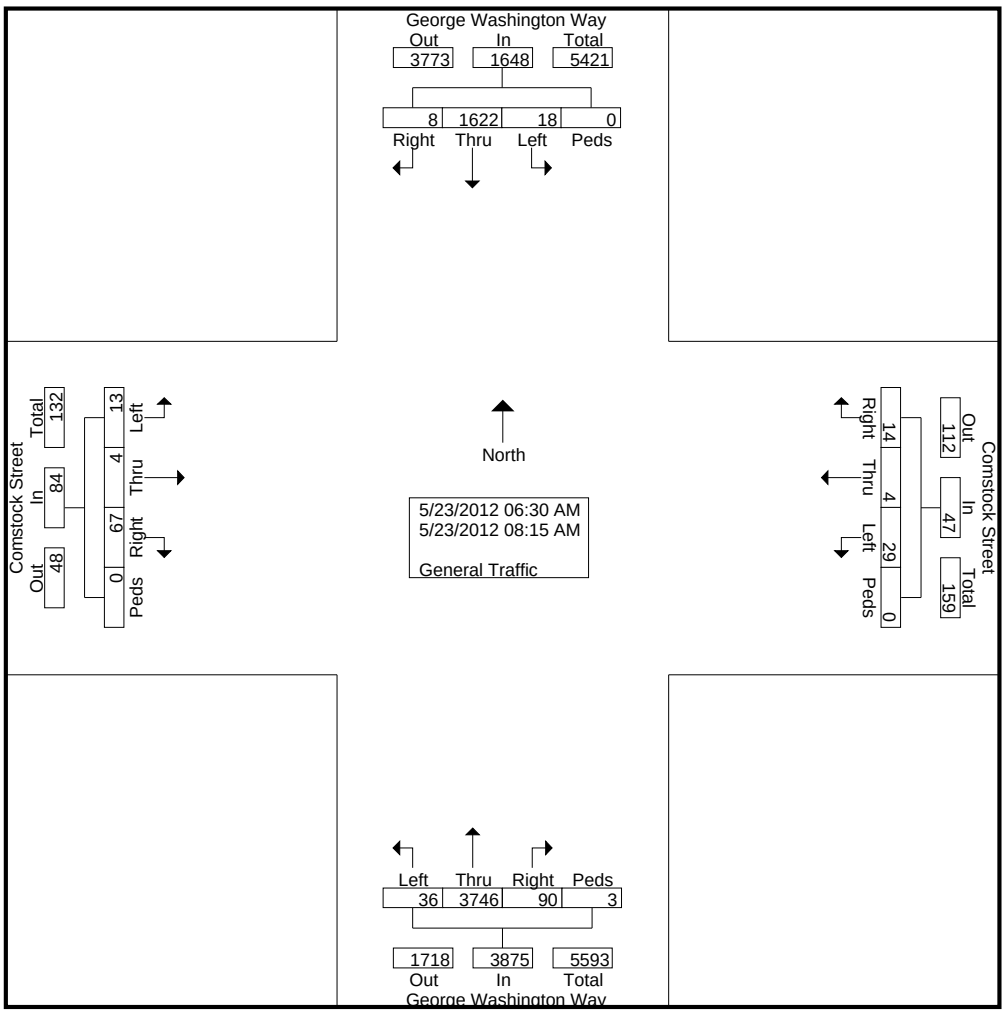
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Comstock
City, State: Richland, Washington
Control: Signalized

File Name : GW and Comstock AM
Site Code : 1
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	George Washington Way From North					Comstock Street From East					George Washington Way From South					Comstock Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:30 AM	0	148	2	0	150	4	1	5	0	10	6	498	5	0	509	9	0	1	0	10	679
06:45 AM	1	150	6	0	157	5	0	5	0	10	9	525	1	0	535	7	0	4	0	11	713
Total	1	298	8	0	307	9	1	10	0	20	15	1023	6	0	1044	16	0	5	0	21	1392
07:00 AM	1	152	1	0	154	0	0	5	0	5	6	387	2	1	396	4	0	1	0	5	560
07:15 AM	1	175	1	0	177	1	1	4	0	6	7	433	9	0	449	7	2	0	0	9	641
07:30 AM	1	264	1	0	266	2	0	2	0	4	19	509	3	0	531	14	1	0	0	15	816
07:45 AM	2	282	3	0	287	0	0	2	0	2	15	556	5	2	578	12	1	2	0	15	882
Total	5	873	6	0	884	3	1	13	0	17	47	1885	19	3	1954	37	4	3	0	44	2899
08:00 AM	1	225	2	0	228	0	0	3	0	3	9	444	6	0	459	7	0	1	0	8	698
08:15 AM	1	226	2	0	229	2	2	3	0	7	19	394	5	0	418	7	0	4	0	11	665
Grand Total	8	1622	18	0	1648	14	4	29	0	47	90	3746	36	3	3875	67	4	13	0	84	5654
Apprch %	0.5	98.4	1.1	0		29.8	8.5	61.7	0		2.3	96.7	0.9	0.1		79.8	4.8	15.5	0		
Total %	0.1	28.7	0.3	0	29.1	0.2	0.1	0.5	0	0.8	1.6	66.3	0.6	0.1	68.5	1.2	0.1	0.2	0	1.5	



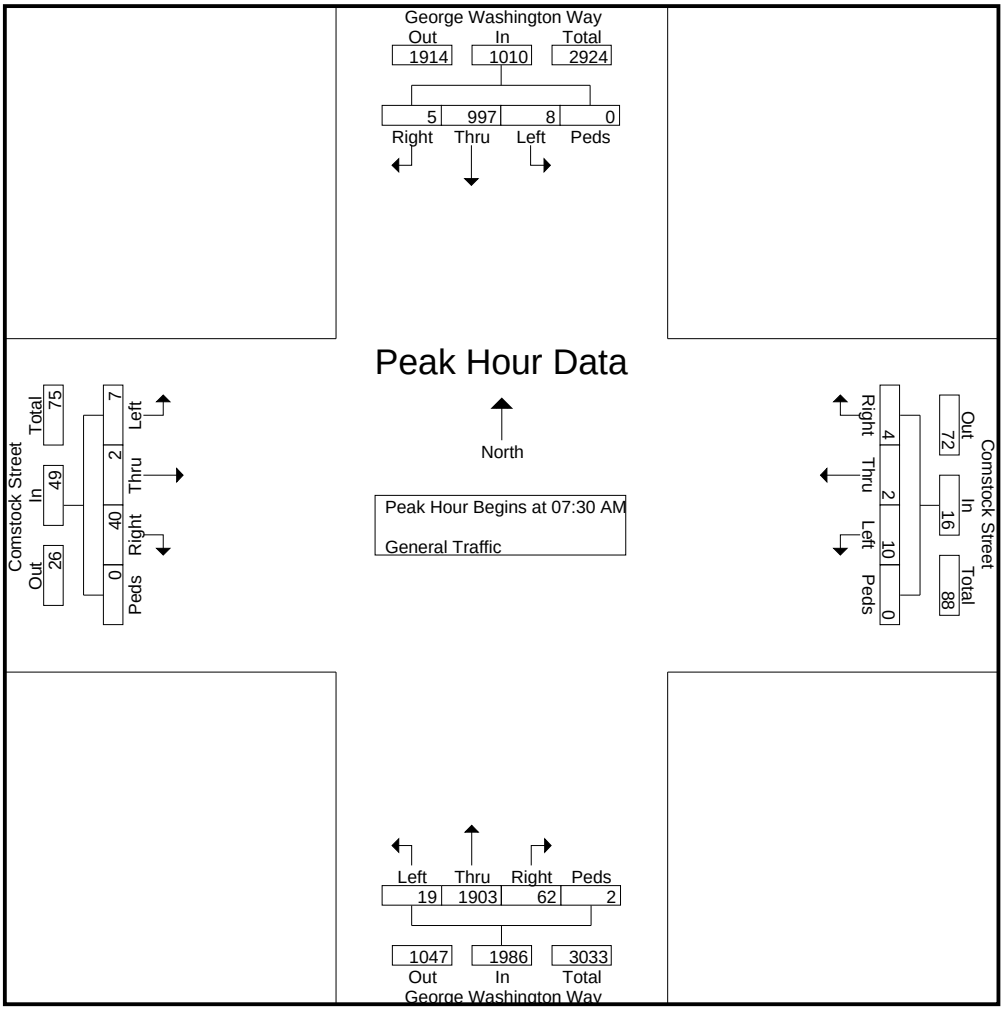
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Comstock
City, State: Richland, Washington
Control: Signalized

File Name : GW and Comstock AM
Site Code : 1
Start Date : 5/23/2012
Page No : 2

	George Washington Way From North					Comstock Street From East					George Washington Way From South					Comstock Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	1	264	1	0	266	**2**	0	2	0	4	**19**	509	3	0	531	**14**	**1**	0	0	**15**	816
07:45 AM	**2**	**282**	**3**	0	**287**	0	0	2	0	2	15	**556**	5	**2**	**578**	12	1	2	0	15	**882**
08:00 AM	1	225	2	0	228	0	0	**3**	0	3	9	444	**6**	0	459	7	0	1	0	8	698
08:15 AM	1	226	2	0	229	2	**2**	3	0	**7**	19	394	5	0	418	7	0	**4**	0	11	665
Total Volume	5	997	8	0	1010	4	2	10	0	16	62	1903	19	2	1986	40	2	7	0	49	3061
% App. Total	0.5	98.7	0.8	0		25	12.5	62.5	0		3.1	95.8	1	0.1		81.6	4.1	14.3	0		
PHF	.625	.884	.667	.000	.880	.500	.250	.833	.000	.571	.816	.856	.792	.250	.859	.714	.500	.438	.000	.817	.868



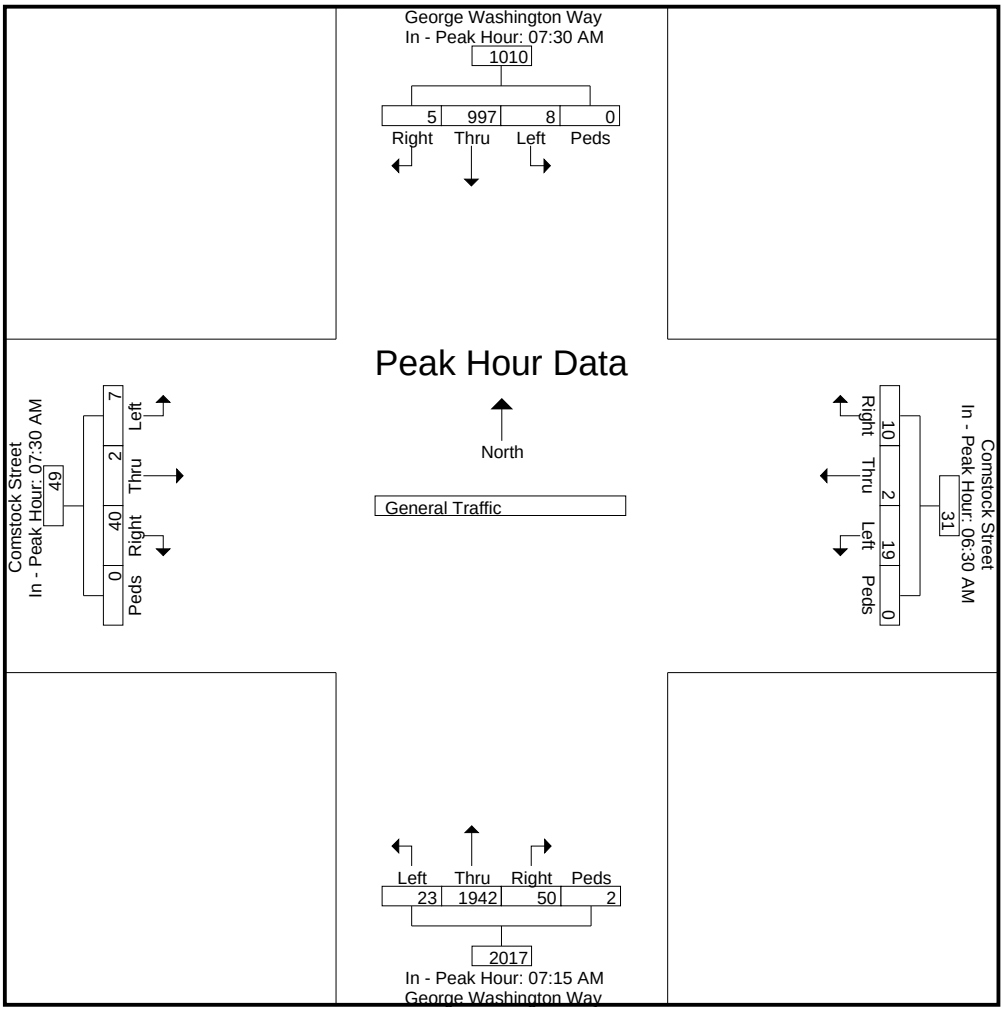
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Comstock
City, State: Richland, Washington
Control: Signalized

File Name : GW and Comstock AM
Site Code : 1
Start Date : 5/23/2012
Page No : 3

	George Washington Way From North					Comstock Street From East					George Washington Way From South					Comstock Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:30 AM					06:30 AM					07:15 AM					07:30 AM					
+0 mins.	1	264	1	0	266	4	**1**	**5**	0	**10**	7	433	**9**	0	449	**14**	**1**	0	0	**15**	
+15 mins.	**2**	**282**	**3**	0	**287**	**5**	0	5	0	10	**19**	509	3	0	531	12	1	2	0	15	
+30 mins.	1	225	2	0	228	0	0	5	0	5	15	**556**	5	**2**	**578**	7	0	1	0	8	
+45 mins.	1	226	2	0	229	1	1	4	0	6	9	444	6	0	459	7	0	**4**	0	11	
Total Volume	5	997	8	0	1010	10	2	19	0	31	50	1942	23	2	2017	40	2	7	0	49	
% App. Total	0.5	98.7	0.8	0		32.3	6.5	61.3	0		2.5	96.3	1.1	0.1		81.6	4.1	14.3	0		
PHF	.625	.884	.667	.000	.880	.500	.500	.950	.000	.775	.658	.873	.639	.250	.872	.714	.500	.438	.000	.817	



L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Comstock
City, State: Richland, Washington
Control: Signalized

File Name : GW and Comstock AM
Site Code : 1
Start Date : 5/23/2012
Page No : 4

Image 1

L2 Data Collection

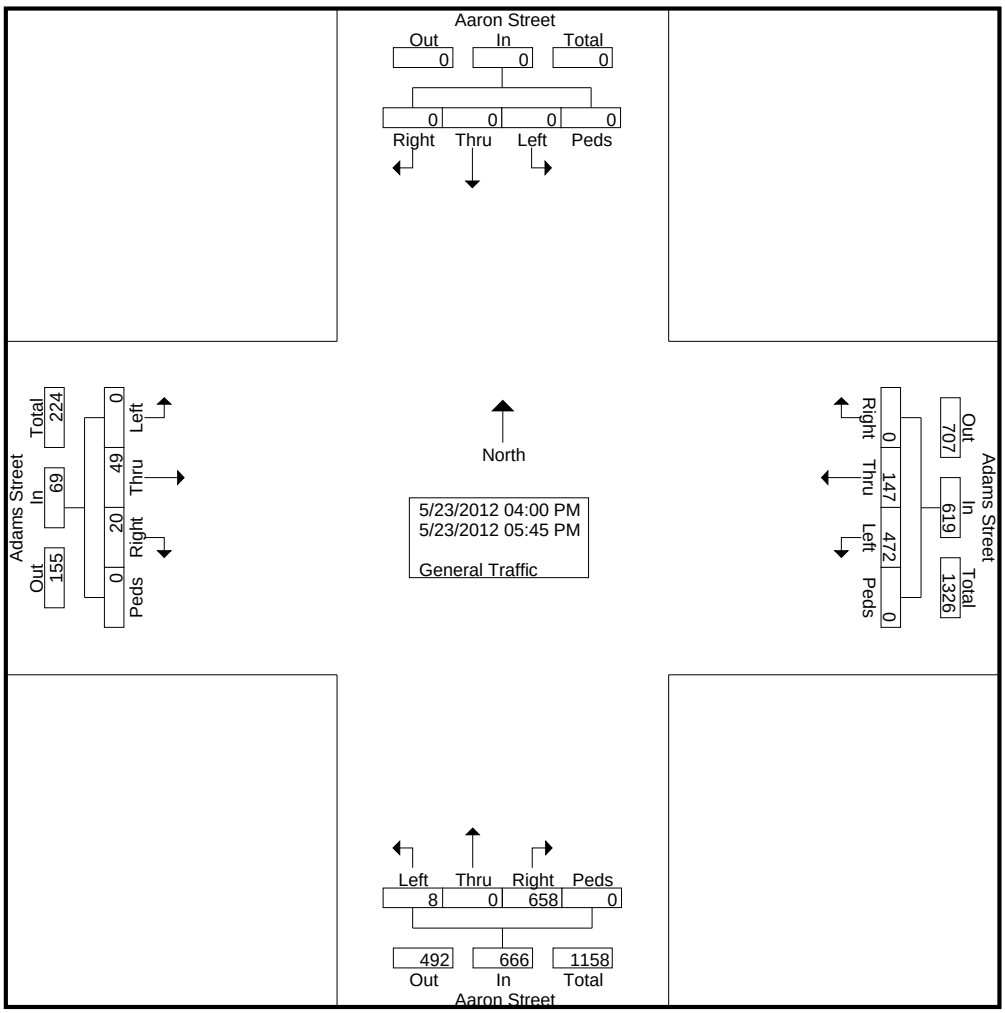
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: Aaron Drive / Adams Street
City, State: Richland, Washington
Control: Stop Sign

File Name : Aaron and Adams PM
Site Code : 3
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	Aaron Street From North					Adams Street From East					Aaron Street From South					Adams Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	0	0	0	0	0	0	14	69	0	83	52	0	2	0	54	0	8	0	0	8	145
04:15 PM	0	0	0	0	0	0	20	60	0	80	74	0	0	0	74	2	5	0	0	7	161
04:30 PM	0	0	0	0	0	0	15	58	0	73	78	0	2	0	80	4	10	0	0	14	167
04:45 PM	0	0	0	0	0	0	21	63	0	84	115	0	0	0	115	4	3	0	0	7	206
Total	0	0	0	0	0	0	70	250	0	320	319	0	4	0	323	10	26	0	0	36	679
05:00 PM	0	0	0	0	0	0	26	44	0	70	133	0	1	0	134	5	2	0	0	7	211
05:15 PM	0	0	0	0	0	0	24	70	0	94	74	0	1	0	75	1	4	0	0	5	174
05:30 PM	0	0	0	0	0	0	14	62	0	76	80	0	2	0	82	4	9	0	0	13	171
05:45 PM	0	0	0	0	0	0	13	46	0	59	52	0	0	0	52	0	8	0	0	8	119
Total	0	0	0	0	0	0	77	222	0	299	339	0	4	0	343	10	23	0	0	33	675
Grand Total	0	0	0	0	0	0	147	472	0	619	658	0	8	0	666	20	49	0	0	69	1354
Apprch %	0	0	0	0		0	23.7	76.3	0		98.8	0	1.2	0		29	71	0	0		
Total %	0	0	0	0	0	0	10.9	34.9	0	45.7	48.6	0	0.6	0	49.2	1.5	3.6	0	0	5.1	



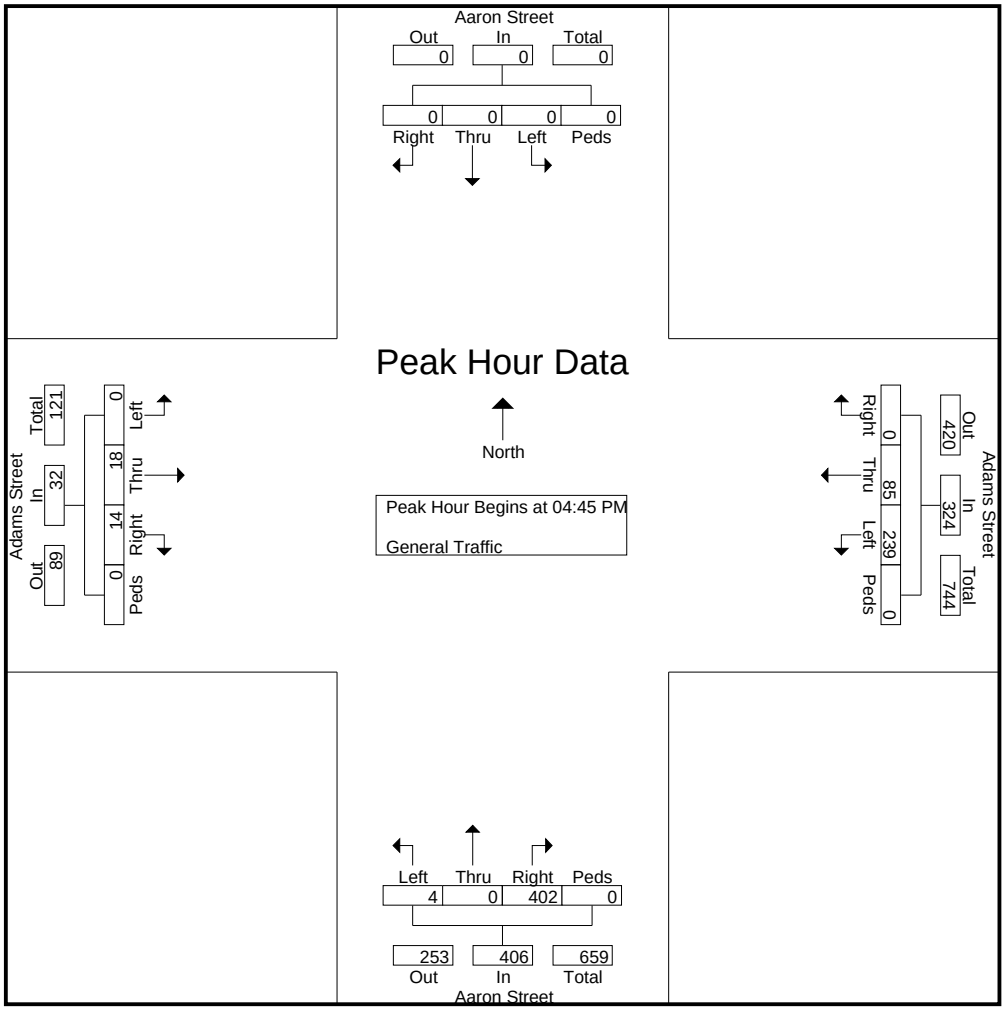
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: Aaron Drive / Adams Street
City, State: Richland, Washington
Control: Stop Sign

File Name : Aaron and Adams PM
Site Code : 3
Start Date : 5/23/2012
Page No : 2

	Aaron Street From North					Adams Street From East					Aaron Street From South					Adams Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	0	21	63	0	84	115	0	0	0	115	4	3	0	0	7	206
05:00 PM	0	0	0	0	0	0	**26**	44	0	70	**133**	0	1	0	**134**	**5**	2	0	0	7	**211**
05:15 PM	0	0	0	0	0	0	24	**70**	0	**94**	74	0	1	0	75	1	4	0	0	5	174
05:30 PM	0	0	0	0	0	0	14	62	0	76	80	0	**2**	0	82	4	**9**	0	0	**13**	171
Total Volume	0	0	0	0	0	0	85	239	0	324	402	0	4	0	406	14	18	0	0	32	762
% App. Total	0	0	0	0		0	26.2	73.8	0		99	0	1	0		43.8	56.2	0	0		
PHF	.000	.000	.000	.000	.000	.000	.817	.854	.000	.862	.756	.000	.500	.000	.757	.700	.500	.000	.000	.615	.903



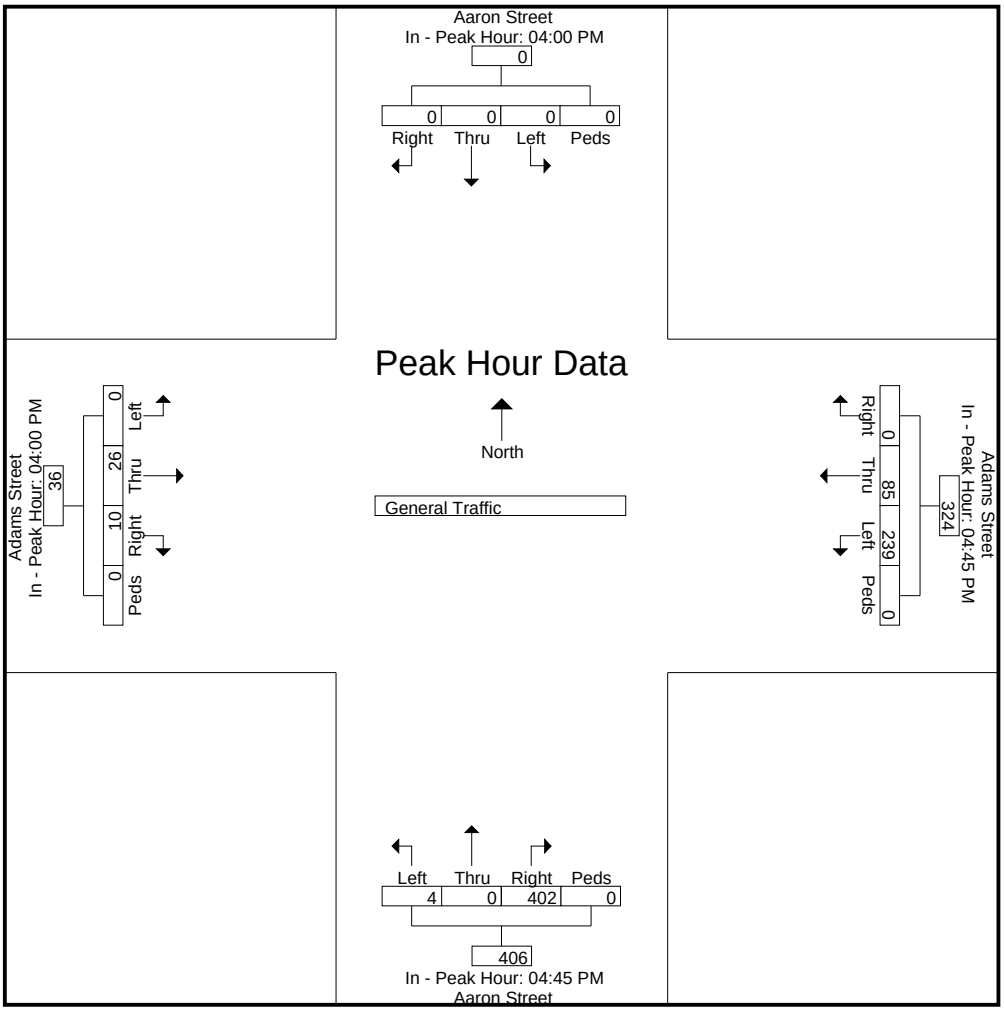
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: Aaron Drive / Adams Street
City, State: Richland, Washington
Control: Stop Sign

File Name : Aaron and Adams PM
Site Code : 3
Start Date : 5/23/2012
Page No : 3

	Aaron Street From North					Adams Street From East					Aaron Street From South					Adams Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	04:00 PM					04:45 PM					04:45 PM					04:00 PM					
+0 mins.	0	0	0	0	0	0	21	63	0	84	115	0	0	0	115	0	8	0	0	8	
+15 mins.	0	0	0	0	0	0	**26**	44	0	70	**133**	0	1	0	**134**	2	5	0	0	7	
+30 mins.	0	0	0	0	0	0	24	**70**	0	**94**	74	0	1	0	75	**4**	**10**	0	0	**14**	
+45 mins.	0	0	0	0	0	0	14	62	0	76	80	0	**2**	0	82	4	3	0	0	7	
Total Volume	0	0	0	0	0	0	85	239	0	324	402	0	4	0	406	10	26	0	0	36	
% App. Total	0	0	0	0		0	26.2	73.8	0		99	0	1	0		27.8	72.2	0	0		
PHF	.000	.000	.000	.000	.000	.000	.817	.854	.000	.862	.756	.000	.500	.000	.757	.625	.650	.000	.000	.643	



L2 Data Collection

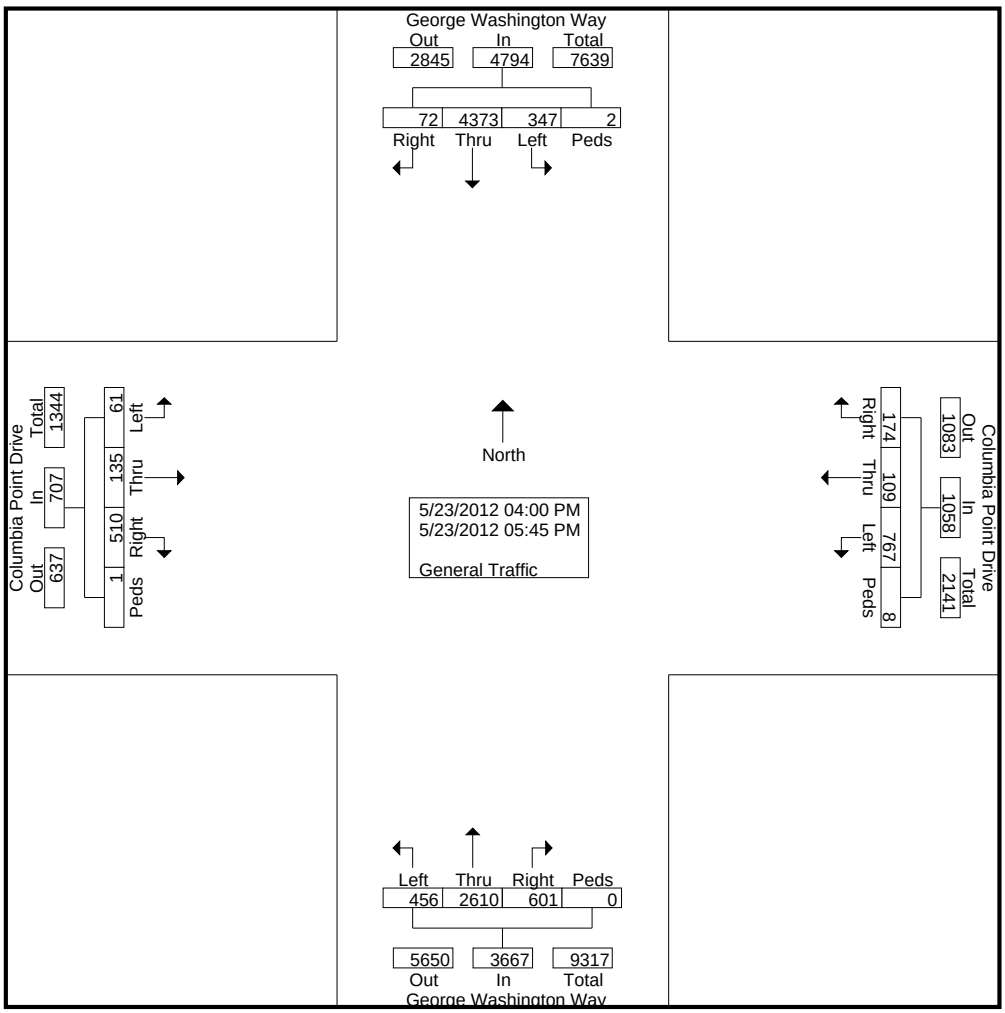
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Columbia
City, State: Richland, Washington
Control: Signalized

File Name : GW and Columbia PM
Site Code : 4
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	George Washington Way From North					Columbia Point Drive From East					George Washington Way From South					Columbia Point Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	10	454	41	2	507	26	14	96	0	136	67	284	51	0	402	44	10	9	0	63	1108
04:15 PM	8	591	54	0	653	22	15	74	3	114	80	302	60	0	442	43	15	10	0	68	1277
04:30 PM	10	589	36	0	635	22	13	98	1	134	74	318	57	0	449	64	21	6	0	91	1309
04:45 PM	7	686	39	0	732	23	17	76	0	116	66	296	49	0	411	78	20	9	0	107	1366
Total	35	2320	170	2	2527	93	59	344	4	500	287	1200	217	0	1704	229	66	34	0	329	5060
05:00 PM	8	636	48	0	692	23	11	108	1	143	67	337	64	0	468	100	19	11	1	131	1434
05:15 PM	9	536	51	0	596	21	14	118	0	153	72	397	78	0	547	65	16	6	0	87	1383
05:30 PM	13	481	48	0	542	16	12	114	2	144	94	342	50	0	486	55	15	6	0	76	1248
05:45 PM	7	400	30	0	437	21	13	83	1	118	81	334	47	0	462	61	19	4	0	84	1101
Total	37	2053	177	0	2267	81	50	423	4	558	314	1410	239	0	1963	281	69	27	1	378	5166
Grand Total	72	4373	347	2	4794	174	109	767	8	1058	601	2610	456	0	3667	510	135	61	1	707	10226
Apprch %	1.5	91.2	7.2	0		16.4	10.3	72.5	0.8		16.4	71.2	12.4	0		72.1	19.1	8.6	0.1		
Total %	0.7	42.8	3.4	0	46.9	1.7	1.1	7.5	0.1	10.3	5.9	25.5	4.5	0	35.9	5	1.3	0.6	0	6.9	



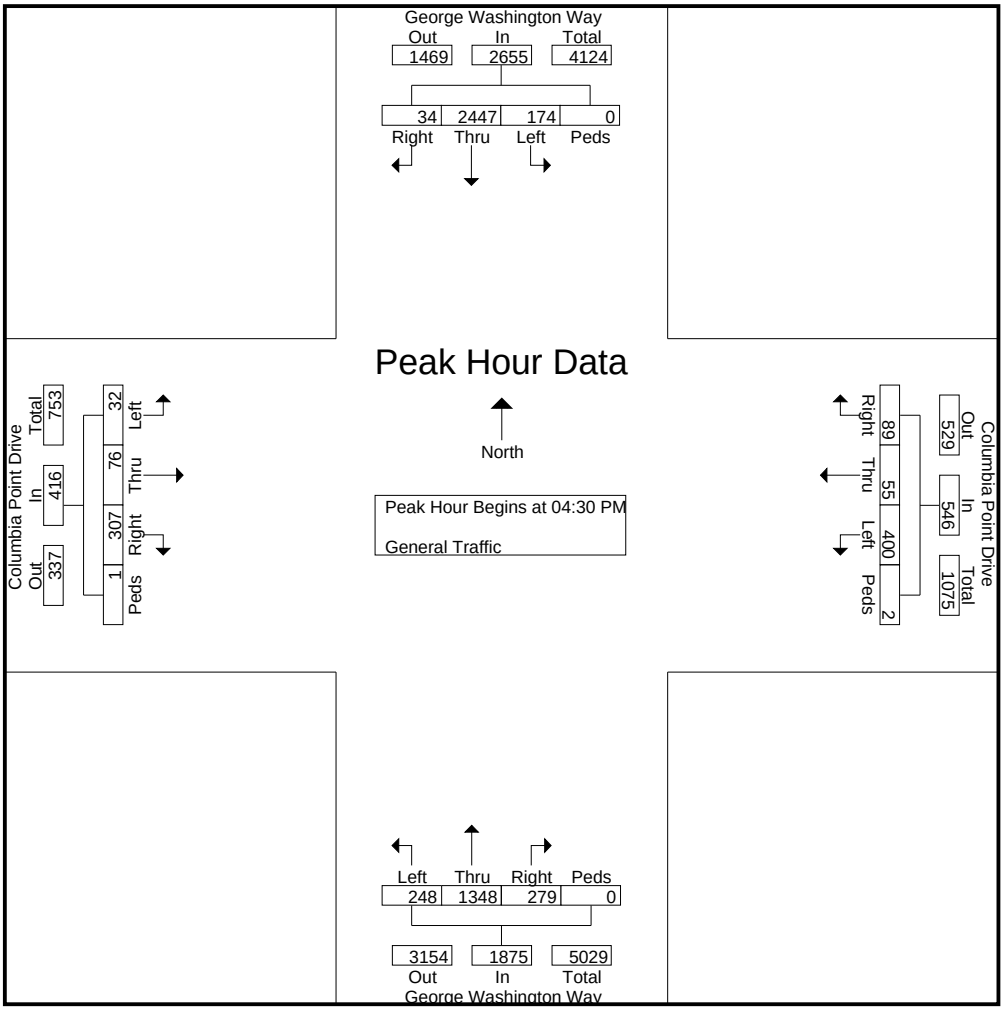
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Columbia
City, State: Richland, Washington
Control: Signalized

File Name : GW and Columbia PM
Site Code : 4
Start Date : 5/23/2012
Page No : 2

	George Washington Way From North					Columbia Point Drive From East					George Washington Way From South					Columbia Point Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	**10**	589	36	0	635	22	13	98	**1**	134	**74**	318	57	0	449	64	**21**	6	0	91	1309
04:45 PM	7	**686**	39	0	**732**	**23**	**17**	76	0	116	66	296	49	0	411	78	20	9	0	107	1366
05:00 PM	8	636	48	0	692	23	11	108	1	143	67	337	64	0	468	**100**	19	**11**	**1**	**131**	**1434**
05:15 PM	9	536	**51**	0	596	21	14	**118**	0	**153**	72	**397**	**78**	0	**547**	65	16	6	0	87	1383
Total Volume	34	2447	174	0	2655	89	55	400	2	546	279	1348	248	0	1875	307	76	32	1	416	5492
% App. Total	1.3	92.2	6.6	0		16.3	10.1	73.3	0.4		14.9	71.9	13.2	0		73.8	18.3	7.7	0.2		
PHF	.850	.892	.853	.000	.907	.967	.809	.847	.500	.892	.943	.849	.795	.000	.857	.768	.905	.727	.250	.794	.957



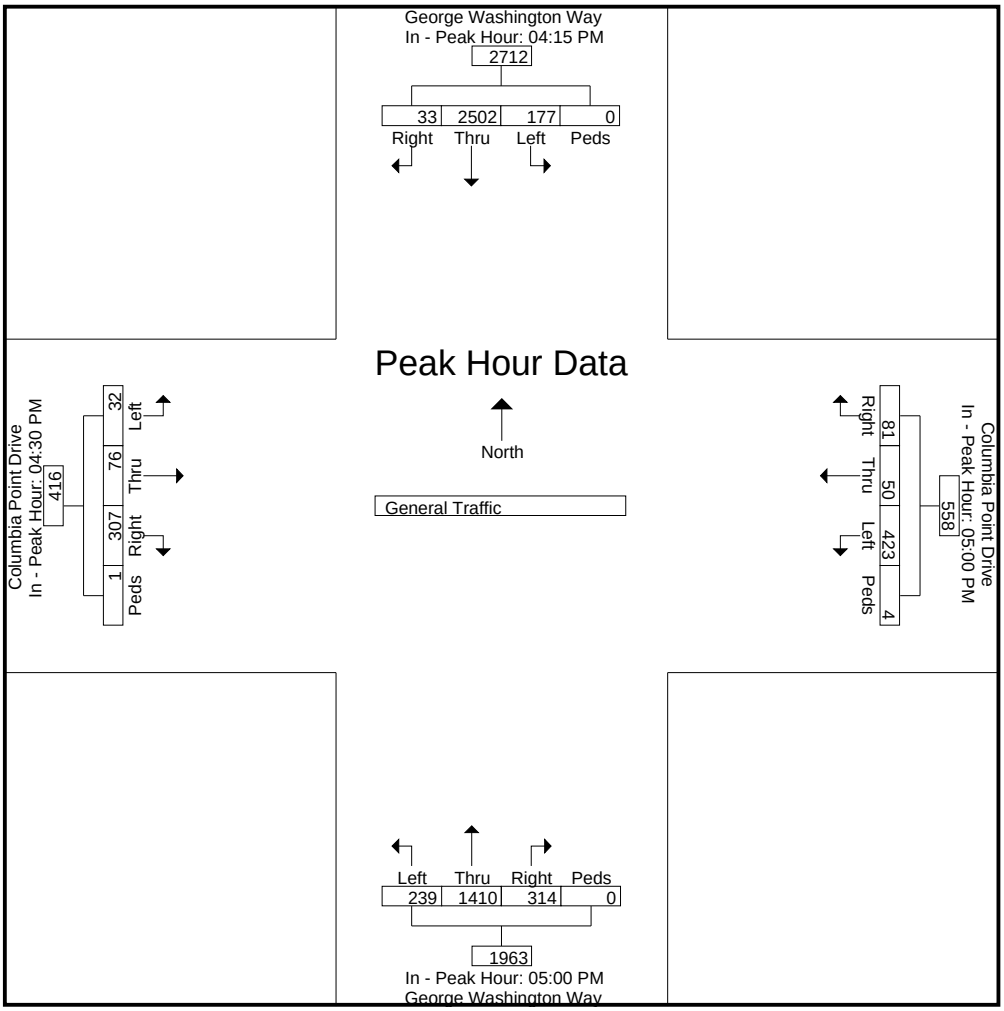
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Columbia
City, State: Richland, Washington
Control: Signalized

File Name : GW and Columbia PM
Site Code : 4
Start Date : 5/23/2012
Page No : 3

	George Washington Way From North					Columbia Point Drive From East					George Washington Way From South					Columbia Point Drive From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	04:15 PM					05:00 PM					05:00 PM					04:30 PM					
+0 mins.	8	591	**54**	0	653	**23**	11	108	1	143	67	337	64	0	468	64	**21**	6	0	91	
+15 mins.	**10**	589	36	0	635	21	**14**	**118**	0	**153**	72	**397**	**78**	0	**547**	78	20	9	0	107	
+30 mins.	7	**686**	39	0	**732**	16	12	114	**2**	144	**94**	342	50	0	486	**100**	19	**11**	**1**	**131**	
+45 mins.	8	636	48	0	692	21	13	83	1	118	81	334	47	0	462	65	16	6	0	87	
Total Volume	33	2502	177	0	2712	81	50	423	4	558	314	1410	239	0	1963	307	76	32	1	416	
% App. Total	1.2	92.3	6.5	0		14.5	9	75.8	0.7		16	71.8	12.2	0		73.8	18.3	7.7	0.2		
PHF	.825	.912	.819	.000	.926	.880	.893	.896	.500	.912	.835	.888	.766	.000	.897	.768	.905	.727	.250	.794	



L2 Data Collection

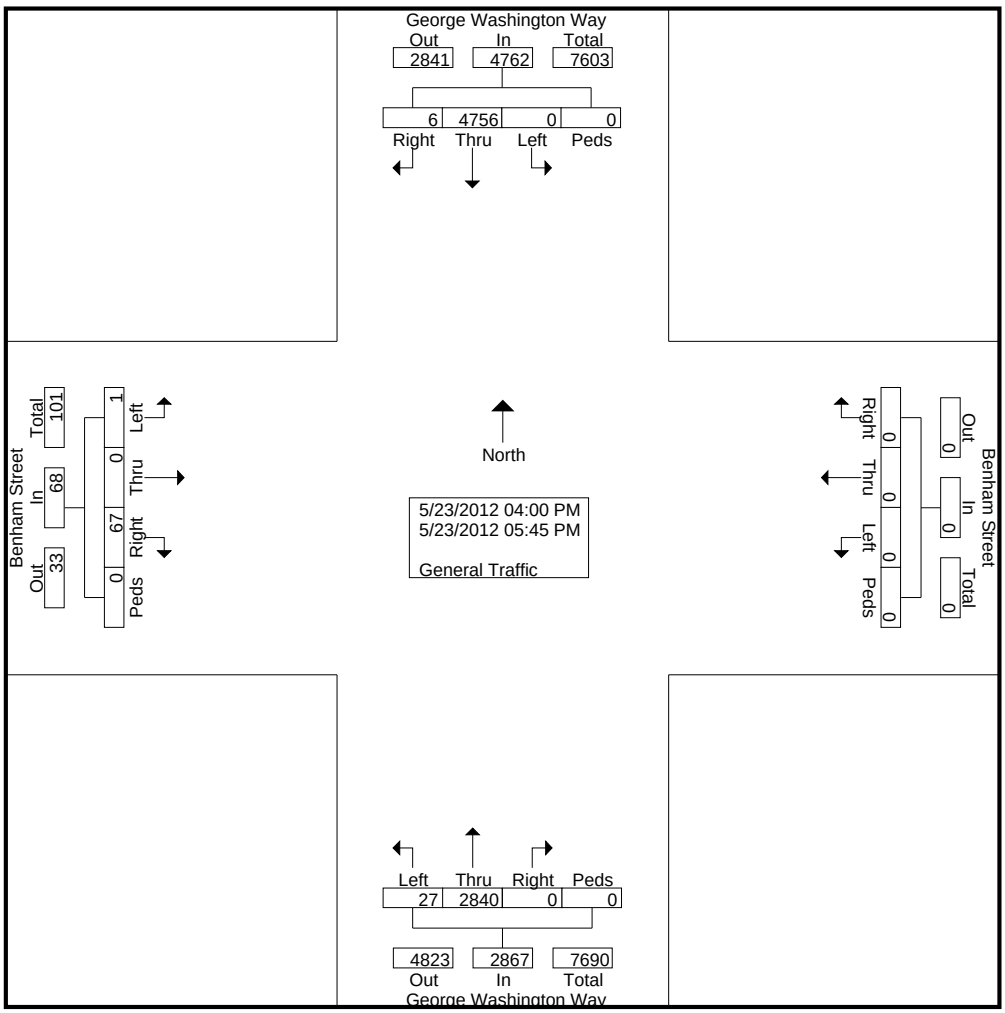
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: George Washington / Benham
City, State: Richland, Washington
Control: Stop Sign

File Name : GW and Benham PM
Site Code : 2
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	George Washington Way From North					Benham Street From East					George Washington Way From South					Benham Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	0	530	0	0	530	0	0	0	0	0	0	325	2	0	327	3	0	1	0	4	861
04:15 PM	0	631	0	0	631	0	0	0	0	0	0	344	3	0	347	6	0	0	0	6	984
04:30 PM	0	650	0	0	650	0	0	0	0	0	0	347	3	0	350	11	0	0	0	11	1011
04:45 PM	1	730	0	0	731	0	0	0	0	0	0	324	3	0	327	10	0	0	0	10	1068
Total	1	2541	0	0	2542	0	0	0	0	0	0	1340	11	0	1351	30	0	1	0	31	3924
05:00 PM	1	678	0	0	679	0	0	0	0	0	0	370	2	0	372	11	0	0	0	11	1062
05:15 PM	1	601	0	0	602	0	0	0	0	0	0	422	4	0	426	6	0	0	0	6	1034
05:30 PM	3	514	0	0	517	0	0	0	0	0	0	375	4	0	379	14	0	0	0	14	910
05:45 PM	0	422	0	0	422	0	0	0	0	0	0	333	6	0	339	6	0	0	0	6	767
Total	5	2215	0	0	2220	0	0	0	0	0	0	1500	16	0	1516	37	0	0	0	37	3773
Grand Total	6	4756	0	0	4762	0	0	0	0	0	0	2840	27	0	2867	67	0	1	0	68	7697
Apprch %	0.1	99.9	0	0		0	0	0	0		0	99.1	0.9	0		98.5	0	1.5	0		
Total %	0.1	61.8	0	0	61.9	0	0	0	0	0	0	36.9	0.4	0	37.2	0.9	0	0	0	0.9	



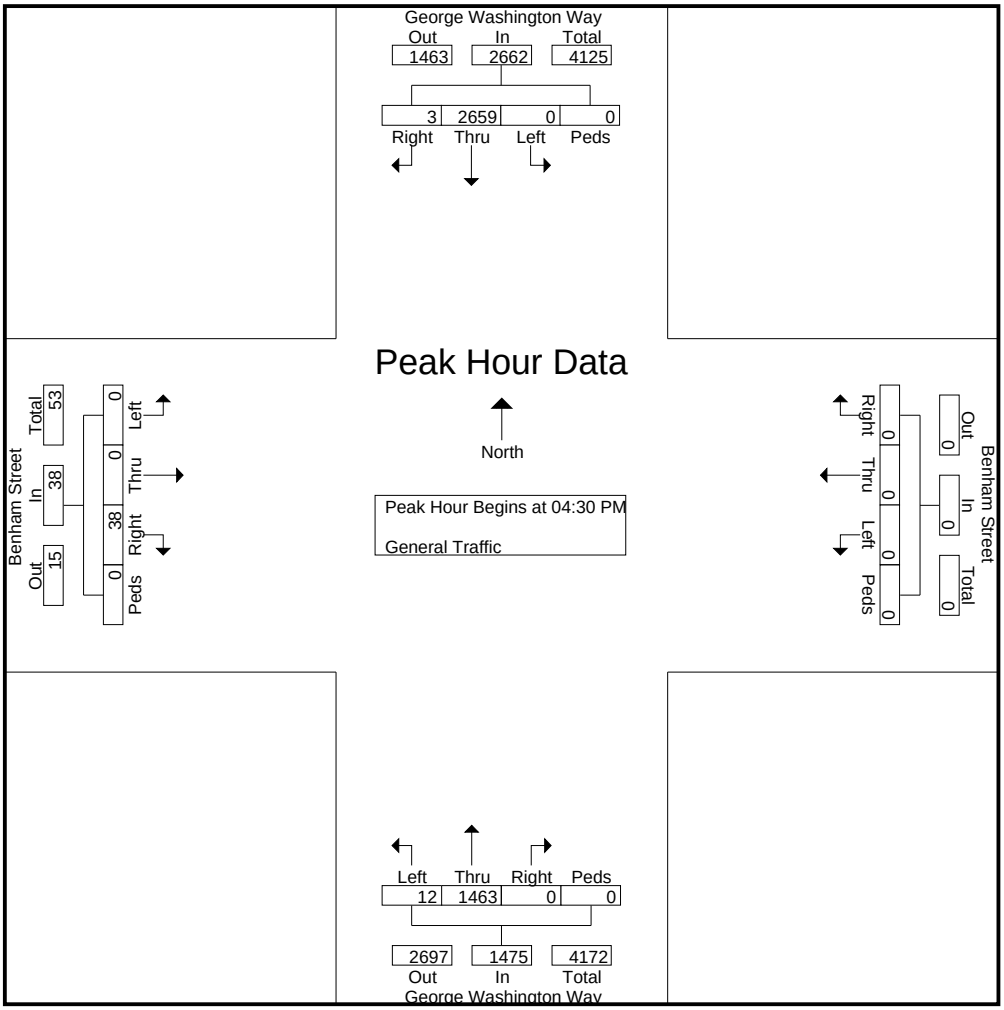
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: George Washington / Benham
City, State: Richland, Washington
Control: Stop Sign

File Name : GW and Benham PM
Site Code : 2
Start Date : 5/23/2012
Page No : 2

	George Washington Way From North					Benham Street From East					George Washington Way From South					Benham Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	650	0	0	650	0	0	0	0	0	0	347	3	0	350	**11**	0	0	0	**11**	1011
04:45 PM	**1**	**730**	0	0	**731**	0	0	0	0	0	0	324	3	0	327	10	0	0	0	10	**1068**
05:00 PM	1	678	0	0	679	0	0	0	0	0	0	370	2	0	372	11	0	0	0	11	1062
05:15 PM	1	601	0	0	602	0	0	0	0	0	0	**422**	**4**	0	**426**	6	0	0	0	6	1034
Total Volume	3	2659	0	0	2662	0	0	0	0	0	0	1463	12	0	1475	38	0	0	0	38	4175
% App. Total	0.1	99.9	0	0		0	0	0	0		0	99.2	0.8	0		100	0	0	0		
PHF	.750	.911	.000	.000	.910	.000	.000	.000	.000	.000	.000	.867	.750	.000	.866	.864	.000	.000	.000	.864	.977



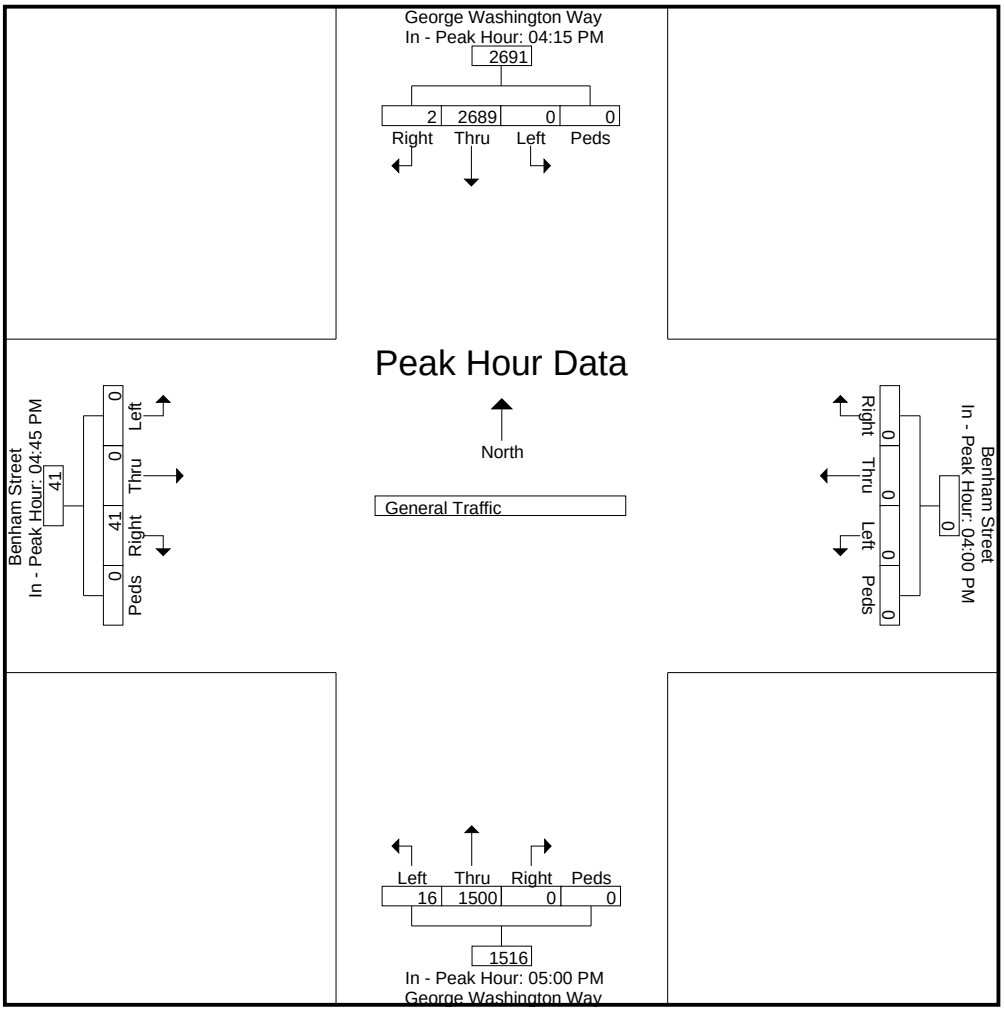
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: George Washington / Benham
City, State: Richland, Washington
Control: Stop Sign

File Name : GW and Benham PM
Site Code : 2
Start Date : 5/23/2012
Page No : 3

	George Washington Way From North					Benham Street From East					George Washington Way From South					Benham Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	04:15 PM					04:00 PM					05:00 PM					04:45 PM					
+0 mins.	0	631	0	0	631	0	0	0	0	0	0	370	2	0	372	10	0	0	0	10	
+15 mins.	0	650	0	0	650	0	0	0	0	0	0	**422**	4	0	**426**	11	0	0	0	11	
+30 mins.	**1**	**730**	0	0	**731**	0	0	0	0	0	0	375	4	0	379	6	0	0	0	6	
+45 mins.	1	678	0	0	679	0	0	0	0	0	0	333	**6**	0	339	**14**	0	0	0	**14**	
Total Volume	2	2689	0	0	2691	0	0	0	0	0	0	1500	16	0	1516	41	0	0	0	41	
% App. Total	0.1	99.9	0	0		0	0	0	0		0	98.9	1.1	0		100	0	0	0		
PHF	.500	.921	.000	.000	.920	.000	.000	.000	.000	.000	.000	.889	.667	.000	.890	.732	.000	.000	.000	.732	



L2 Data Collection

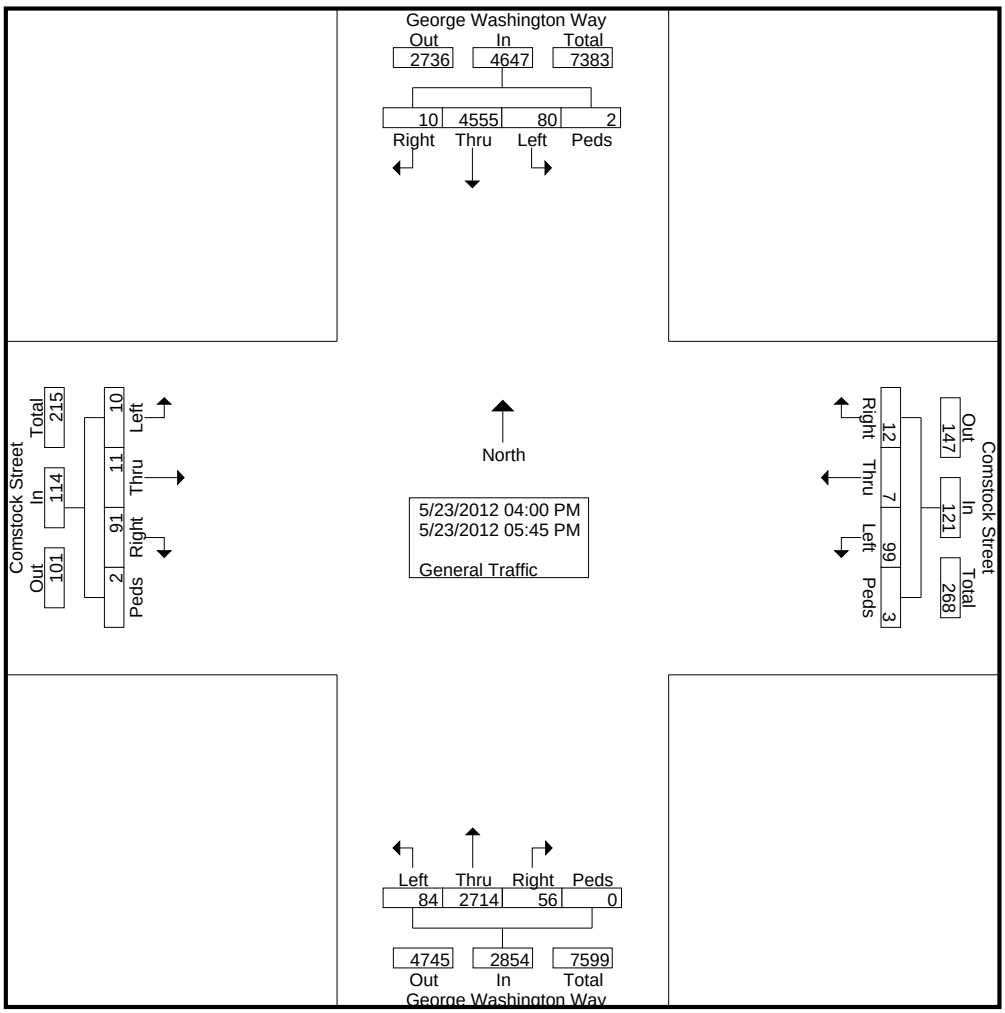
www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Comstock
City, State: Richland, Washington
Control: Signalized

File Name : GW and Comstock PM
Site Code : 1
Start Date : 5/23/2012
Page No : 1

Groups Printed- General Traffic

	George Washington Way From North					Comstock Street From East					George Washington Way From South					Comstock Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	1	515	8	0	524	2	1	11	1	15	8	312	8	0	328	10	1	1	1	13	880
04:15 PM	0	608	6	0	614	0	1	9	1	11	8	337	11	0	356	10	0	1	0	11	992
04:30 PM	1	663	10	0	674	3	1	18	0	22	9	333	8	0	350	13	0	1	0	14	1060
04:45 PM	2	718	18	1	739	0	1	9	0	10	8	316	10	0	334	15	2	1	0	18	1101
Total	4	2504	42	1	2551	5	4	47	2	58	33	1298	37	0	1368	48	3	4	1	56	4033
05:00 PM	0	627	11	1	639	4	1	20	0	25	4	355	14	0	373	10	2	2	1	15	1052
05:15 PM	3	569	17	0	589	2	2	11	0	15	7	402	12	0	421	16	2	1	0	19	1044
05:30 PM	2	497	8	0	507	1	0	11	0	12	8	379	11	0	398	9	2	1	0	12	929
05:45 PM	1	358	2	0	361	0	0	10	1	11	4	280	10	0	294	8	2	2	0	12	678
Total	6	2051	38	1	2096	7	3	52	1	63	23	1416	47	0	1486	43	8	6	1	58	3703
Grand Total	10	4555	80	2	4647	12	7	99	3	121	56	2714	84	0	2854	91	11	10	2	114	7736
Apprch %	0.2	98	1.7	0		9.9	5.8	81.8	2.5		2	95.1	2.9	0		79.8	9.6	8.8	1.8		
Total %	0.1	58.9	1	0	60.1	0.2	0.1	1.3	0	1.6	0.7	35.1	1.1	0	36.9	1.2	0.1	0.1	0	1.5	



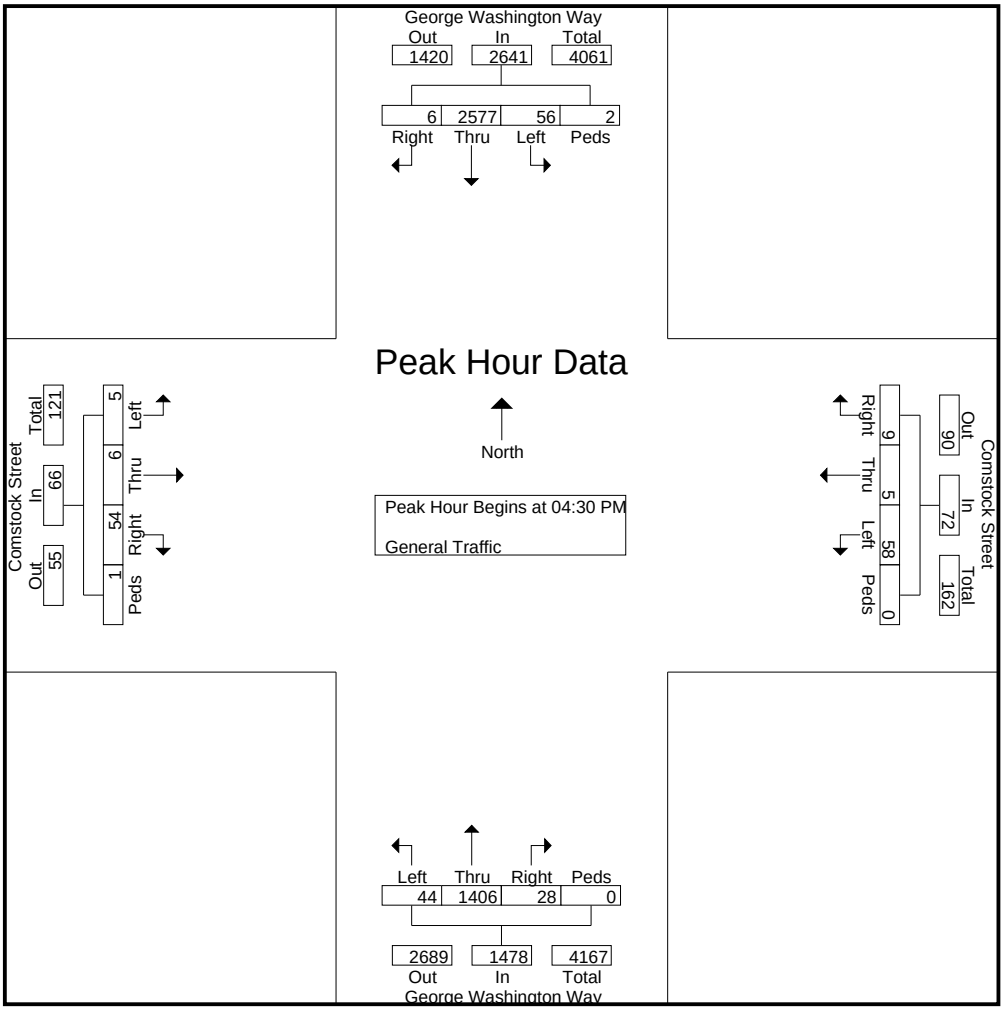
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Comstock
City, State: Richland, Washington
Control: Signalized

File Name : GW and Comstock PM
Site Code : 1
Start Date : 5/23/2012
Page No : 2

	George Washington Way From North					Comstock Street From East					George Washington Way From South					Comstock Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	1	663	10	0	674	3	1	18	0	22	**9**	333	8	0	350	13	0	1	0	14	1060
04:45 PM	2	**718**	**18**	**1**	**739**	0	1	9	0	10	8	316	10	0	334	15	**2**	1	0	18	**1101**
05:00 PM	0	627	11	1	639	**4**	1	**20**	0	**25**	4	355	**14**	0	373	10	2	**2**	**1**	15	1052
05:15 PM	**3**	569	17	0	589	2	**2**	11	0	15	7	**402**	12	0	**421**	**16**	2	1	0	**19**	1044
Total Volume	6	2577	56	2	2641	9	5	58	0	72	28	1406	44	0	1478	54	6	5	1	66	4257
% App. Total	0.2	97.6	2.1	0.1		12.5	6.9	80.6	0		1.9	95.1	3	0		81.8	9.1	7.6	1.5		
PHF	.500	.897	.778	.500	.893	.563	.625	.725	.000	.720	.778	.874	.786	.000	.878	.844	.750	.625	.250	.868	.967



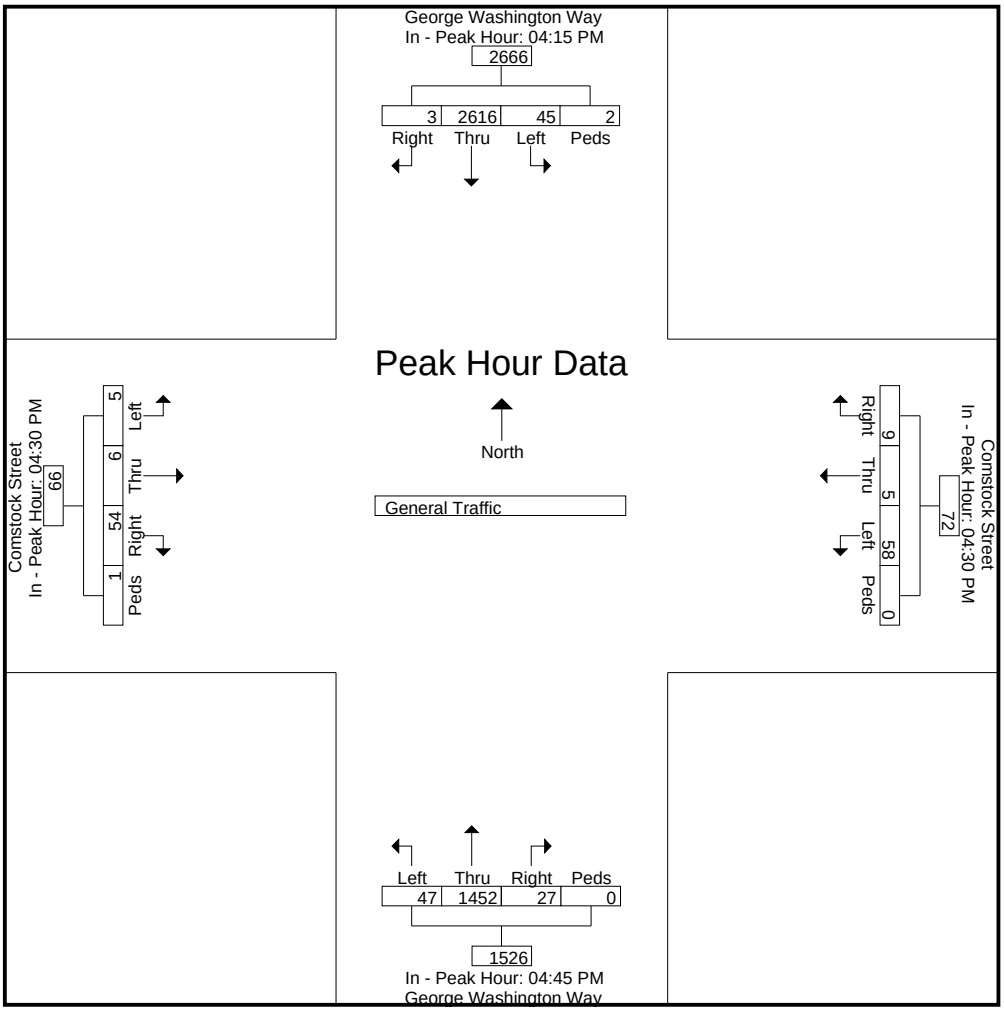
L2 Data Collection

www.L2DataCollection.com
Idaho (208) 860-7554 Utah (801) 413-2993

Project: JUB0030
Intersection: G. Washington / Comstock
City, State: Richland, Washington
Control: Signalized

File Name : GW and Comstock PM
Site Code : 1
Start Date : 5/23/2012
Page No : 3

	George Washington Way From North					Comstock Street From East					George Washington Way From South					Comstock Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	04:15 PM					04:30 PM					04:45 PM					04:30 PM					
+0 mins.	0	608	6	0	614	3	1	18	0	22	**8**	316	10	0	334	13	0	1	0	14	
+15 mins.	1	663	10	0	674	0	1	9	0	10	4	355	**14**	0	373	15	**2**	1	0	18	
+30 mins.	**2**	**718**	**18**	**1**	**739**	**4**	1	**20**	0	**25**	7	**402**	12	0	**421**	10	2	**2**	**1**	15	
+45 mins.	0	627	11	1	639	2	**2**	11	0	15	8	379	11	0	398	**16**	2	1	0	**19**	
Total Volume	3	2616	45	2	2666	9	5	58	0	72	27	1452	47	0	1526	54	6	5	1	66	
% App. Total	0.1	98.1	1.7	0.1		12.5	6.9	80.6	0		1.8	95.2	3.1	0		81.8	9.1	7.6	1.5		
PHF	.375	.911	.625	.500	.902	.563	.625	.725	.000	.720	.844	.903	.839	.000	.906	.844	.750	.625	.250	.868	



Appendix B

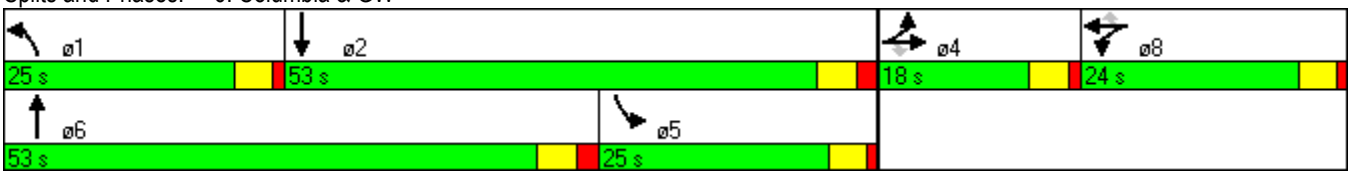
Level of Service Worksheets for Existing and 2032 No-Build Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	36	108	159	23	88	126	1914	232	100	970	12
Satd. Flow (prot)	0	1827	1583	1681	1711	1583	1770	5085	1583	1770	5070	0
Flt Permitted		0.981		0.950	0.967		0.950			0.950		
Satd. Flow (perm)	0	1827	1583	1681	1711	1583	1770	5085	1583	1770	5070	0
Satd. Flow (RTOR)			144			107			101		3	
Lane Group Flow (vph)	0	92	144	102	103	107	156	2252	252	116	1193	0
Turn Type	Split		Perm	Split		Perm	Prot		Free	Prot		
Protected Phases	4	4		8	8		1	6		5	2	
Permitted Phases			4			8			Free			
Total Split (s)	18.0	18.0	18.0	24.0	24.0	24.0	25.0	53.0	0.0	25.0	53.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	4.0	4.5	5.5	4.0
Act Effct Green (s)		10.9	10.9	12.8	12.8	12.8	15.8	56.8	120.0	20.5	61.5	
Actuated g/C Ratio		0.09	0.09	0.11	0.11	0.11	0.13	0.47	1.00	0.17	0.51	
v/c Ratio		0.55	0.52	0.57	0.57	0.41	0.67	0.94	0.16	0.38	0.46	
Control Delay		64.3	15.2	62.6	62.2	13.4	63.1	39.4	0.2	44.6	18.3	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		64.3	15.2	62.6	62.2	13.4	63.1	39.4	0.2	44.6	18.3	
LOS		E	B	E	E	B	E	D	A	D	B	
Approach Delay		34.3			45.6			37.1			20.6	
Approach LOS		C			D			D			C	
Queue Length 50th (ft)		69	0	81	81	0	117	591	0	81	197	
Queue Length 95th (ft)		85	32	135	106	39	160	#736	0	129	216	
Internal Link Dist (ft)		524			494			597			1251	
Turn Bay Length (ft)												
Base Capacity (vph)		206	306	273	278	347	305	2407	1583	302	2600	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio		0.45	0.47	0.37	0.37	0.31	0.51	0.94	0.16	0.38	0.46	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 32.8 Intersection LOS: C
Intersection Capacity Utilization 66.3% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Columbia & GW



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	32	76	307	400	55	89	248	1348	279	174	2447	34
Satd. Flow (prot)	0	1831	1583	1681	1706	1583	1770	5085	1583	1770	5075	0
Flt Permitted		0.983		0.950	0.964		0.950			0.950		
Satd. Flow (perm)	0	1831	1583	1681	1706	1583	1770	5085	1583	1770	5075	0
Satd. Flow (RTOR)			277			92			242		2	
Lane Group Flow (vph)	0	128	399	268	271	92	310	1586	297	205	2789	0
Turn Type	Split		Perm	Split		Perm	Prot		Free	Prot		
Protected Phases	4	4		8	8		1	6		5	2	
Permitted Phases			4			8			Free			
Total Split (s)	22.0	22.0	22.0	30.0	30.0	30.0	34.0	80.0	0.0	28.0	74.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	4.0	4.5	5.5	4.0
Act Effct Green (s)		16.4	16.4	26.5	26.5	26.5	29.2	74.5	160.0	23.5	68.8	
Actuated g/C Ratio		0.10	0.10	0.17	0.17	0.17	0.18	0.47	1.00	0.15	0.43	
v/c Ratio		0.68	0.97	0.96	0.96	0.27	0.96	0.67	0.19	0.79	1.28	
Control Delay		87.5	58.3	110.0	108.9	12.4	104.6	34.9	0.3	87.1	166.4	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		87.5	58.3	110.0	108.9	12.4	104.6	34.9	0.3	87.1	166.4	
LOS		F	E	F	F	B	F	C	A	F	F	
Approach Delay		65.4			95.3			40.1			161.0	
Approach LOS		E			F			D			F	
Queue Length 50th (ft)		131	139	~300	303	0	325	466	0	210	~1357	
Queue Length 95th (ft)		206	#197	#463	#426	54	#422	477	0	#301	#1405	
Internal Link Dist (ft)		524			494			597			1251	
Turn Bay Length (ft)									500			
Base Capacity (vph)		200	420	279	283	339	326	2369	1583	260	2184	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio		0.64	0.95	0.96	0.96	0.27	0.95	0.67	0.19	0.79	1.28	

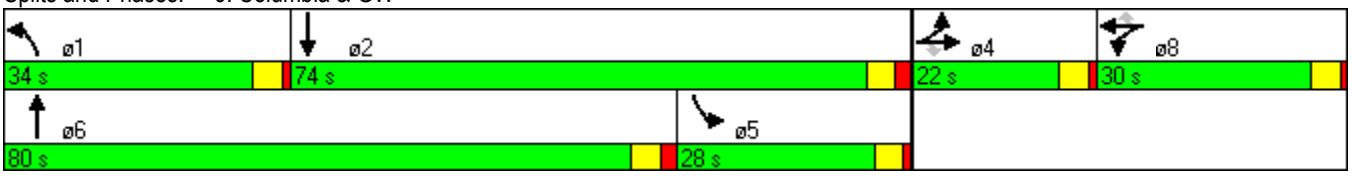
Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 120 (75%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.28
Intersection Signal Delay: 104.7 Intersection LOS: F
Intersection Capacity Utilization 93.0% ICU Level of Service F
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Columbia & GW

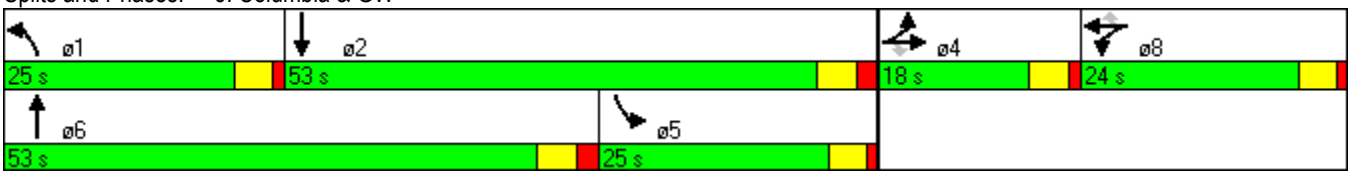


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	40	130	230	30	130	150	2560	290	120	1200	20
Satd. Flow (prot)	0	1829	1583	1681	1709	1583	1770	5085	1583	1770	5065	0
Flt Permitted		0.982		0.950	0.966		0.950			0.950		
Satd. Flow (perm)	0	1829	1583	1681	1709	1583	1770	5085	1583	1770	5065	0
Satd. Flow (RTOR)			173			159			94		4	
Lane Group Flow (vph)	0	98	173	145	147	159	185	3012	315	140	1486	0
Turn Type	Split		Perm	Split		Perm	Prot		Free	Prot		
Protected Phases	4	4		8	8		1	6		5	2	
Permitted Phases			4			8			Free			
Total Split (s)	18.0	18.0	18.0	24.0	24.0	24.0	25.0	53.0	0.0	25.0	53.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	4.0	4.5	5.5	4.0
Act Effct Green (s)		11.2	11.2	15.4	15.4	15.4	17.0	54.0	120.0	20.5	57.4	
Actuated g/C Ratio		0.09	0.09	0.13	0.13	0.13	0.14	0.45	1.00	0.17	0.48	
v/c Ratio		0.58	0.57	0.67	0.67	0.47	0.74	1.32	0.20	0.46	0.61	
Control Delay		65.2	15.0	64.8	64.5	11.5	66.5	175.8	0.3	45.0	21.7	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		65.2	15.0	64.8	64.5	11.5	66.5	175.8	0.3	45.0	21.7	
LOS		E	B	E	E	B	E	F	A	D	C	
Approach Delay		33.2			45.9			154.3			23.7	
Approach LOS		C			D			F			C	
Queue Length 50th (ft)		74	0	113	115	0	138	~1112	0	99	257	
Queue Length 95th (ft)		90	33	182	142	44	188	#1165	0	150	271	
Internal Link Dist (ft)		524			494			597			1251	
Turn Bay Length (ft)												
Base Capacity (vph)		206	332	273	278	390	302	2286	1583	302	2426	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio		0.48	0.52	0.53	0.53	0.41	0.61	1.32	0.20	0.46	0.61	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.32
Intersection Signal Delay: 104.1 Intersection LOS: F
Intersection Capacity Utilization 82.0% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Columbia & GW

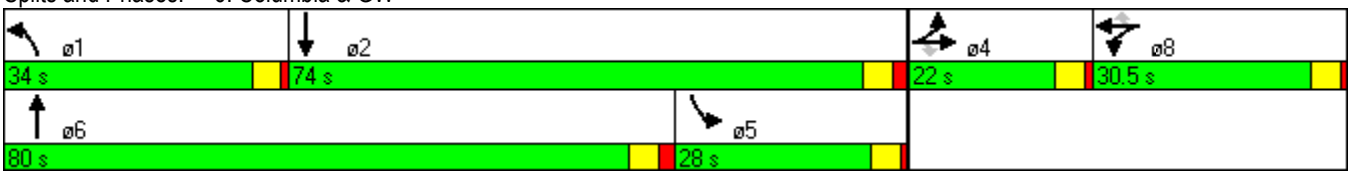


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	80	340	490	70	110	280	1570	310	190	2740	40
Satd. Flow (prot)	0	1827	1583	1681	1706	1583	1770	5085	1583	1770	5075	0
Flt Permitted		0.981		0.950	0.964		0.950			0.950		
Satd. Flow (perm)	0	1827	1583	1681	1706	1583	1770	5085	1583	1770	5075	0
Satd. Flow (RTOR)			273			100			142		2	
Lane Group Flow (vph)	0	143	442	328	334	113	350	1847	330	224	3126	0
Turn Type	Split		Perm	Split		Perm	Prot		Free	Prot		
Protected Phases	4	4		8	8		1	6		5	2	
Permitted Phases			4			8			Free			
Total Split (s)	22.0	22.0	22.0	30.5	30.5	30.5	34.0	80.0	0.0	28.0	74.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	4.0	4.5	5.5	4.0
Act Effct Green (s)		17.5	17.5	26.0	26.0	26.0	29.5	74.5	160.5	23.5	68.5	
Actuated g/C Ratio		0.11	0.11	0.16	0.16	0.16	0.18	0.46	1.00	0.15	0.43	
v/c Ratio		0.72	1.06	1.21	1.21	0.33	1.08	0.78	0.21	0.86	1.44	
Control Delay		89.3	86.0	176.3	177.4	16.1	131.4	39.1	0.3	96.4	236.6	
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay		89.3	86.0	176.3	177.4	16.1	131.4	39.1	0.3	96.4	236.6	
LOS		F	F	F	F	B	F	D	A	F	F	
Approach Delay		86.8			153.4			46.8			227.3	
Approach LOS		F			F			D			F	
Queue Length 50th (ft)		148	~239	~438	~448	12	~407	590	0	233	~1635	
Queue Length 95th (ft)		#244	#294	#602	#567	72	#510	594	0	#349	#1671	
Internal Link Dist (ft)		524			494			597			1251	
Turn Bay Length (ft)				300			300		300	300		
Base Capacity (vph)		199	416	272	276	340	325	2360	1583	259	2167	
Starvation Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn		0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio		0.72	1.06	1.21	1.21	0.33	1.08	0.78	0.21	0.86	1.44	

Intersection Summary

Cycle Length: 160.5
Actuated Cycle Length: 160.5
Offset: 120 (75%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.44
Intersection Signal Delay: 145.0 Intersection LOS: F
Intersection Capacity Utilization 103.5% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Columbia & GW



Appendix C

Initial Alternatives Considered

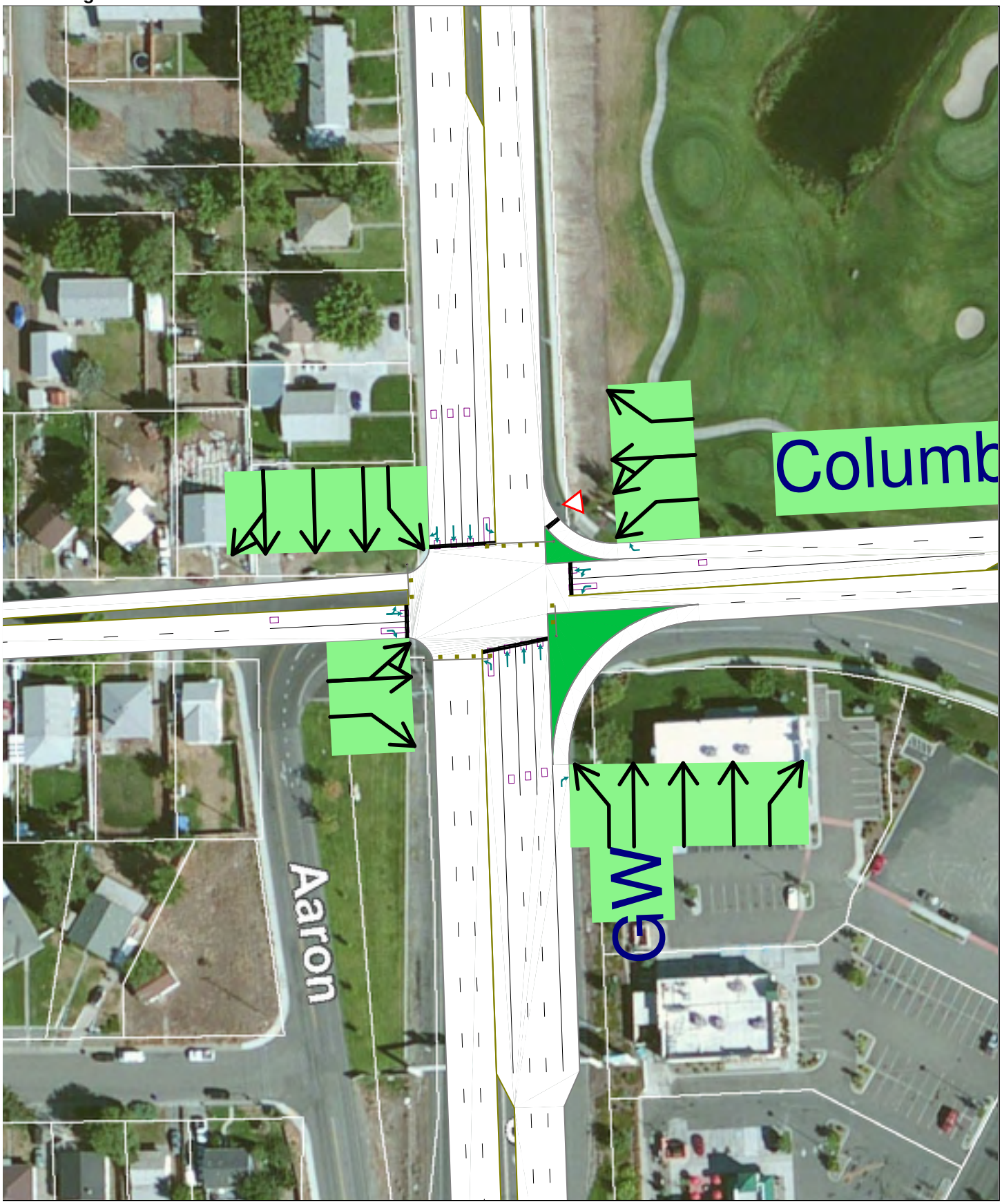
George Washington Way/ Columbia Point Intersection Study
Potential Alternatives Considered

No.	Alternative	Descriptions	Follow-up Comments /Cons
1	No-Build	Leaves all existing lanes as they are today	Does not meet acceptable Levels of Service
2	Add Lanes	Widen pavement for adding 1 SBT lane and various turn lanes.	Possibly need to realign George Washington Way.
3	Separate T-intersections	Close Adams St. leg at GW/Columbia Ct. intersection and move Adams St. Leg's traffic to Abbot St. leg with new T-intersection.	Need to check available NBL storage length. Need to check allowable access spacing from the closest freeway and whether WS DOT would accept this spacing.
4	Regular Continuous Flow Intersection	Add new intersections north and south for GWW left turns to occur prior Columbia Point Drive. Add 2 left turn lanes and signals for each new direction.	Possibly need to realign Geoge Washington Way. Need to move Aaron Dr. corridor westwards. Possibly need additiona right of way (take some house properties).
5	Thru U-Turn	Add Thru U-turn movement on north and south leg and eliminate NB left & SB left turn movement @ George Washington Way/Columbia Pt.	Need to check allowable access spacing from the closest freeway.
6	CFI @ SB Leg & Roundabout @ Columbia Pt/shopping access	Widen pavement for adding 1 SBT lane. Add CFI leg for SBL movement. Add roundabout at the first driveway on Columbia Pt. (Divert NBL as right turns followed by u-turn at RBT followed by WB thru).	Possibly need to realign George Washington Way. Possibly need additional right of way.
7	Thru U-Turn Intersections with no left turns at main interseciton	Similar to Alt 5, but also has east - west left turns make right turns and then U-Turns	Still has side street left turns.
8	High-T & Thru U-Turn	Adding U-turn movement on north leg & separate WBL for GW & SR-240	Possibly need additional right of way for the U-turn.
9	CFI/Thru-U to North with Roundabout at shopping	Removes all left turns from main intersection	
10	Hamburger Roundabout	Adding roundabout for minor streets around major streets.	Possibly need additional right of way (take some house properties).
11	CFI @ SB Leg & New LT Intersection	Add CFI leg for SBL movement. Add new intersection for NBL by moving LT movement from Adams St. to Abbot St.	Need to check available NBL storage length. Need to check allowable access spacing from the closest freeway and whether WS DOT would accept this spacing. Geometric Challenges
12	Roundabout @ Major Intersection	Add roundabout at the major intersection (approximately 4 laned roundabout)	Geometrics potentially too big for the intersections, might require significant right of way, & possibly eliminate several houses.
13	Roundabout U-Turn	Adding roundabouts on Columbia Pt. and Adams St. for diverted major street left turns	Mixing thru traffic from arterial road with residential traffic on residential road is undesirable. Potential neighborhood opposition.
14	High-T Intersection	Close Adams St. Leg from the intersection	One leg is eliminated. Significant weaving on ramp due to traffic from Columbia Pt.
15	Quadrant Left	Divert SBL traffic through residential area.	Mixing thru traffic from arterial road with residential traffic on residential road is undesirable. Possible neighborhood opposition.
16	Reversible Lane on GW	Convert middle lane into reversible lane	Downstream intersection is needed to inform traffic where to start/stop the reversible lane.
17	Center Exit Interchange	George Washington Way would be an overpass roadway and with center exit interchange.	Potential structure/access problem with residential and commercial on minor streets. The ramp would possibly be too long and too close to SR-240 structures.
18	Center Turn Overpass	Raise all left turn movement to overpass and add traffic light on the overpass intersection.	Potential structure/access problem with residential and commercial on minor streets. The ramp would possibly be too long and too close to SR-240 structures. Difficult grade transition on minor streets.
19	Echelon Overpass	Raise north leg GW and Adams St. to overpass (having 2 intersections, one on the overpass and one at-grade)	Possible structure/access problem with residential and commercial on minor streets. The ramp would possibly be too long and too close to SR-240 structures.

APPENDIX D

Synchro Diagram of 9 Alternatives
Summary of LOS and Queue lengths of 9 Alternatives
Detailed Alternative Descriptions and Pros and Cons

ALT 1 No Build
Lane Diagrams **8/14/2012**



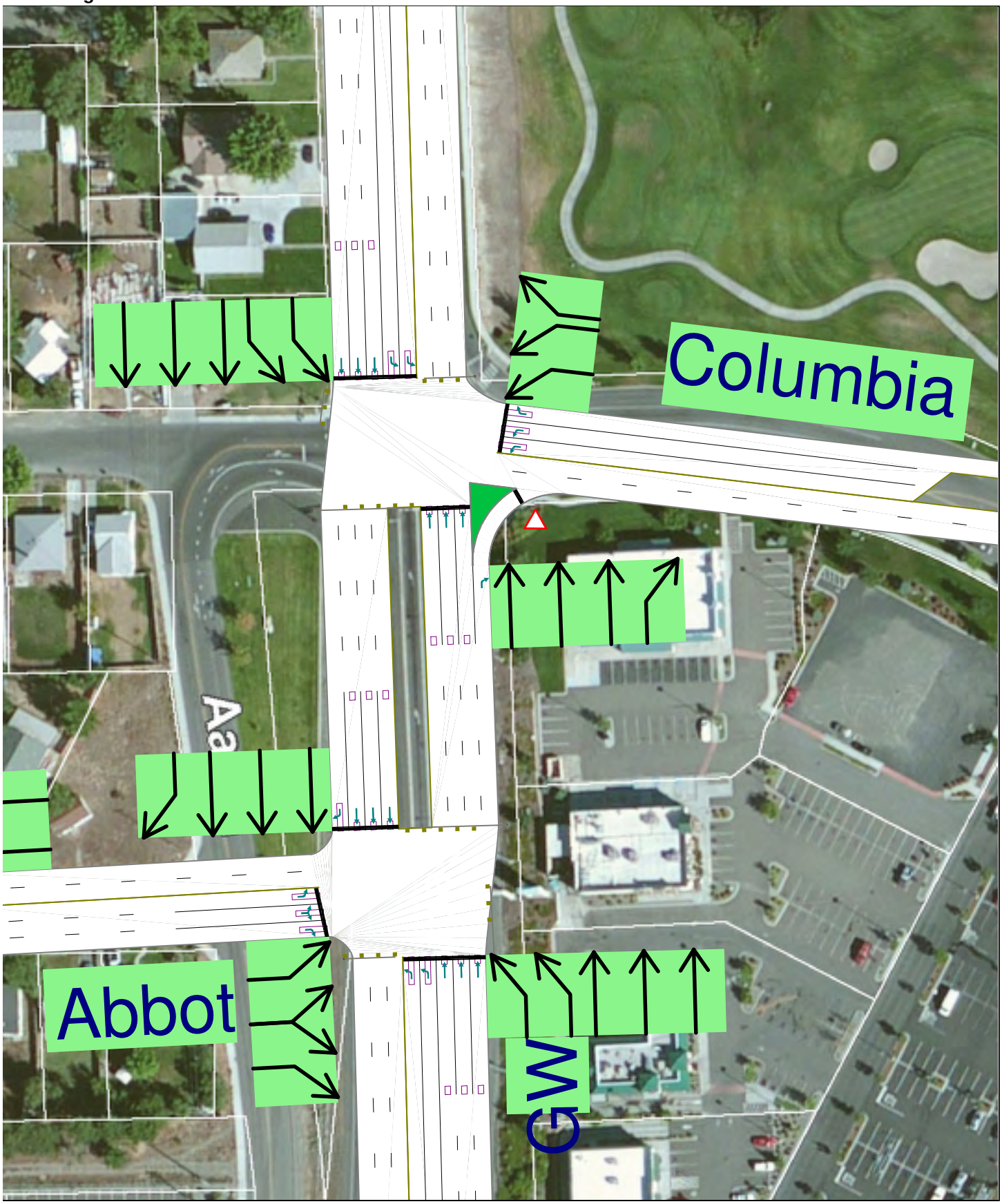
Baseline **E:\Projects\JUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\2032 PM No BUild.syn**

ALT 2 _B

8/16/2012

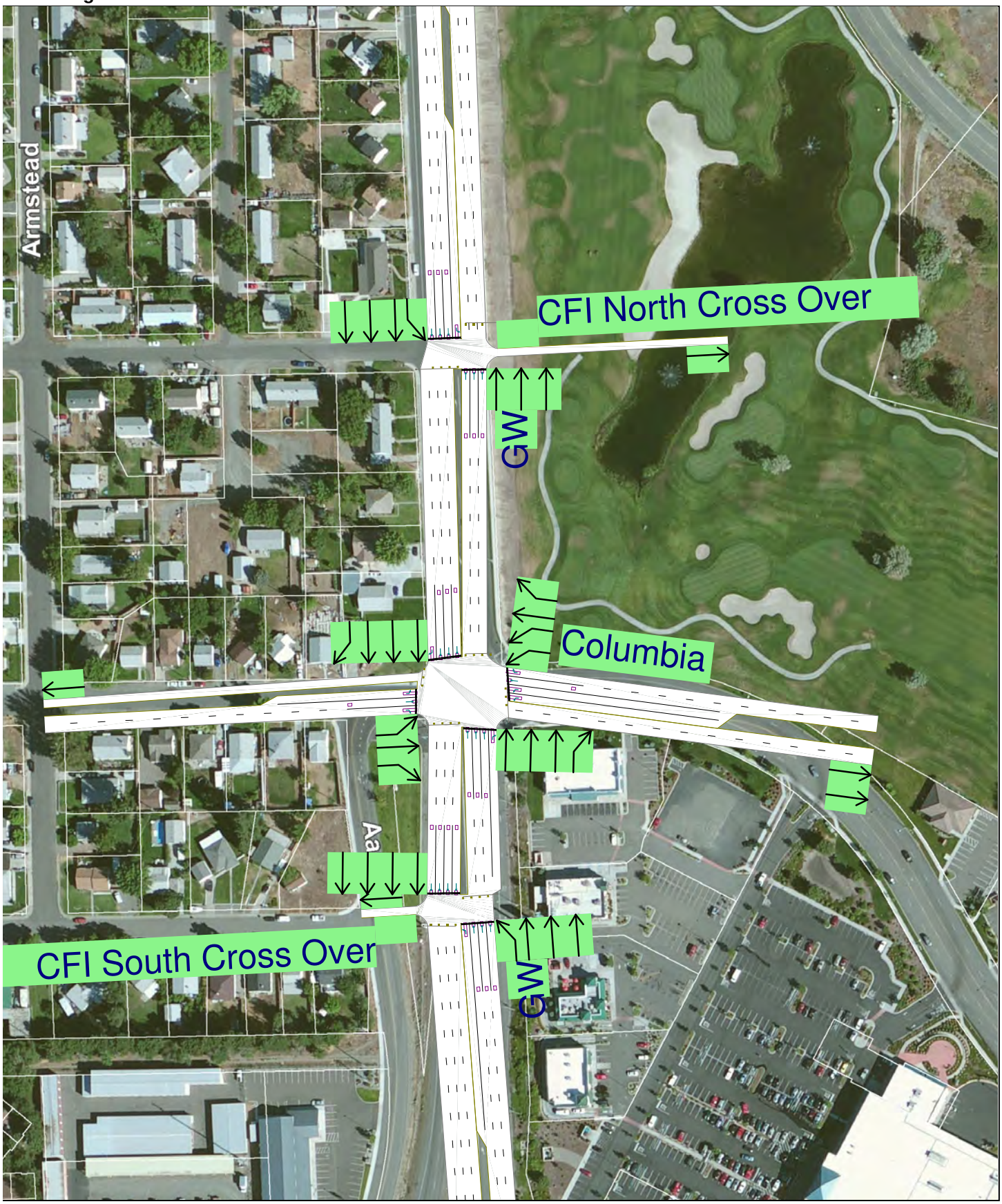
Projects\JBS Inland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 2_B 2032 PM ADDATIONAL LANE.syn

ALT 3 Separate T Intersections
Lane Diagrams **8/14/2012**



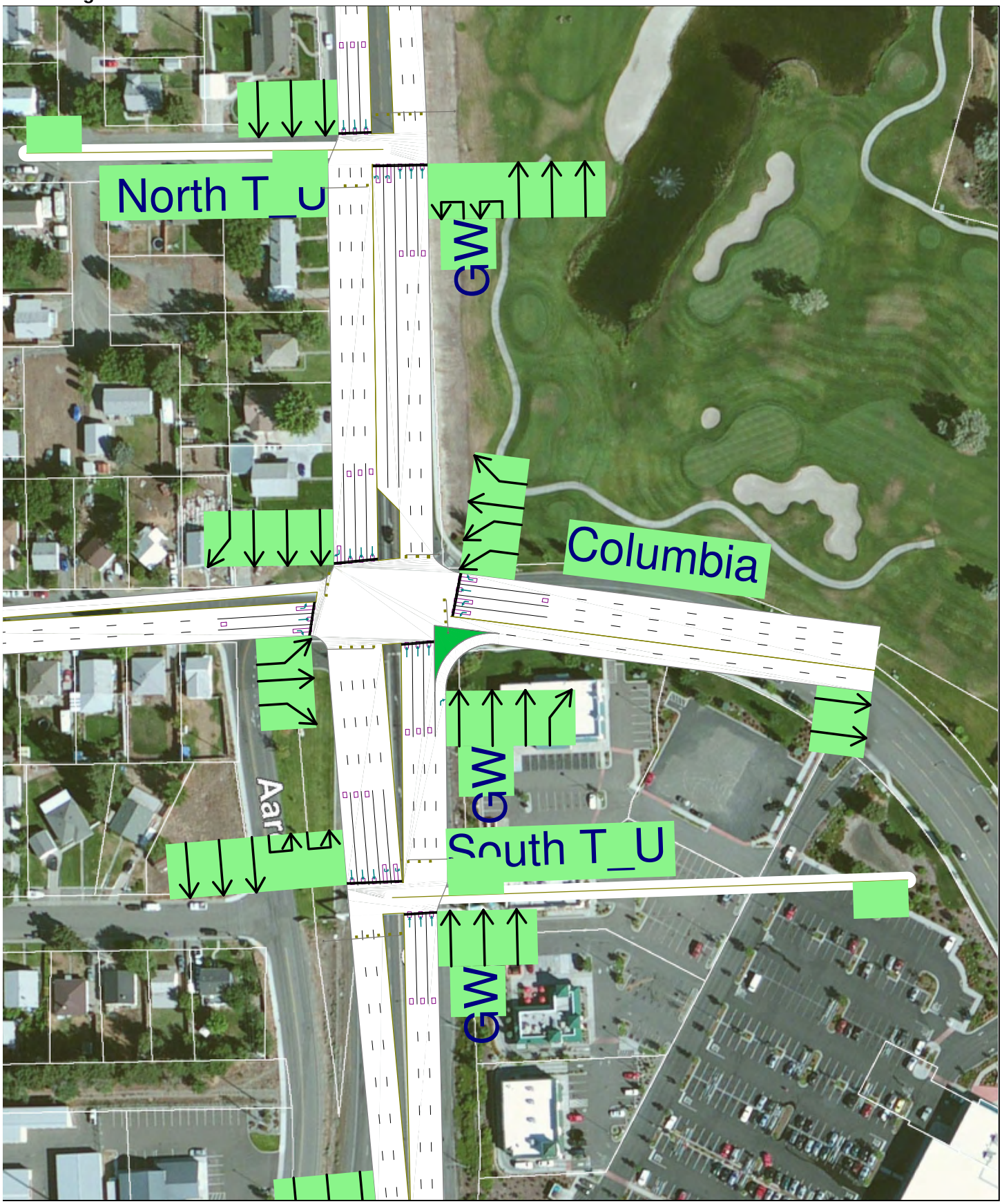
Baseline **L:\Projects\JUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 3_2032 PM S_T.syn**

ALT 4 CFI_Main Intersection
Lane Diagrams **8/13/2012**



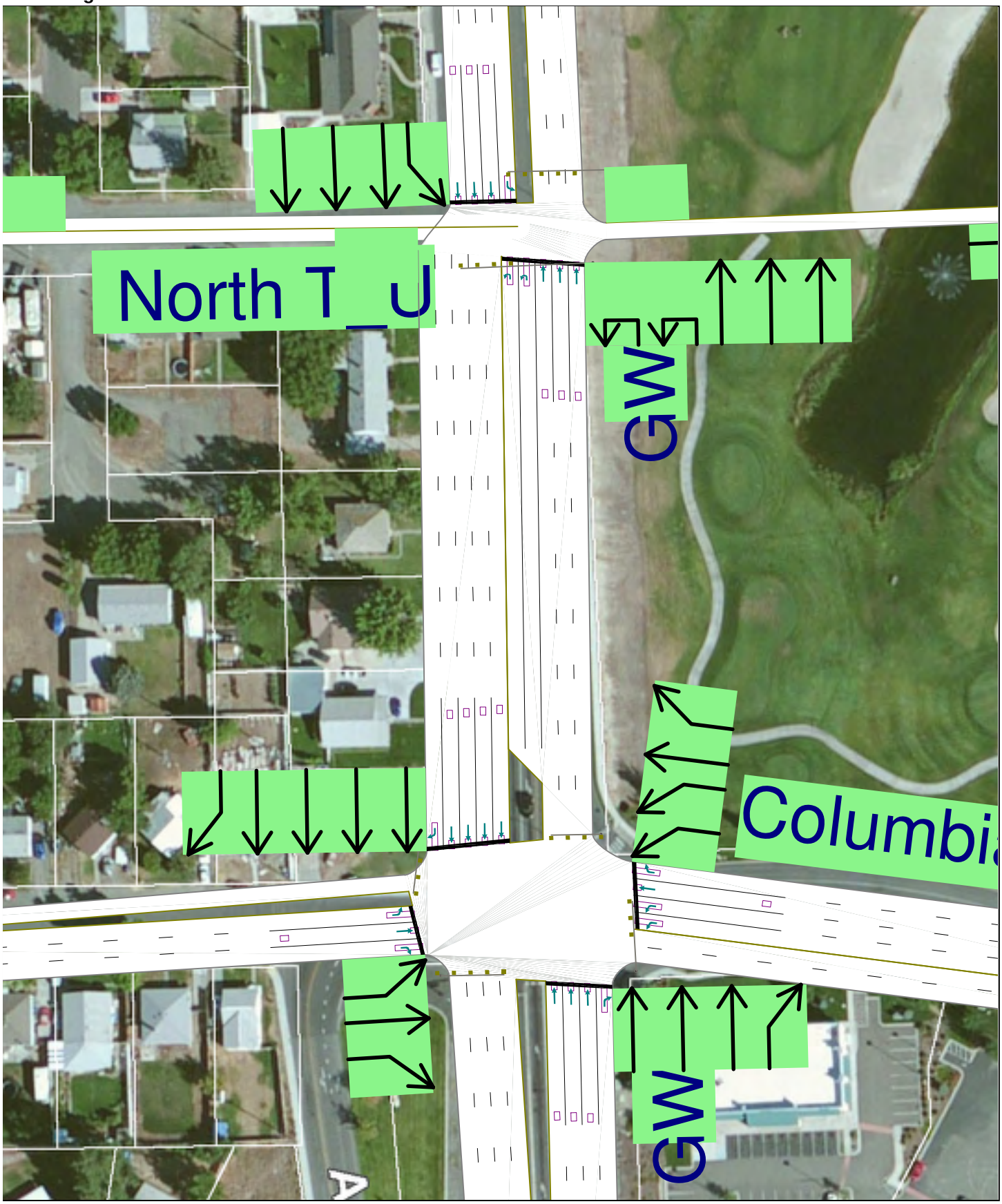
L:\Projects\JUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 4_2032 PM Regular CFI.syn

ALT 5 T_U
Lane Diagrams **8/14/2012**



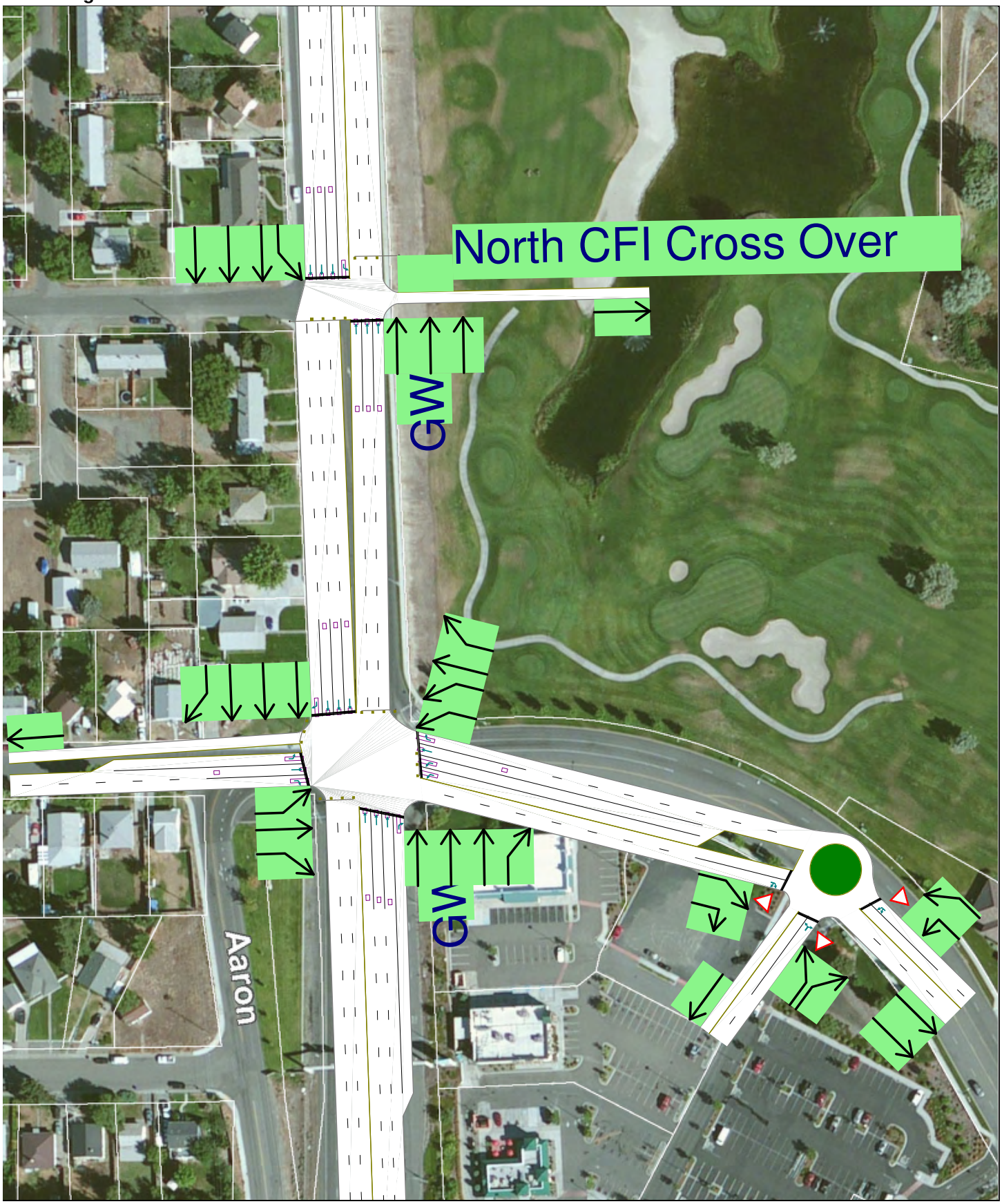
Baseline **I:\Projects\JUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 5 2032 PM T_U.syn**

ALT 5_B T_U& CFI North
Lane Diagrams **8/14/2012**



L:\Projects\HUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 5_B 2032 PM 4 SBTlanes.syn

ALT 6 CFI_Minor RBT
Lane Diagrams **8/13/2012**



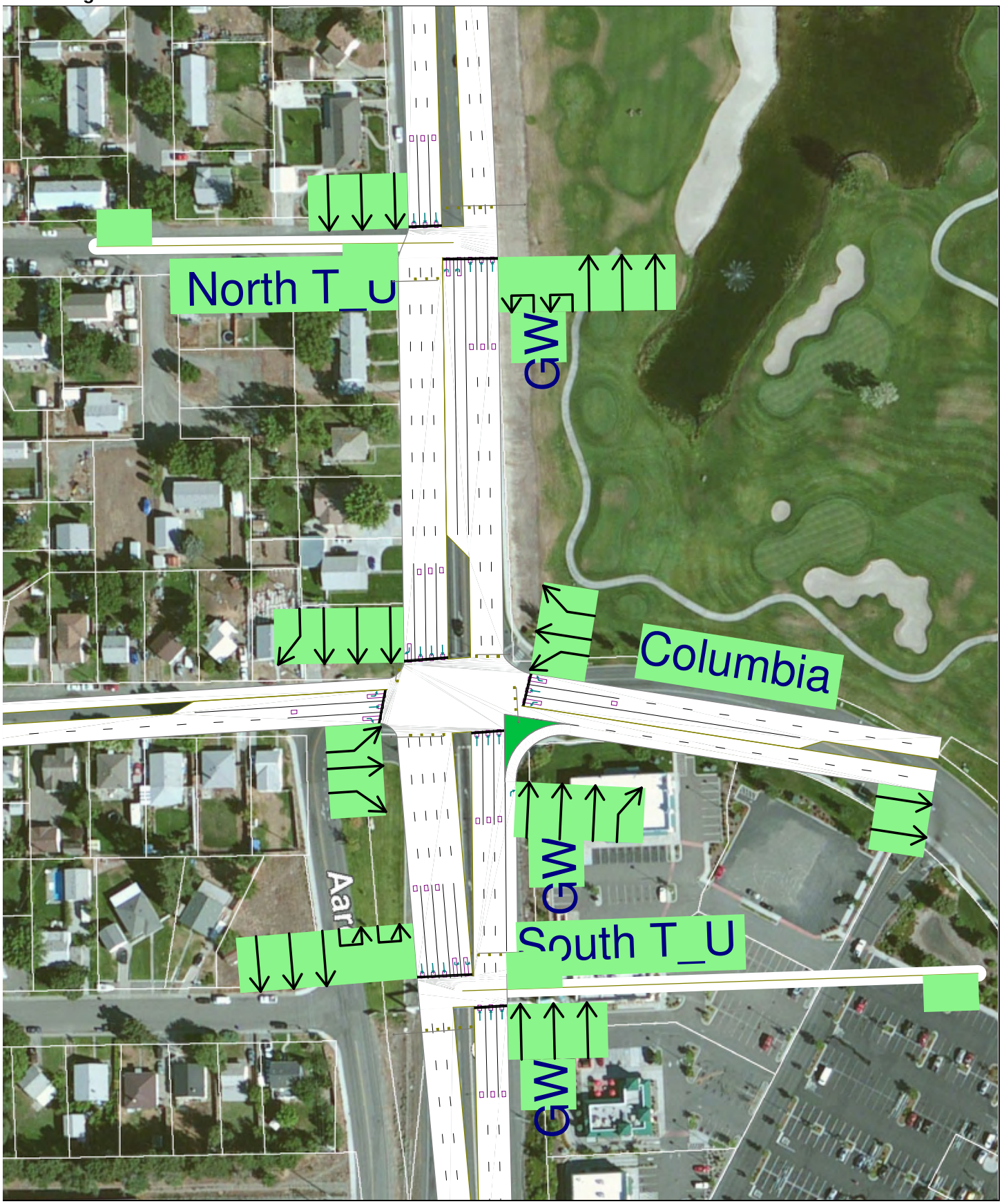
Baseline **Projects\JUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 6_2032 PM CFi_MU.syn**

ALT 7 T_U No Left Turn

8/14/2012

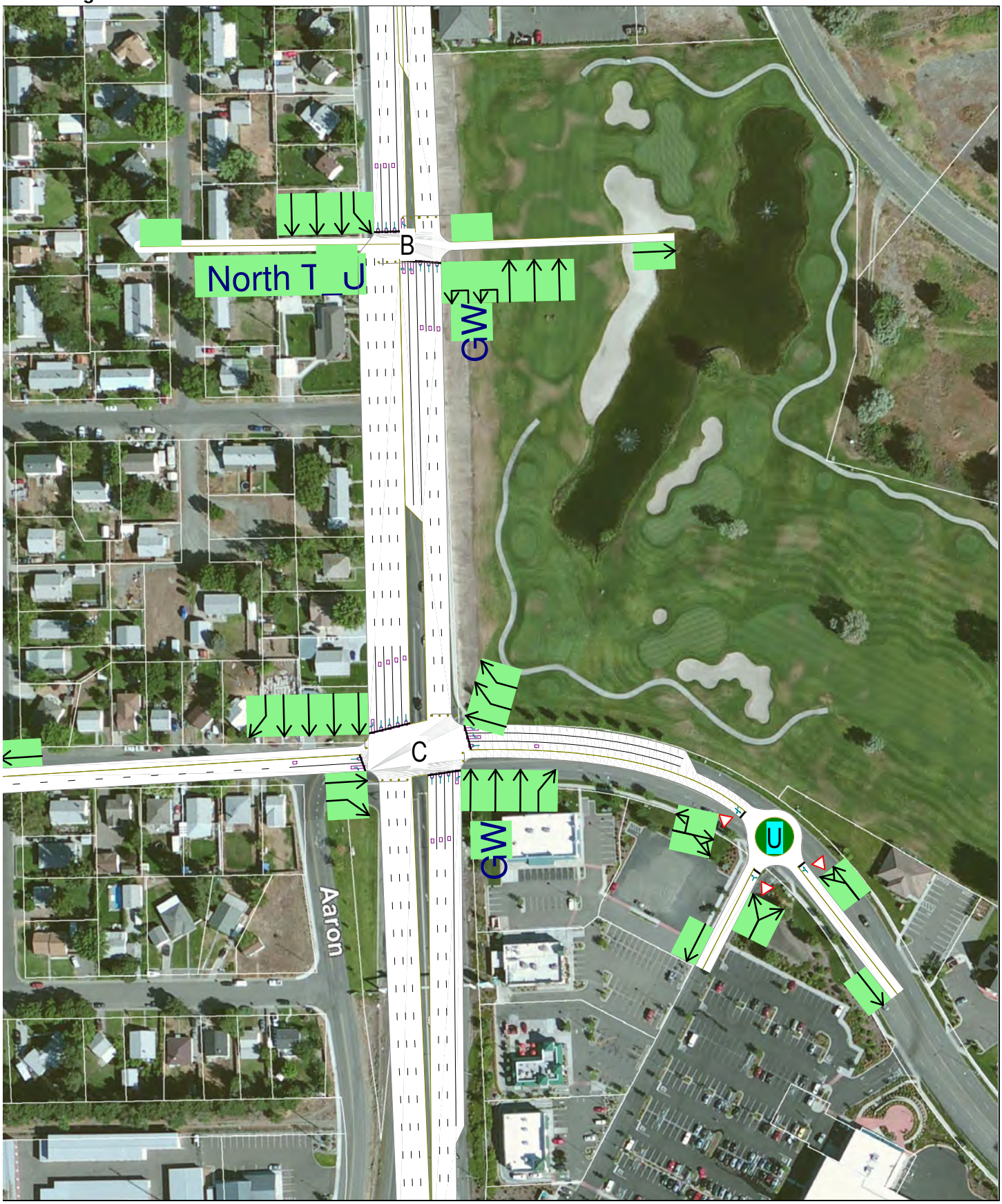
L:\Projects\UB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 7 2032 PM T_U_ NoLefturn.syn

ALT 8 HT_T_U
Lane Diagrams **8/14/2012**



Baseline **Base Project\JUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 8_2032 PM HT_T_U.syn**

ALT 9
Lane Diagrams **8/14/2012**



Baseline **I:\Projects\JUB\Richland City VISSIM\2032 PM ALternatives\Synchro Models\Synchro\ALT 9 2032 PM T_U.syn**

Description of Alternatives

George Washington Way/Columbia Point Drive Intersection

Alternative 1 – No Build:

George Washington (GW) Way/Columbia Point Drive intersection – existing lane configuration. Future PM delay increases from 104 seconds to 145 seconds.

Alternative 2 – Traditional Intersection Improvements:

This alternative maintains traditional intersection operations for GW Way/Columbia Point Drive but increases the number of lanes to achieve a 20 year LOS "D", including the following:

- SB left-turn lane (dual lefts)
- SB thru lane
- SB right-turn lane
- NB left-turn lane (dual lefts)
- NB thru lane
- WB left-turn lane and convert the shared left/thru lane to a thru lane
- EB left-turn lane and convert shared left/thru lane to a thru lane

Pros:

- Traditional intersection signal operation is maintained
- Acceptable future LOS
- Queue shortened for SBT from 1670' (No-Build) to 918'.

Cons:

- Increased ROW required to accommodate additional lanes – 11 lanes wide across GW Way including turn lanes.
- EBL, NBL, WBR would experience excessive delay and queuing.

Alternative 3 – Separate T-Intersections

This alternative separates the eastbound and westbound movements by creating two T-intersections. The turning movements on the west leg (Aaron Drive) of the intersection would be moved to a new intersection at GW Way/Abbot Street. The east leg (Columbia Point Drive) would remain at the existing location. The following changes would be needed at the intersections.

GW Way/Columbia Point:

- SB left-turn lane (dual lefts)
- Convert the WB shared left/thru lane to a left-turn lane
- Remove EB leg

GW Way/Abbot Street:

- EB left-turn lane
- EB shared left/right
- EB right turn Lane
- Two NB left-turn lanes (dual lefts)

Pros:

- Acceptable future LOS
- Maintains traditional intersection configurations

Cons:

- Creates an intersection 300 feet closer to the freeway ramps
- Separation distance between two signalized intersections is short
- ROW on Abbot for transition of Aaron Drive

Alternative 4 – Convert to CFI Intersection

Under this alternative, the existing GW/Columbia Point Drive is converted to a Continuous Flow Intersection (CFI) for the north and south approaches. Two new intersections would be created for the northbound and southbound left turns. There would be a total of three intersections; a north intersection, the main intersection, and a south intersection. The northbound left-turns would crossover to the west side of southbound GW Way traffic at the south intersection and the southbound left-turns would crossover to the east side of northbound traffic at the north intersection. Improvements would include the following:

- SB left-turn lane at north intersection
- NB left-turn lane at south intersection
- SB thru lane at south intersection
- WB left-turn lane and convert the shared left/thru lane to thru lane at main intersection
- EB left-turn lane and convert left/thru lane to thru lane

Pros:

- The crossover intersections operate at acceptable LOS
- Eliminates the N-S left turn phase at main intersection

Cons:

- Main intersection does not operate at an acceptable LOS in the 20-year horizon.
- Creates an intersection 300 feet closer to the freeway ramps
- Additional ROW for Aaron Drive realignment
- SBT queue is long

Alternative 5 – Thru-U Turn Intersections North and South of Main Intersection

In this alternative, two new (Thru-U) intersections would be created north and south of the GW Way/Columbia Point Drive intersection. There would be a total of 3 signalized intersections, the north Thru-U intersection, the main intersection, and the south Thru-U intersection. The northbound left-turn

would be made as a U-turn at the north Thru-U intersection followed by southbound right-turn at the main intersection. Similarly, the southbound left-turn would be made as a U-turn at the south Thru-U intersection followed by northbound right-turn at the main intersection. Improvements would include the following:

- SB dual U-Turn lanes at the south Thru-U intersection
- NB dual U-Turn lanes at the north Thru-U intersection
- WB left-turn lane and convert the shared left/thru lane to a thru lane at main intersection
- EB left-turn lane and convert the shared left/thru lane to a thru lane at main intersection
- SB right-turn lane at main intersection

Pros:

- U-Turn intersections operate at LOS A in the future

Cons:

- Unacceptable future LOS at the main intersection
- Additional ROW on GW and Columbia Point
- SBT delay is unacceptable and queue is long
- Creates intersection closer to freeway ramps

Alternative 5B – Thru–U Turn with CFI Intersection north of GW Way/Columbia Pointe Drive

In this alternative the Thru-U and CFI concepts are combined. This requires a new intersection section north of GW Way/Columbia Point Drive. The northbound left-turns would be made as U-turns at the Thru-U/CFI intersection followed by a southbound right turn at the main intersection. The southbound left-turns would crossover to the east side of GW Way traffic at this location. The eastbound and westbound movements would remain at the main intersection. Improvements would include the following:

- SB left-turn lane at the Thru-U/CFI crossover
- NB dual U-turn lanes at Thru-U/CFI crossover
- SB right-turn lane at main intersection
- SB thru lane at main intersection
- WB left-turn lane and convert the shared left/thru lane to a thru lane at the main intersection
- EB left-turn lane and convert the shared left/thru lane to a thru lane at the main intersection

Pros:

- Overall acceptable future LOS at both intersections, LOS A at the north intersection
- Decreases northbound and southbound queue lengths
- No interference at freeway ramps

Cons:

- EBL and WBL will experience excessive delay and queuing

Alternative 6 – CFI for SB left turns and Roundabout at Columbia Point Drive/Shopping Center Access

This alternative includes a CFI intersection to the north of GW Way/Columbia Point Drive for southbound left turns and a roundabout at the intersection of Columbia Point Drive/Shopping Center Access. The southbound left turns would crossover to the east of GW Way at the north CFI intersection. The northbound left turns would be made as a northbound right turn at the main intersection followed by U-turn at the roundabout and a westbound thru at main intersection. Improvements would include the following:

- SB left-turn lane at the CFI crossover intersection
- SB right-turn lane at main intersection
- WB left-turn lane and convert the shared left/thru lane to a thru lane at the main intersection
- EB left-turn lane and convert the shared left/thru lane to a thru lane
- Install a roundabout at Columbia Point Drive/Shopping Center Access

Pros:

- Acceptable future LOS at the CFI and the roundabout intersections
- No additional ROW required on GW Way
- No interference with freeway ramp operations

Cons:

- Unacceptable future LOS at the main intersection
- Long southbound queues
- NBL movement diverted to Columbia Point to access Aaron Drive

Alternative 7 – Thru-U Intersections with No Left turns at Main Intersection

In this alternative, two new thru-U Turn intersections would be created to the north and south of the main intersection. All left turns at the Main intersection would be eliminated. The southbound left turns would be shifted to the south Thru-U intersection and the northbound left turn turns would be shifted to the north Thru-U intersection, the U-turn movement would be followed by a right turn at the main intersection. The Columbia Point Drive intersection left-turn movements would be converted to a right-turn onto GW Way, followed by a U-turn at the Thru-U intersections. Intersection improvements would include the following:

- SB dual U-turn lanes at the south intersection
- SB thru lane at the south intersection
- SB right-turn lane at the main intersection
- SB thru lane at the main intersection
- Reconfigure WB approach at the main intersection to include a thru lane and dual right turn lanes
- Convert the EB shared left/thru lane to a thru lane
- Dual U-turn lanes at the north intersection

Pros:

- Acceptable future LOS at all of the intersections
- Removes all left-turn movements from the main intersection

Cons:

- Creates an intersection 300 feet closer to the freeway ramps
- EBR would experience excessive delay
- Longer travel distance for all left turn movements
- ROW required on GW Way

Alternative 8 – High-T at main intersection plus Thru-U Turn intersections

This alternative would include a High-T at the main intersection and two Thru-U Turn intersections, one north and one south of the main intersection. The northbound and southbound left-turns would be prohibited at the main intersection. These movements will be made as U-turns at the Thru-U intersections followed by right turns at the main intersection. In addition, it is assumed that 50% of the westbound left turns would make westbound right turns followed by U-turns at the north Thru-U intersection. The remaining 50% westbound left-turns would make left turns at the main intersection in the signal phase with the southbound thru traffic. This will be facilitated by providing a special lane (separated by median) for the left turns to enter GW Way and merge with the southbound thru traffic after a certain distance. Intersection improvements would include the following:

- SB dual U-turn lanes at the south Thru-U intersection
- SB right-turn lane at the main intersection
- Convert the WB shared left/thru lane to a thru lane at the main intersection
- EB left-turn lane and convert the shared left/thru lane to thru lane
- Add dual U-Turn lanes at the north Thru-U intersection

Pros:

Cons:

- Unacceptable future LOS at the main intersection
- High-T movement can only go south on SR 240 at the freeway
- SBT queue is long

Alternative 9 – New Thru-U/CFI Intersection and Roundabout at Columbia Point Drive/Shopping Center Access

This alternative combines the Thru-U/CFI and Roundabout options. It involves the installation of a Thru-U-Turn/CFI Crossover intersection on the north side of the main intersection and a roundabout at Columbia Point Drive/Shopping Center Access. All left turns at the main intersection would be eliminated. The northbound left turns would be made as U-turns at the Thru-U/CFI intersection followed by southbound right turns. The southbound left turns would crossover to the east side of the GW Way at the Thru-U/CFI intersection. The westbound left turns would make a westbound right turn followed by a

U-turn at the Thru-U/CFI intersection. The eastbound left-turns would travel east thru the main intersection and make a U-turn at the roundabout followed by a right-turn to GW Way. Improvements would include the following:

- SB left-turn lane at the Thru-U/CFI intersection
- NB Dual U-turn lanes at the Thru-U/CFI intersection
- SB thru lane at main intersection
- SB right-turn lane at the main intersection
- Reconfigure WB approach to include a thru lane and dual right turn lanes at the main intersection
- Convert EB shared left/thru lane to a thru lane
- Install a roundabout at Columbia Point Drive/Shopping Center Access

Pros:

- Acceptable future LOS at all of the intersections
- Significant reduction in queue lengths
- No interference with freeway ramps

Cons:

- Longer travel distances for side street left turns
- ROW requirements

RICHLAND - GEORGE WASHINGTON WAY (GW)/COLUMBIA POINT TRAFFIC ANALYSIS (SYNCHRO)

2032 AM PEAK HOUR

Scenario Number		0				1				2			
Description		Existing				No-Build				Additional SBT & Dual NBL			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
AM Peak Hour	NBL	126	63.1	160	E	150	66.5	188	E	150	74.8	115	E
	NBT	1914	39.4	736	D	2560	175.8	1165	F	2560	19.4	532	B
	NBR	232	0.2	0	A	290	0.3	0	A	290	0.3	0	A
	SBL	100	44.6	129	D	120	45	150	D	120	70.7	100	E
	SBT	970	18.3	216	B	1200	21.7	271	C	1200	12.8	168	B
	SBR	12				20				20	3.1	1	A
	EBL	20	64.3	85	E	20	65.2	90	E	20	75.2	44	E
	EBT	36				40				40	78.4	75	E
	EBR	108	84.9	73	F	130	15	33	B	130	20.3	34	C
	WBL	159	62.6	135	E	230	64.8	182	E	230	83.6	184	F
	WBT	23	62.2	106	E	30	64.5	142	E	30	62.1	61	E
	WBR	88	13.4	39	B	130	11.5	44	B	130	15.4	55	B
	Overall		**32.8**		**C**		**104.1**		**F**		**23.5**		**C**

Scenario Number		3								4											
Description		Separate T-Intersections (1st - GW/Columbia, 2nd - GW/Abbot)								Continuous Flow Intersection (CFI)- Main Intersection											
		GW Way/Columbia Point				GW Way/Abbot				GW/North CFI Crossover				GW/Columbia Point				GW/South CFI Crossover			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
AM Peak Hour	NBL	-	-	-	-	150	61.3	100	E	-	-	-	-	-	-	-	-	150	53	204	D
	NBT	2580	17.5	702	B	2850	4.5	293	A	2710	1.2	26	A	2560	20.4	789	C	2850	0.8	0	A
	NBR	330	3.6	69	A	-	-	-	-	-	-	-	-	290	4.5	79	A	-	-	-	-
	SBL	120	93.5	109	F	-	-	-	-	120	59.6	184	E	-	-	-	-	-	-	-	-
	SBT	1220	4.1	121	A	1430	8.7	249	A	1220	0.1	0	A	1200	9.2	165	A	1560	4.1	98	A
	SBR	-	-	-	-	50	4.2	24	A	-	-	-	-	20	2.4	1	A	-	-	-	-
	EBL	-	-	-	-	60	32.2	56	C	-	-	-	-	20	71.2	42	E	-	-	-	-
	EBT	-	-	-	-	-	-	-	-	-	-	-	-	40	64.3	70	E	-	-	-	-
	EBR	-	-	-	-	130	20.6	50	C	-	-	-	-	130	60.7	125	E	-	-	-	-
	WBL	260	56.7	149	E	-	-	-	-	-	-	-	-	230	68	156	E	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-	30	51.6	55	D	-	-	-	-
	WBR	130	38.7	117	D	-	-	-	-	-	-	-	-	130	20.2	81	C	-	-	-	-
	Overall		**17.6**		**B**		**8.6**		**A**		**2.6**		**A**		**20.9**		**C**		**3.6**		**A**

Scenario Number		5												5-B							
Description		Thru-U (3 Intersections North Thru U, Main Intersection, South Thru-U)												Thru-U (2 Intersections North Thru U/CFI, Main Intersection)							
		GW/North Thru-U				GW/Columbia Point				GW/South Thru-U				GW/North Thru-U				GW/Columbia Point			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
AM Peak Hour	NBL	150	61.4	85	E	-	-	-	-	-	-	-	-	150	41.1	85	E	-	-	-	-
	NBT	2710	0.2	0	A	2710	21.6	930	C	3000	5.4	350	A	2710	0.9	0	A	2710	25.1	894	B
	NBR	-	-	-	-	410	0.3	0	A	-	-	-	-	-	-	-	-	290	4.4	85	A
	SBL	-	-	-	-	-	-	-	-	120	81.3	103	F	120	66.5	172	E	-	-	-	-
	SBT	1340	2.2	98	A	1320	8.5	162	A	1560	0.2	0	A	1220	2.4	74	A	1200	9.5	183	A
	SBR	-	-	-	-	170	1.2	0	A	-	-	-	-	-	-	-	-	170	2	7	A
	EBL	-	-	-	-	20	77.2	44	E	-	-	-	-	-	-	-	-	20	65.4	40	E
	EBT	-	-	-	-	40	68.7	74	E	-	-	-	-	-	-	-	-	40	58.8	65	E
	EBR	-	-	-	-	130	73.8	147	E	-	-	-	-	-	-	-	-	130	51.2	112	E
	WBL	-	-	-	-	230	73.4	165	E	-	-	-	-	-	-	-	-	230	62.5	145	E
	WBT	-	-	-	-	30	55.7	58	E	-	-	-	-	-	-	-	-	30	45.9	51	E
	WBR	-	-	-	-	130	25.8	100	C	-	-	-	-	-	-	-	-	130	14.2	62	C
	Overall		**3**		**A**		**20.3**		**C**		**5.6**		**A**		**4.6**		**A**		**21.7**		**C**

RICHLAND - GEORGE WASHINGTON WAY (GW)/COLUMBIA POINT TRAFFIC ANALYSIS (SYNCHRO)

2032 AM PEAK HOUR

Scenario Number		6												7											
Description		CFI_Minor Street RBT												Thru-U with no Left Turn (3 Intersections North Thru U, Main Intersection, South Thru-U)											
		GW/North CFI Crossover				GW/Columbia Point				Roundabout				GW/North Thru-U				GW/Columbia Point					GW/South Thru-U		
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS		Volume	Delay (sec)	95% Q (ft)	LOS
AM Peak Hour	NBL	-	-	-	-	-	-	-	-	117	6.4	11.2	A	380	49.8	147	D	-	-	-	-		-	-	-	-
	NBT	2710	1.1	26	A	2560	22.4	819	C	-	-	-	-	2710	0.2	0	A	2730	15.6	601	B		3000	5.4	293	A
	NBR	-	-	-	-	440	4.8	127	A	50	5.5	4.9	A	-	-	-	-	410	0.3	0	A		-	-	-	-
	SBL	120	58.3	184	E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		140	63.2	91	E
	SBT	1220	0.1	0	A	1200	10	173	A	-	-	-	-	1340	1.8	24	A	1550	6.3	159	A		1560	0.2	0	A
	SBR	-	-	-	-	20	2.5	1	A	-	-	-	-	-	-	-	-	170	0.7	0	A		-	-	-	-
	EBL	-	-	-	-	20	71.2	42	E	150	6.4	27.2	A	-	-	-	-	-	-	-	-		-	-	-	-
	EBT	-	-	-	-	40	72.8	72	E	315	6.4	27.2	A	-	-	-	-	40	35.8	49	D		-	-	-	-
	EBR	-	-	-	-	130	25.8	42	C	135	6.4	25.4	A	-	-	-	-	150	41.4	144	D		-	-	-	-
	WBL	-	-	-	-	230	58.4	151	E	50	6	14.8	A	-	-	-	-	-	-	-	-		-	-	-	-
	WBT	-	-	-	-	180	73.8	242	E	273	6	14.8	A	-	-	-	-	30	34.9	42	C		-	-	-	-
	WBR	-	-	-	-	130	19.1	80	B	-	-	-	-	-	-	-	-	360	51.1	196	D		-	-	-	-
	Overall		**2.5**		**A**		**22.3**		**C**		**6.2**		**A**		**5**		**A**		**14.6**		**B**			**5.4**		**A**

Scenario Number		8												9											
Description		Thru-U with High-T Intersection												Thru-U& CFI with no Left Turn (3 Intersections North Thru U & CFI, Main Intersection, Roundabout)											
		GW/North Thru-U				GW/Columbia Point				GW/South Thru-U				GW/North Thru-U				GW/Columbia Point					Roundabout		
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS		Volume	Delay (sec)	95% Q (ft)	LOS
AM Peak Hour	NBL	265	57.6	159	E	-	-	-	-	-	-	-	-	380	55.6	193	E	-	-	-	-		117	7.4	23.1	A
	NBT	2710	1.5	61	A	2710	44.8	1314	D	3000	6	350	A	2710	2	108	A	2710	17.1	646	B		-			
	NBR	-	-	-	-	410	0.3	0	A	-	-	-	-	-	-	-	-	290	0.3	0	A		50	7.4	23.1	A
	SBL	-	-	-	-	-	-	-	-	120	89.5	104	F	120	61.2	163	E	-	-	-	-		-			
	SBT	1340	3.4	135	A	1435	6.8	318	A	1560	0.4	0	A	1220	3.7	74	A	1430	5.2	98	A		-			
	SBR	-	-	-	-	170	1.5	0	A	-	-	-	-	-	-	-	-	170	0.6	0	A		-			
	EBL	-	-	-	-	20	77.2	44	E	-	-	-	-	-	-	-	-	-	-	-	-		20	9.1	74.4	A
	EBT	-	-	-	-	40	55	63	D	-	-	-	-	-	-	-	-	60	41.5	75	D		315	9.1	74.4	A
	EBR	-	-	-	-	130	64.8	163	E	-	-	-	-	-	-	-	-	130	37.5	125	D		135	9.1	74.4	A
	WBL	-	-	-	-	115	81	185	F	-	-	-	-	-	-	-	-	-	-	-	-		50	7.8	44.5	A
	WBT	-	-	-	-	30	69.7	61	E	-	-	-	-	-	-	-	-	30	38.8	46	D		273	7.8	44.5	A
	WBR	-	-	-	-	245	18.9	54	B	-	-	-	-	-	-	-	-	380	59	229	E		-	-	-	-
	Overall		**5.5**		**A**		**29.7**		**C**		**6.3**		**A**		**8.7**		**A**		**16.3**		**B**			**8.4**		**A**

RICHLAND - GEORGE WASHINGTON WAY (GW)/COLUMBIA POINT TRAFFIC ANALYSIS (SYNCHRO)

2032 PM PEAK HOUR

Scenario Number		0				1				2			
Description		Existing				No-Build				Additional Lanes			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
PM Peak Hour	NBL	248	104.6	422	F	280	131.4	510	F	280	100.3	220	F
	NBT	1348	34.9	477	C	1570	39.1	594	D	1570	32.3	394	C
	NBR	279	0.3	0	A	310	0.3	0	A	310	3.6	55	A
	SBL	174	87.1	301	F	190	96.4	349	F	190	48.9	115	D
	SBT	2447	166.4	1405	F	2740	236.6	1671	F	2740	43.9	918	D
	SBR	34				40				40	7.9	7	A
	EBL	32	87.5	206	F	40	89.3	244	F	40	76.2	78	E
	EBT	76				80				80	67	138	E
	EBR	307	58.3	197	E	340	86	294	F	340	200.6	456	F
	WBL	400	110	463	F	490	176.3	602	F	490	83.2	352	F
	WBT	55	108.9	426	F	70	177.4	567	F	70	48.1	108	D
	WBR	89	12.4	54	B	110	16.1	72	B	110	9.5	54	A
	Overall		**104.7**		**F**		**145**		**F**		**54.5**		**D**

Scenario Number		3								4											
Description		Separate T-Intersections (1st - GW/Columbia, 2nd - GW/Abbot)								Continuous Flow Intersection (CFI)- Main Intersection											
		GW Way/Columbia Point				GW Way/Abbot				GW/North CFI Crossover				GW/Columbia Point				GW/South CFI Crossover			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
PM Peak Hour	NBL	-	-	-	-	280	69.2	189	E	-	-	-	-	-	-	-	-	280	78.6	385	E
	NBT	1610	19.2	443	B	1880	3.7	199	A	1720	7.3	151	A	1570	23.3	445	C	1880	0.3	0	A
	NBR	390	2.4	34	A	-	-	-	-	-	-	-	-	310	2.3	43	A	-	-	-	-
	SBL	190	54.3	117	D	-	-	-	-	190	51	247	D	-	-	-	-	-	-	-	-
	SBT	2780	7.9	239	A	3230	57.3	1396	E	2780	0.3	0	A	2740	61.1	1256	E	3570	67	336	E
	SBR	-	-	-	-	110	2.4	12	A	-	-	-	-	40	9.3	21	A	-	-	-	-
	EBL	-	-	-	-	120	41.1	108	D	-	-	-	-	40	79.3	80	E	-	-	-	-
	EBT	-	-	-	-	-	-	-	-	-	-	-	-	80	60.4	136	E	-	-	-	-
	EBR	-	-	-	-	340	25.6	72	C	-	-	-	-	340	421.3	710	F	-	-	-	-
	WBL	560	64.6	337	E	-	-	-	-	-	-	-	-	490	78.9	335	E	-	-	-	-
	WBT	-	-	-	-	-	-	-	-	-	-	-	-	70	43.3	104	D	-	-	-	-
	WBR	110	8.5	50	A	-	-	-	-	-	-	-	-	110	8.2	51	A	-	-	-	-
	Overall		**18.3**		**B**		**37.8**		**D**		**4.9**		**A**		**71.8**		**E**		**45.7**		**D**

Scenario Number		5												5-B							
Description		Thru-U (3 Intersections North Thru U, Main Intersection, South Thru-U)												Thru-U/CFI (2 Intersections North Thru U/CFI, Main Intersection)							
		GW/North Thru-U				GW/Columbia Point				GW/South Thru-U				GW/North Thru-U				GW/Columbia Point			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
PM Peak Hour	NBL	280	65.8	210	E	-	-	-	-	-	-	-	-	280	76.5	212	E	-	-	-	-
	NBT	1720	0.1	0	A	1850	29.4	604	C	2160	4.1	207	A	1720	5.3	124	A	1850	27.2	572	C
	NBR	-	-	-	-	500	0.5	0	A	-	-	-	-	-	-	-	-	310	5.1	87	A
	SBL	-	-	-	-	-	-	-	-	190	57.4	91	E	190	45.1	211	D	-	-	-	-
	SBT	2970	4	79	A	2930	121.3	1413	F	3570	1.9	0	A	2970	3.6	187	A	2740	37	578	D
	SBR	-	-	-	-	320	6.5	79	A	-	-	-	-	-	-	-	-	320	7.1	80	A
	EBL	-	-	-	-	40	93.1	83	F	-	-	-	-	-	-	-	-	40	93.1	83	F
	EBT	-	-	-	-	80	57.5	133	E	-	-	-	-	-	-	-	-	80	57.5	133	E
	EBR	-	-	-	-	340	350.6	686	F	-	-	-	-	-	-	-	-	340	350.6	686	F
	WBL	-	-	-	-	490	90.8	372	F	-	-	-	-	-	-	-	-	490	90.8	372	F
	WBT	-	-	-	-	70	40.8	99	D	-	-	-	-	-	-	-	-	70	40.8	99	D
	WBR	-	-	-	-	110	30.1	114	C	-	-	-	-	-	-	-	-	110	30.1	114	C
	Overall		**6.2**		**A**		**89.2**		**F**		**4.5**		**A**		**9.9**		**A**		**54.9**		**D**

RICHLAND - GEORGE WASHINGTON WAY (GW)/COLUMBIA POINT TRAFFIC ANALYSIS (SYNCHRO)

2032 PM PEAK HOUR

Scenario Number		6												7											
Description		CFI_Minor Street RBT												Thru-U with no Left Turn (3 Intersections North Thru U, Main Intersection, South Thru-U)											
		GW/North CFI Crossover				GW/Columbia Point				Roundabout				GW/North Thru-U				GW/Columbia Point				GW/South Thru-U			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
PM Peak Hour	NBL	-	-	-	-	-	-	-	-	469	16.2	90.1	C	770	59.1	444	E	-	-	-	-	-	-	-	-
	NBT	1720	3	54	A	1570	23.8	445	C	-	-	-	-	1720	0.1	0	A	1890	14.6	304	B	2160	4.1	201	A
	NBR	-	-	-	-	590	3	53	A	50	5.5	4.8	A	-	-	-	-	500	0.5	0	A	-	-	-	-
	SBL	190	51.1	247	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	230	65.6	94	E
	SBT	2780	0.4	0	A	2740	64.5	1256	E	-	-	-	-	2970	41.2	219	D	3420	63	675	E	3570	0.1	0	A
	SBR	-	-	-	-	40	8.2	19	A	-	-	-	-	-	-	-	-	320	1.8	6	A	-	-	-	-
	EBL	-	-	-	-	40	68	78	E	280	8.2	47.3	A	-	-	-	-	-	-	-	-	-	-	-	-
	EBT	-	-	-	-	80	60	136	E	174	8.2	47.3	A	-	-	-	-	80	33	94	C	-	-	-	-
	EBR	-	-	-	-	340	394.8	710	F	406	8.2	44.3	A	-	-	-	-	380	108.2	494	F	-	-	-	-
	WBL	-	-	-	-	490	78.9	335	E	50	8.9	16.3	A	-	-	-	-	-	-	-	-	-	-	-	-
	WBT	-	-	-	-	350	75.2	543	E	201	8.7	16.3	A	-	-	-	-	70	33	82	C	-	-	-	-
	WBR	-	-	-	-	110	14.5	72	B	-	-	-	-	-	-	-	-	600	46.7	320	D	-	-	-	-
	Overall		**3.4**		**A**		**69.5**		**E**		**10.5**		**B**		**30.8**		**C**		**44**		**D**		**4.1**		**A**

Scenario Number		8												9											
Description		Thru-U with High-T Intersection												Thru-U & CFI with no Left Turn (3 Intersections North Thru U & CFI, Main Intersection, Roundabout)											
		GW/North Thru-U				GW/Columbia Point				GW/South Thru-U				GW/North Thru-U				GW/Columbia Point				Roundabout			
MOEs		Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS	Volume	Delay (sec)	95% Q (ft)	LOS
PM Peak Hour	NBL	525	137.8	456	F	-	-	-	-	-	-	-	-	770	53.3	397	D	-	-	-	-	469	14.5	125.1	B
	NBT	1720	0.2	0	A	1850	315.3	729	F	2160	3.8	207	A	1720	3.6	156	A	1850	15.8	382	B	-			
	NBR	-	-	-	-	500	0.6	0	A	-	-	-	-	-	-	-	-	310	0.3	0	A	50			
	SBL	-	-	-	-	-	-	-	-	190	72.7	146	E	190	54.5	179	D	-	-	-	-	-	-	-	-
	SBT	2970	2.8	79	A	3175	159.5	1383	F	3570	1.1	0	A	2780	11.8	196	B	3230	17.2	519	B	-	-	-	-
	SBR	-	-	-	-	320	5.4	80	A	-	-	-	-	-	-	-	-	320	1.3	10	A	-	-	-	-
	EBL	-	-	-	-	40	77.4	78	E	-	-	-	-	-	-	-	-	-	-	-	-	40	12.6	133.2	B
	EBT	-	-	-	-	80	41.9	113	D	-	-	-	-	-	-	-	-	120	34.3	132	C	174			
	EBR	-	-	-	-	340	104.5	510	F	-	-	-	-	-	-	-	-	340	78.5	417	E	406			
	WBL	-	-	-	-	245	78.2	376	E	-	-	-	-	-	-	-	-	-	-	-	-	50	12.2	50.5	B
	WBT	-	-	-	-	70	54.9	115	D	-	-	-	-	-	-	-	-	70	33	82	C	201			
	WBR	-	-	-	-	355	12.6	126	B	-	-	-	-	-	-	-	-	640	47.9	345	D	-	-	-	-
	Overall		**15.5**		**B**		**168.4**		**F**		**4.4**		**A**		**16.5**		**B**		**21.9**		**C**		**13.2**		**B**

APPENDIX E

Calibration Report of VISSIM model.

TECHNICAL MEMORANDUM

CALIBRATION DOCUMENT

FOR

George Washington Way / Columbia Point Drive Traffic Study

DESCRIPTION

J-U-B Engineers, Inc. (J-U-B) prepared a traffic study titled George Washington Way / Columbia Point Drive Traffic Study and dated September 20, 2012. The study was prepared to evaluate the existing and future capacities, and potential future improvements for the George Washington Way / Columbia Point Drive intersection in Richland, WA. This calibration document was prepared as part of the traffic study for the existing 2012 AM and PM peak hour VISSIM models.

VISSIM models for the existing 2012 AM and PM peak hours have been developed and calibrated for the purposes of analyzing the traffic operations and performance of the intersection of George Washington/Columbia Point Drive. Existing 2012 AM (7:00 – 9:00) and PM (4:00 – 6:00) traffic volumes were collected by L2 Data Collection for the study intersections using video cameras. The traffic count videos were also provided to JUB. Based on the collected data, the AM and PM peak hour at the study intersections generally occurs from 7:30 am to 8:30 am, 4:30 pm to 5:30 pm on a weekday. The simulation study period was 4200 seconds, which includes a 600 second seeding period and 3600 seconds for the peak hour period.

The VISSIM model was constructed by tracing the roadway network over an aerial photograph background. The scale of the VISSIM network was established by confirming locations of landmarks on the aerials with field verified measurements.

The number of lanes, location of lane additions and drops, and other roadway geometry were confirmed by field visits. Additional detail was incorporated into the VISSIM network (posted speed limits, grades, etc.) to better reflect field conditions. Current signal timing plans for the signalized intersections in the study area were obtained from the Richland City and were also coded into the VISSIM network. Driver behavior parameters were adjusted in the model to replicate realistic traffic volumes, queuing and other traffic conditions observed in the field. The distribution of vehicle types was also calibrated to local conditions so that the percentage of cars and heavy vehicles matched the traffic vehicle distribution observed in the field.

DATA COLLECTION

The model simulation required the input of geometrics, traffic control, and traffic flow data for the corridor and intersections. The following is a discussion of the data collection and field observations relevant to the VISSIM model development.

Geometric Data

The features that were input, included, the number of lanes, lane additions, lane drops, and roadway curvature. Four sources of geometric information were used in the data collection efforts:

(1) scaled aerial photographs, (2) non-scaled aerial photographs from Google Maps, (3) roadway maps, and (4) field video observations.

Speed

The posted speed limits are 55 MPH on I-82 Westbound off-ramp, 35 MPH on George Washington Way from Columbia Point Drive to Comstock Street, 55 MPH on George Washington Way south of Columbia Point Drive, 25 MPH on Columbia Point Drive, Aaron Drive, and Comstock Street. The posted speed limits were used as the 85% of desired speeds and the posted speed limits plus 5 MPH were used as the maximum desired speeds in the VISSIM model.

Traffic Control Data

The traffic signal timing plans for the study intersections were obtained from the City. The signal timing information was input into VISSIM. The location of intersection control was identified using the aerial photographs and confirmed based on the field observations.

Existing Traffic Data

The traffic flow data collected for the micro-simulation model development includes the following:

- L2 Data Collection collected turning movement counts for both the weekday AM and PM peak hour periods at four intersections on May 23, 2012:
  - George Washington Way/Columbia Point Drive
  - George Washington Way/Comstock Street
  - George Washington Way/Benham Street
  - Aaron Drive/Adams Street

- Peak hour queue lengths were observed from the traffic count videos and documented for the following locations:
  - George Washington Way/Columbia Point Drive

Vehicle Classification

The vehicle population in VISSIM is categorized into vehicles types, classes, categories and composition. The default North American VISSIM vehicle type, class and categories were used in this model. The observed heavy vehicle percentages on George Washington Way and the intersecting side streets were used in the VISSIM model. The PM peak hour heavy vehicle percentages are approximately 0.05% on the study area roadways. The AM peak hour heavy vehicle percentages are approximately 0.05% on George Washington Way and the intersecting side streets with the exception of Aaron Drive, which has a 10% heavy vehicle percentage.

CALIBRATION GOALS

To simulate the existing conditions, the VISSIM model was constructed by using an aerial photograph of the roadway network as the background. The number of lanes, location of lane additions, lane drops, speed limits and other roadway geometry were input in the model to reflect the field conditions.

The objective of model calibration was to obtain the best match possible between model performance and the field measurements of existing conditions. It should be noted that there are no universally accepted procedures for conducting calibration and validation for complex transportation networks. It is the responsibility of the modeler to implement a suitable procedure, which provides an acceptable level of confidence in the model results.

During the VISSIM calibration, model outputs were compared against field data to determine if the output was within acceptable levels. Based on the Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software, dated July 2004, published by the Federal Highway Administration, the validation criteria used for the VISSIM model is as follows:

1. Modeled major movement hourly flows versus observed flows to meet the following criteria:

Value	Accuracy
Movements with less than 100 vph	±25 vph (25% accuracy), GEH Statistic < 5
Movements with less than 300 vph	±75 vph (25% accuracy), GEH Statistic < 5
Movements with less than 500 vph	±100 vph (20% accuracy), GEH Statistic < 5
Movements with more than 500 vph	±10%, GEH Statistic < 5
Total Intersection traffic volume	±10%, GEH Statistic < 4

2. Each average queue length at the key intersections is to be within ±20% of field observed average queue length for each timing cycle for more than 85% of cases or within 1 or 2 vehicles difference for unsignalized intersections. The queuing in the model should be visually acceptable for the intersection of George Washington Way and Columbia Point Drive.

CALIBRATION PROCEDURE & RESULTS

Goal 1: Modeled major movement hourly flows versus observed

Table 1 illustrates the difference between the modeled and the observed traffic volumes. A comparison between the modeled and the observed volumes was made using a modified Chi-Squared statistic test called the GEH statistic. The GEH statistic is a formula used in traffic engineering, traffic forecasting, and traffic modeling to compare two sets of traffic volumes. A GEH statistic is not a true statistical test. Rather, it is an empirical formula that has proven useful for a variety of traffic analysis purposes.

The formula for the GEH statistic is:

$$GEH = \sqrt{(\,(M - C)2 \,/\, (0.5 \times (M + C))\,)}$$

Where M is the traffic volume from the traffic model (or new count) and C is the real world traffic count (or the old count). Various GEH values give an indication of a goodness of fit as outlined below:

- GEH < 5 => Flows can be considered a good fit
- 5 < GEH < 10 => Flows may require further investigation
- 10 < GEH => Flows cannot be considered to be a good fit

The results from Tables 1 & 2 show that the volume criteria were met for the AM and PM peak periods.

Table 1. 2012 Existing AM Peak Hour Calibrated VISSIM Volume						
Intersection	**Approach**	**Movement**	**AVG VISSIM**	**Field**	**Difference**	**GEH**
George Washington Way/Columbia Point Drive	NB	Left	125.6	126	-0.3%	0.04
		Through	1902	1919	-0.9%	0.39
		Right	227.9	232	-1.8%	0.27
	EB	Left	21.4	20	7.0%	0.31
		Through	36.7	36	1.9%	0.12
		Right	105.3	108	-2.5%	0.26
	SB	Left	97.7	100	-2.3%	0.23
		Through	953.3	970	-1.7%	0.54
		Right	11.3	12	-5.8%	0.21
	WB	Left	159.8	159	0.5%	0.06
		Through	23.7	23	3.0%	0.14
		Right	86.3	88	-1.9%	0.18

Table 2 - 2012 Existing PM Peak Hour Calibrated VISSIM Volume						
Intersection	**Approach**	**Movement**	**AVG VISSIM**	**Field**	**Difference**	**GEH**
George Washington Way/Columbia Point Drive	NB	Left	245	248	-1%	0.20
		Through	1358	1348	1%	0.26
		Right	276	279	-1%	0.19
	EB	Left	35	32	9%	0.52
		Through	76	76	0%	0.03
		Right	305	307	-1%	0.13
	SB	Left	152	174	-13%	1.73
		Through	2271	2447	-7%	3.63
		Right	30	34	-12%	0.74
	WB	Left	378	400	-6%	1.14
		Through	56	55	1%	0.09
		Right	89	89	0%	0.01

Goal 2: Queuing meets the visually acceptable queuing at the intersections. Each average queue length at the intersections is within ±20% of field observed average queue length for each timing cycle for more than 85% of cases or within 1 or 2 vehicles difference at the intersections.

The field measured queue lengths for the signal red time were compared to the 95% queue length values in the simulation. The queue data for the George Washington Way/Columbia Point Drive intersection were observed from 7:30 am to 8:30 am, and 4:30 pm to 5:30pm. As shown in the Table 3 & 4, more than 85% of the cases of the queue lengths from the calibrated VISSIM model are within ±20% of the field observed average queue length for each timing cycle. Also, the VISSIM model shows visually acceptable queuing at the intersections along the corridor.

Table 3. 2012 Existing AM Queue (7:30 am ~ 8:00am)					
Intersection	**Approach**	**Movement**	**AVG 95% VISSIM**	**Field**	**Difference**
George Washington Way/Columbia Point Drive	NB	Left	86.49	100	-14%
		Through	252.44	300	-16%
		Right	0	0	0%
	EB	Left	52.41	50	5%
		Through	52.37	50	5%
		Right	0	0	0%
	SB	Left	72.1	75	-4%
		Through	127.57	160	-20%
		Right	126.52	160	-21%
	WB	Left	65.09	60	8%
		Through	65.09	60	8%
		Right	86.49	100	-14%

Table 3 (Contd.). 2012 Existing AM Queue (8:00 am ~ 8:30am)					
Intersection	**Approach**	**Movement**	**AVG 95% VISSIM**	**Field**	**Difference**
George Washington Way/Columbia Point Drive	**NB**	**Left**	**96.17**	**120**	**-0.1985833**
		Through	320.13	360	-11%
		Right	0	0	0%
		Left	97.86	100	-2%
		Through	97.83	100	-2%
		Right	5.01	0	0%
		Left	88.74	100	-11%
		Through	144.43	150	-4%
		Right	143.41	150	-4%
		Left	101.15	100	1%
		Through	101.15	100	1%
		Right	0	0	0%

Table 4. 2012 Existing PM Queue (4:30 pm ~ 5:30 pm)					
Intersection	**Approach**	**Movement**	**AVG 95% VISSIM**	**Field**	**Difference**
George Washington Way/Columbia Point Drive	NB	Left	496.06	400	10.20%
		Through	302.62	278	8.90%
		Right	0	0	0.00%
	EB	Left	234.23	250	-6.30%
		Through	234.2	250	-6.30%
		Right	687.89	722	-4.70%
	SB	Left	168.7	197	-14.40%
		Through	1334.68	1200	6.80%
		Right	1333.63	1200	6.70%
	WB	Left	480.32	425	13.00%
		Through	480.32	425	13.00%
		Right	0	0	10.20%

CONCLUSIONS

This memorandum describes the procedure used to calibrate the VISSIM Microsimulation model for the study area intersections. The procedure included the gathering and processing of field data, and microscopic simulation with VISSIM. The traffic volumes and queue lengths were collected in the field and used to calibrate the base model following the FHWA Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software. The calibrated existing 2012 AM peak hour and PM peak hour VISSIM models meet the calibration and validation criteria using reasonable modifications to the VISSIM's driver behavior parameters. The calibrated VISSIM models accurately represent the field-measured traffic conditions with respect to the traffic volumes and queue lengths.