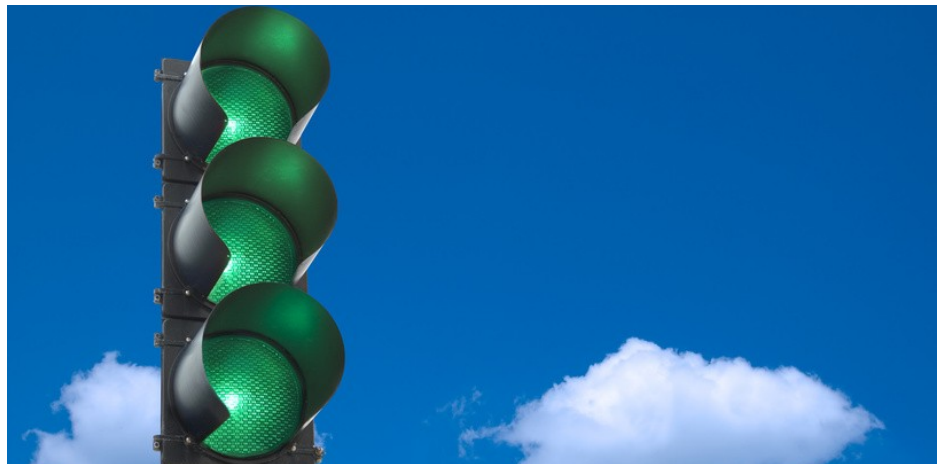




LAKE OSWEGO NORTH END DOWNTOWN REVITALIZATION



STAKEHOLDERS

LORA
Stakeholders Advisory Group
Friends of the Lake Oswego Library
Lake Oswego Chamber of Commerce
Lake Oswego Downtown Business
District Association
Lakewood Center for the Arts

STUDY TEAM

Leland Consulting Group
Myhre Group Architects
DKS Associates
KPFF Consulting Engineers Inc.
GEL Oregon Inc.
Rick Williams Consulting
Lake Oswego Library
LORA

DKS ASSOCIATES

FUTURE TRANSPORTATION CONDITIONS



LELAND CONSULTING GROUP

Technical Memorandum

DATE: October 8, 2010

TO: Jane Blackstone, City of Lake Oswego

FROM: Alan Snook, AICP
Miranda Wells, EIT

**SUBJECT: Downtown Lake Oswego North Anchor Redevelopment
Future Transportation Operations**

P10077-000

The purpose of this memorandum is to document the results from the traffic analysis conducted for the “North Anchor” area of downtown Lake Oswego, and identify potential impacts associated with the proposed redevelopment plans for the area. This memorandum summarizes the redevelopment plans, methodology for analysis, corresponding traffic operations, and potential mitigation strategies when impacts occur. It should be noted that this analysis is focused on exploring the sensitivity of the surrounding transportation network with regards to the proposed development.

Executive Summary

The downtown Lake Oswego area known as “North Anchor” is proposed to be redeveloped and for analysis purposes includes a library, hotel, retail, and housing. The redevelopment may occur in stages with the blocks containing the library, hotel, retail, and housing occurring first. Traffic analysis was conducted on this first portion of redevelopment to determine potential impacts and capacity constraints, then explored mitigation strategies and adding additional development in the area.

An initial analysis of 2020 No-Build p.m. peak conditions was done and that analysis indicated, the intersections with the least amount of capacity are the intersections along OR 43. With the intersection of OR 43/A Avenue being over capacity. All of the other intersections under City jurisdiction met standards (LOS D or better). The addition of the proposed development (Areas 1 and 2) still showed OR 43/A Avenue over capacity, and now OR 43/B Avenue is at capacity, and over ODOT jurisdictional standards. All City intersections still met standards.

To address capacity issues, two potential roadway improvements were evaluated at the two signalized intersections along OR 43 that do not meet standards. These recommendations would provide more capacity for redevelopment in the “North Anchor” area and are as follows:

- SW A Avenue/OR 43: add a southbound right turn pocket
- SW B Avenue/OR 43: restripe the eastbound right turn lane to allow a shared right/left turn lane

If the above recommended mitigations were implemented, then additional development could be pursued as well. Future traffic analysis indicated that approximately half of the additional proposed development beyond Areas 1 and 2 could be accommodated before the roadway network would be over capacity for the p.m. peak 2020 planning horizon.

Project Description

The full proposal redevelopment plan for the “North Anchor” area is portioned into six specific areas (see Figure 1). Area 1 includes a new library, hotel, residential, and retail land uses. Area 2 includes a mixture of residential and supportive parking. Area 1 does not have any parking on site, and parking for this area would be provided in Area 2 by a parking structure. Areas 3 through 6 include a mixture of residential, office, retail, and parking.

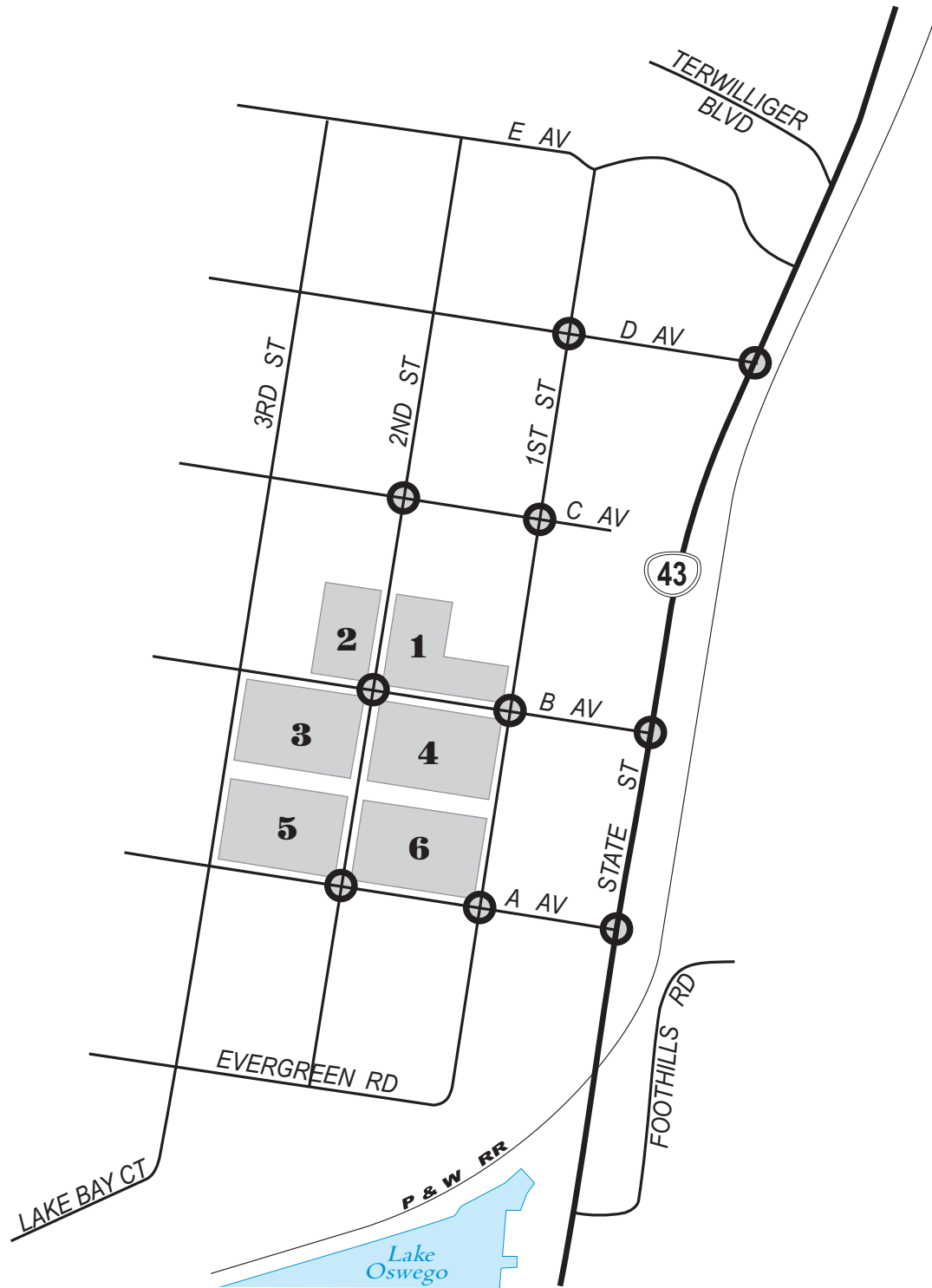
Assumptions

The following section documents the assumptions that were used in the traffic analysis for the proposed redevelopment of the downtown Lake Oswego “North Anchor” area.

Analysis Scenarios

For the purpose of this analysis there were two redevelopment analysis scenarios and a no-build scenario for a basis of comparison. The planning horizon is assumed to be 2020 and based on existing conditions analysis the p.m. peak hour has the highest level of traffic activity and therefore the p.m. peak hour was also selected as the analysis period for the future planning horizon. The No-Build scenario assumes approved comprehensive plan, existing lane configurations, and existing intersection control with optimized signal timings. The build scenarios assume the following

- Scenario 1: Areas 1 and 2 of the redevelopment plan is completed, existing lane configuration and control with optimized signal timings.
- Scenario 2: Adds Areas 3 through 6 incrementally, existing lane configuration and control with optimized signal timings.



LEGEND

⊕ - Study Intersection

1 - Redevelopment Area & Number

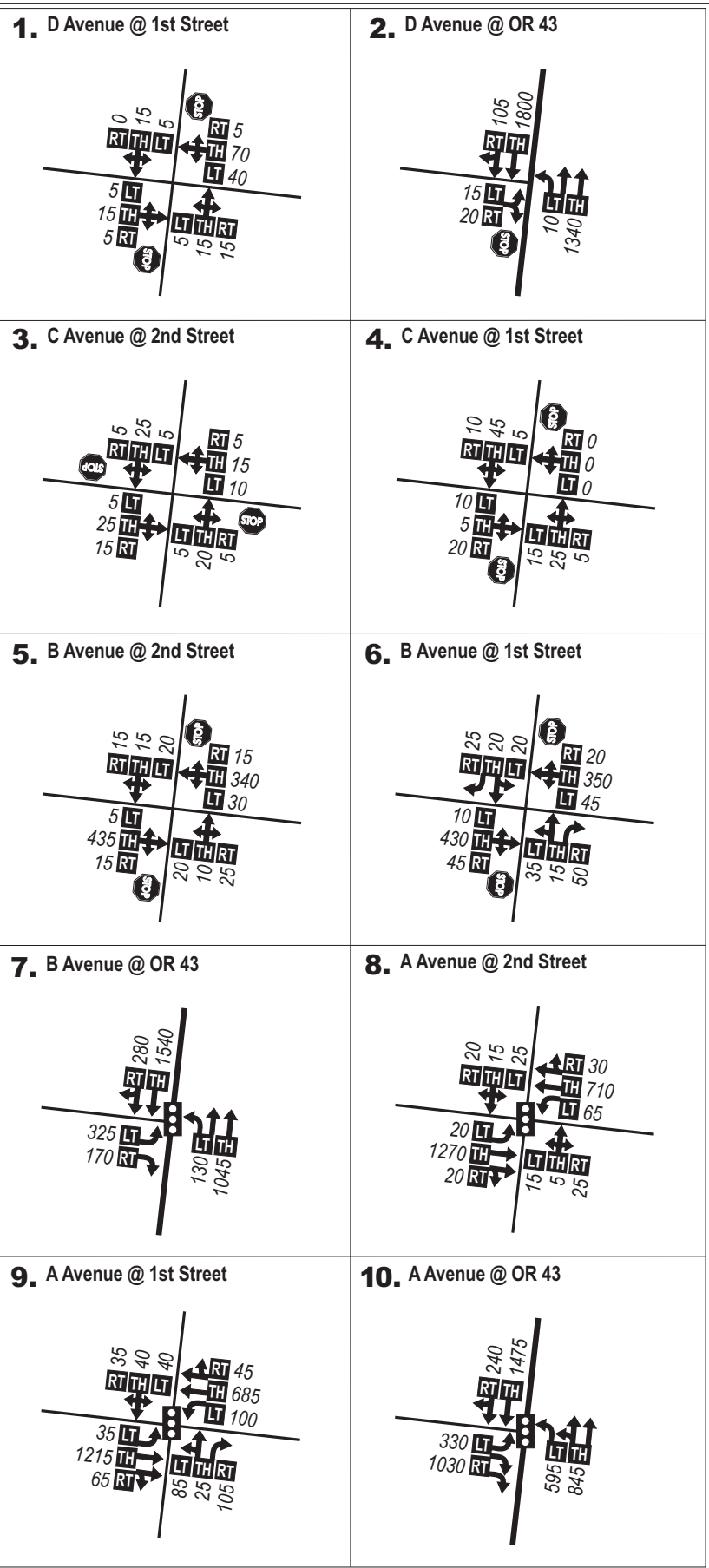
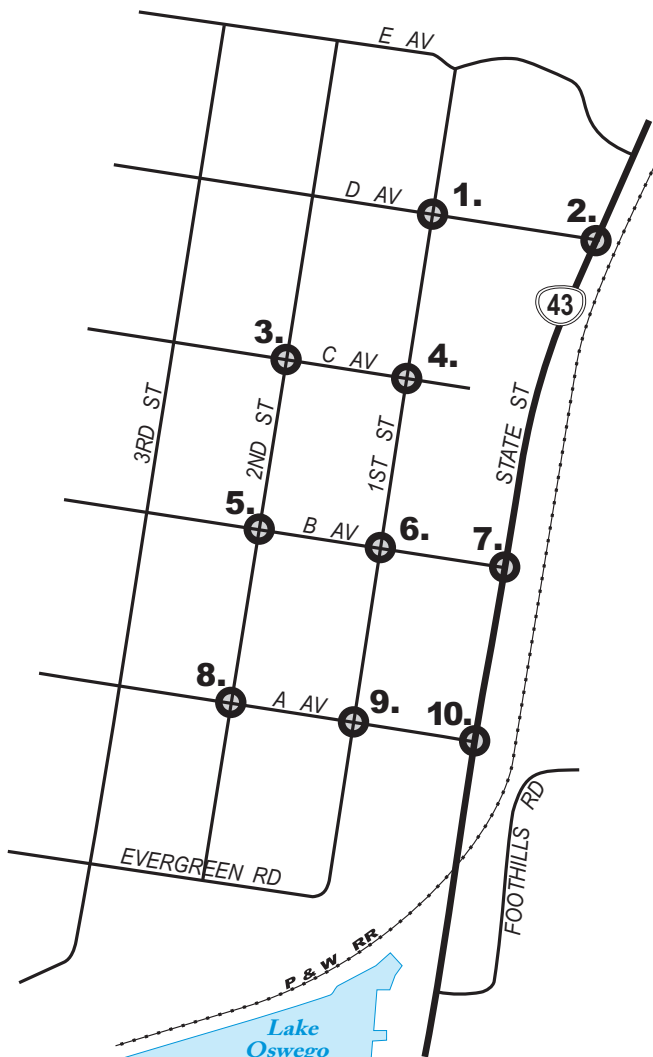
DKS Associates
TRANSPORTATION SOLUTIONS



NO SCALE

Figure 1

STUDY AREA



LEGEND

- 1. ○** - Study Intersection & Number
- 000** - PM Peak Hour Traffic Volume
- ←** - Lane Configuration
- LT TH RT** - Volume Turn Movement
- STOP** - Stop Sign
- ⬮** - Traffic Signal

LT TH RT
Left • Thru • Right

DKS Associates
TRANSPORTATION SOLUTIONS

Figure 2

**2020 NO-BUILD
PM PEAK HOUR
TRAFFIC VOLUMES**

NO SCALE

Traffic Volumes

Background growth for streets in the study area was estimated using Metro’s 2005 and 2035 (State RTP) Regional Travel Demand Models. Linear annual growth rates (2.1% to 2.8%) were seen on the streets along regional connections (Highway 43 and A Avenue) based on the model that represents the downtown Lake Oswego area projections. The average annual growth rate (2.4%) calculated from the values obtained in the model was applied to all intersections within the study area to determine the base 2020 No-Build traffic volumes. The 2020 No-Build traffic volumes used in the traffic analysis in this memo are provided in Figure 2.

Trip Distribution

Trip distribution for the redevelopment area was estimated using Metro’s Regional Travel Demand Model. The transportation Analysis Zone in the travel demand model, which represents downtown Lake Oswego, was used to estimate trip distribution to/from the major roadways in the study area. The trip distribution for the redevelopment area is provided in Figure 3.

Trip Generation

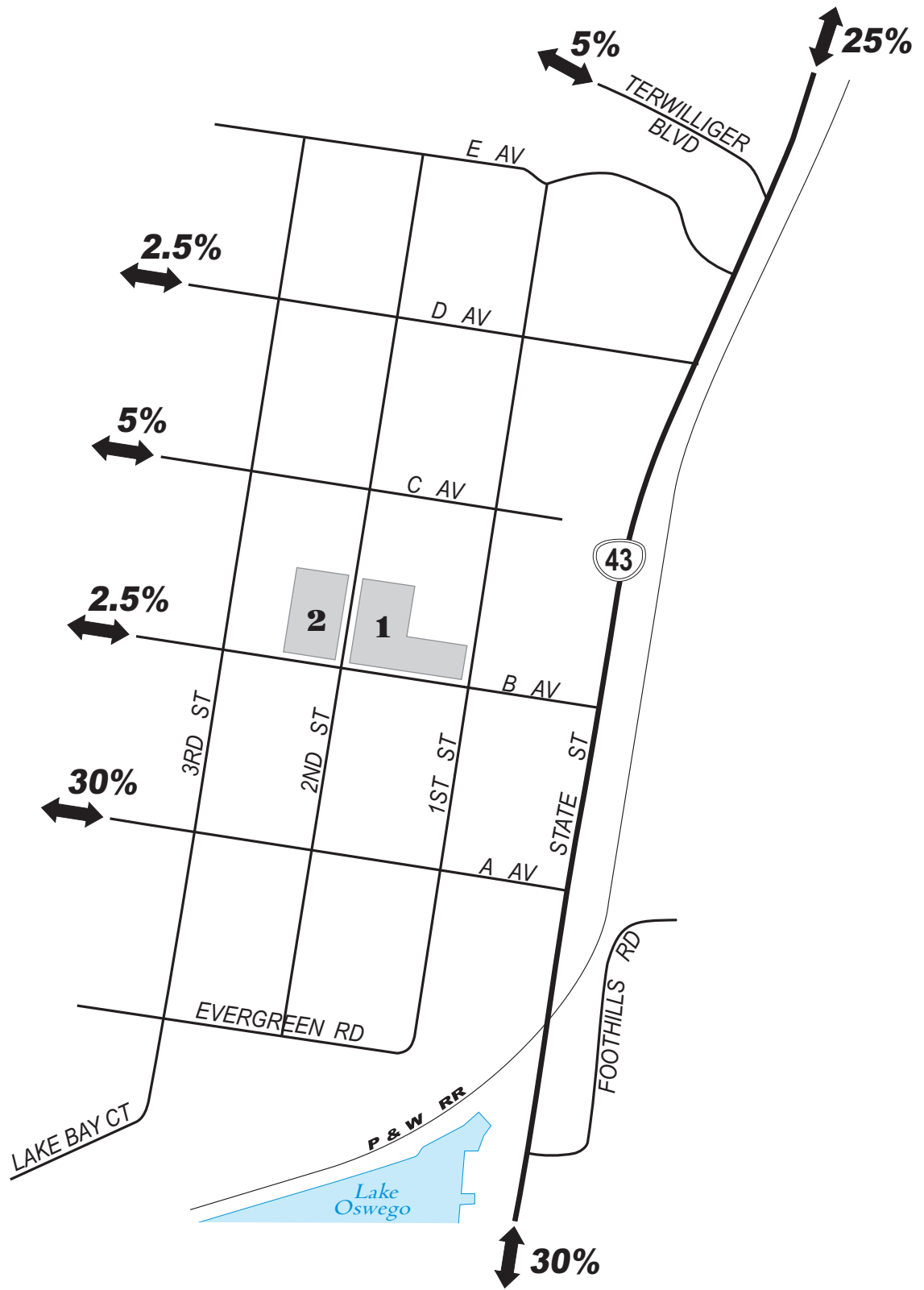
The project traffic expected to be generated by land uses for each area was calculated using the *ITE Trip Generation Handbook*¹ and were based on the given size of each development (see Attachment A). In the redevelopment area there are existing land uses that generate traffic, therefore, to determine the total future traffic that in the area, the existing site traffic was subtracted from the network, and the projected new project traffic was added back in. The existing site traffic was also calculated using the *ITE Trip Generation Handbook*. Table 1 provides a summary of the existing and net new project traffic for Areas 1 and 2. Attachment B provides detailed calculations for the trip generation by individual land use.

Table 1 – Area 1 and Area 2 PM Peak Hour Trip Generation

Redevelopment Area	Total Trip Generation		
	In	Out	Total
Area 1 and 2 Existing Traffic Removed	(97)	(172)	(267)
Area 1 and 2 Proposed Traffic Added	277	236	513
Net New Traffic	180	64	246

The total net new project traffic for Scenario 1, as shown in Table 1, was distributed to the network using trip distribution patterns shown in Figure 3 to determine the total added project traffic (see Figure 4). This traffic was then added to the base 2020 No-Build traffic volumes in Figure 2 to develop the 2020 Scenario 1 traffic volumes (see Figure 5) used in the traffic analysis.

¹ Trip Generation, 8th Edition, Institute of Transportation Engineers



LEGEND

00% - Trip Distribution Percentage



- Project Site (Areas 1 & 2)

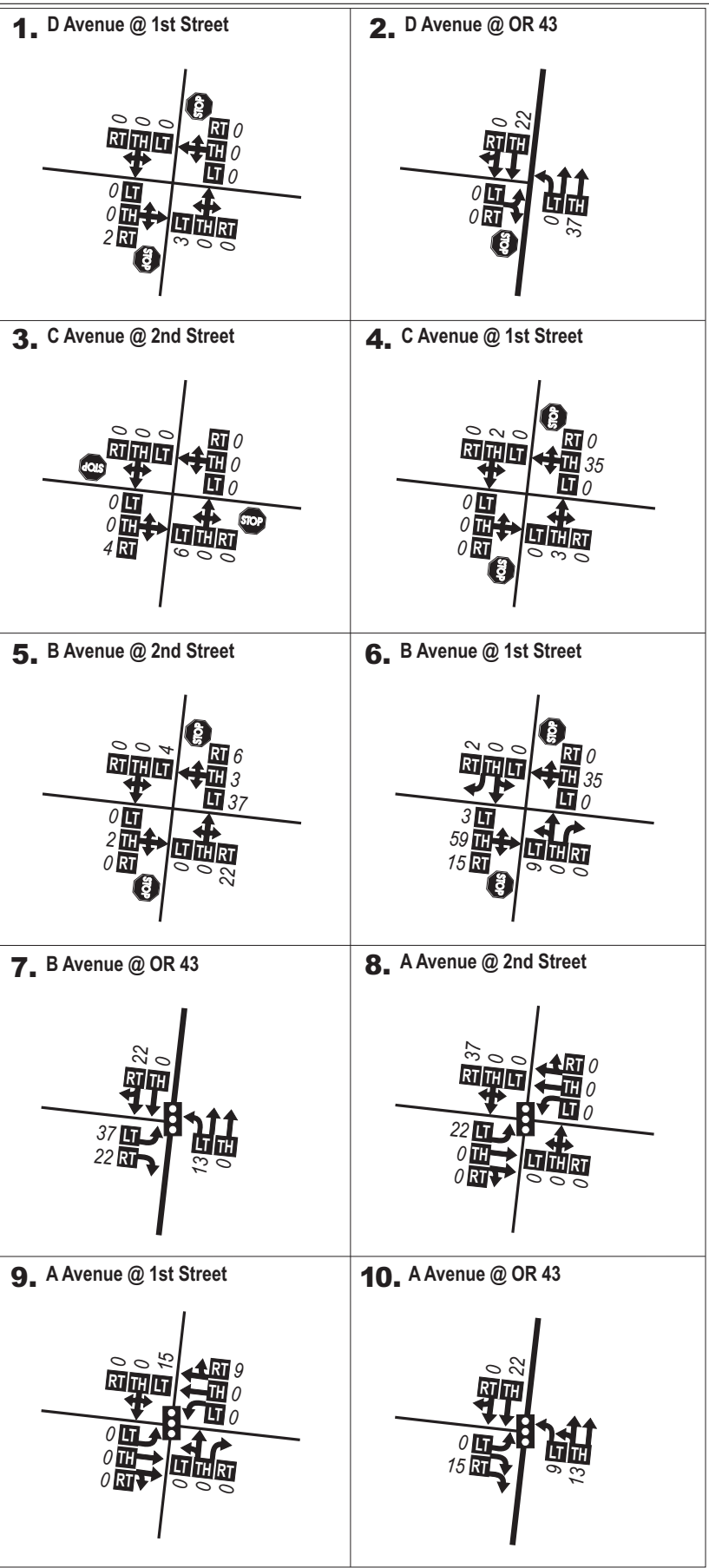
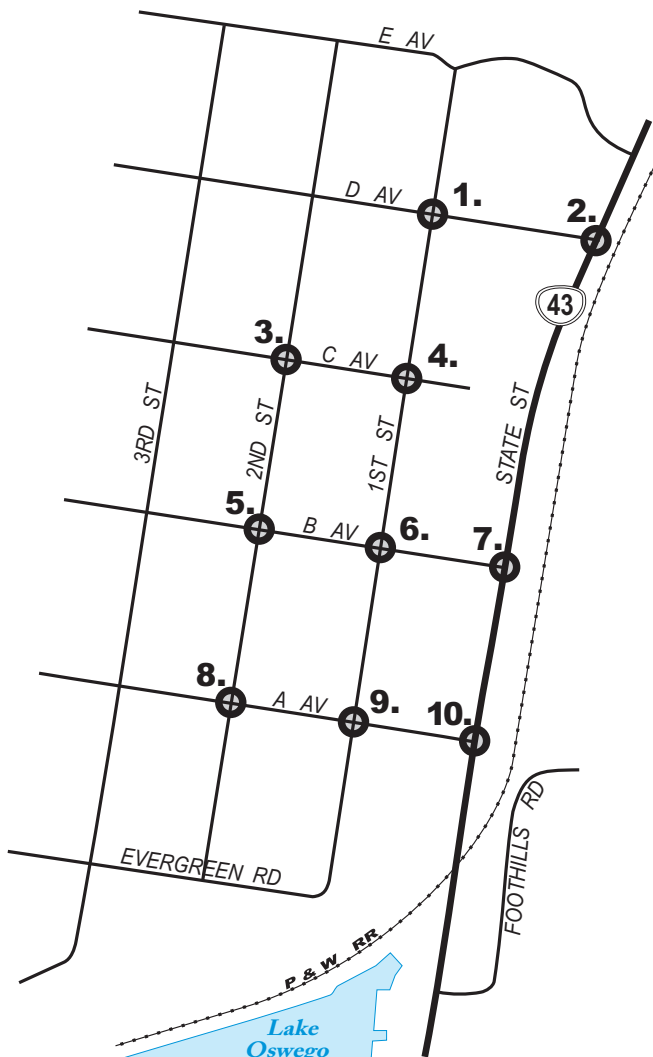
DKS Associates
TRANSPORTATION SOLUTIONS



NO SCALE

Figure 3

PROJECT TRIP DISTRIBUTION



LEGEND

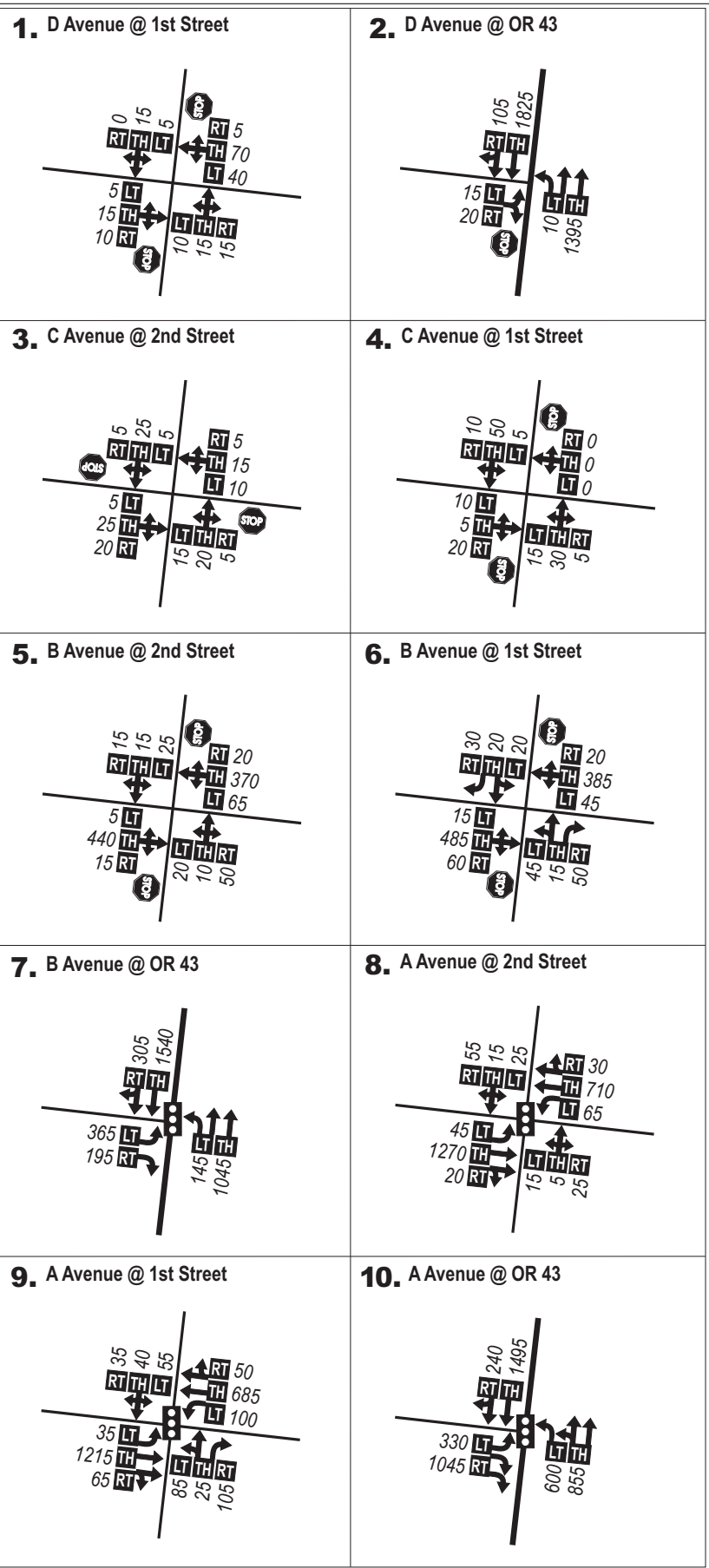
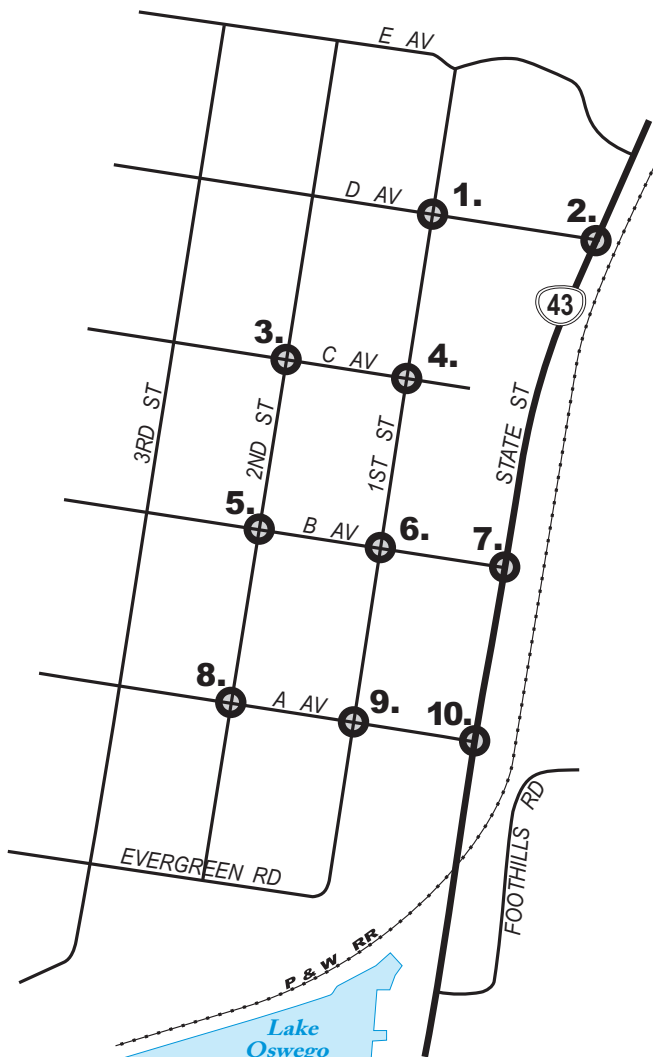
- 1. ○ - Study Intersection & Number
- 000 - PM Peak Hour Traffic Volume
- ← - Lane Configuration
- LT TH RT - Volume Turn Movement
Left • Thru • Right
- STOP - Stop Sign
- ⬮ - Traffic Signal

DKS Associates
TRANSPORTATION SOLUTIONS

Figure 4

**SCENARIO 1:
TOTAL NEW PROJECT
TRAFFIC PM PEAK HOUR**

NO SCALE



LEGEND

- 1. ○** - Study Intersection & Number
- 000** - PM Peak Hour Traffic Volume
- ←** - Lane Configuration
- LT TH RT** - Volume Turn Movement
- STOP** - Stop Sign
- ⬮** - Traffic Signal

Left • Thru • Right

DKS Associates
TRANSPORTATION SOLUTIONS

Figure 5

**2020 SCENARIO 1
PM PEAK HOUR
TRAFFIC VOLUMES**

NO SCALE

Intersection Operations

An intersection's level of service (LOS) is similar to a "report card" rating, based on average vehicle delay. Level of service A, B and C indicates conditions where vehicles can move freely. Level of service D and E are progressively worse. Level of service for the 2020 No-Build scenario and 2020 Scenario 1 were obtained using Synchro 7 which follows the *2000 Highway Capacity Manual*² methodology.

Performance standards for study intersections vary depending on the jurisdiction of the roadway. Study intersections for this project are currently under two jurisdictions, ODOT and the City of Lake Oswego. The agency standard for ODOT intersection is a volume-to-capacity (v/c) of 0.99 or better, and the City of Lake Oswego standard is a level of service (LOS) D or better. All intersections along OR 43 are under ODOT jurisdiction, and all other intersections are under the City of Lake Oswego jurisdiction.

Table 2 lists the future 2020 No-Build intersection performance in comparison with 2020 Scenario 1 intersection performance. This analysis was performed using the traffic volumes provided in previous figures and the existing roadway configuration with optimized signal timings.

Table 2: 2020 PM Peak Hour Intersection Performance

Intersection	Intersection Control	2020 No-Build		2020 Scenario 1	
		LOS	V/C	LOS	V/C
SW D Avenue/OR 43	Unsignalized	A/F	0.91	A/F	0.99
SW D Avenue/SW 1 st Street	All-Way Stop	A	0.15	A	0.15
SW C Avenue/SW 1 st Street	Unsignalized	A/A	0.04	A/A	0.04
SW C Avenue/SW 2 nd Street	Unsignalized	A/A	0.05	A/A	0.06
SW B Avenue/OR 43	Signal	D	0.96	D	1.00
SW B Avenue/SW 1 st Street	Unsignalized	A/C	0.24	A/D	0.35
SW B Avenue/SW 2 nd Street	Unsignalized	A/C	0.19	A/D	0.29
SW A Avenue/OR 43	Signal	D	1.02	D	1.04
SW A Avenue/SW 1 st Street	Signal	B	0.70	B	0.71
SW A Avenue/SW 2 nd Street	Signal	A	0.53	A	0.52

Notes: LOS = Level of service, V/C = Volume-to-Capacity

V/C for unsignalized intersections = v/c for worst street, V/C for signalized intersection = v/c for intersection

X/X for unsignalized LOS = Main street worst LOS/Side street (stop control) worst LOS

X for all-way stop LOS = Average intersection delay, X for signalized intersections LOS = Average intersection delay

Bold = Intersections not meeting jurisdictional standards

As can be seen in Table 2, the intersection of SW A Avenue/OR 43 is operating above jurisdictional standards in both the 2020 No-Build and 2020 Scenario 1. A potential mitigation

² 2000 Highway Capacity Manual, Transportation Research Board, 2000

strategy of a southbound right turn pocket was tested. This allowed for adequate operations under both the 2020 No-Build as well as Scenario 1.

The intersection of SW B Avenue/OR 43 is over jurisdictional standards with the added project trips, but meets standards under the 2020 No-Build. A potential mitigation strategy tested was to restripe the eastbound approach lanes from a separate right and left turn, to a separate left turn with a shared right/left lane. Table 3 provides a summary of operations for the 2020 No-Build scenario mitigated in comparison to the 2020 Scenario 1 mitigated.

Table 3: P.M. Peak Hour Intersection Performance: No-Build (Mitigated) vs. Scenario 1 (Mitigated)

Intersection	Intersection Control	2020 No-Build (Mitigated)		2020 Scenario 1 (Mitigated)	
		LOS	V/C	LOS	V/C
SW D Avenue/OR 43	Unsignalized	A/F	0.90	A/F	0.97
SW D Avenue/SW 1 st Street	All-Way Stop	A	0.15	A	0.15
SW C Avenue/SW 1 st Street	Unsignalized	A/A	0.04	A/A	0.04
SW C Avenue/SW 2 nd Street	Unsignalized	A/A	0.05	A/A	0.06
SW B Avenue/OR 43	Signal	C	0.87	C	0.91
SW B Avenue/SW 1 st Street	Unsignalized	A/C	0.24	A/D	0.35
SW B Avenue/SW 2 nd Street	Unsignalized	A/C	0.21	A/D	0.29
SW A Avenue/OR 43	Signal	C	0.90	C	0.91
SW A Avenue/SW 1 st Street	Signal	B	0.68	B	0.68
SW A Avenue/SW 2 nd Street	Signal	A	0.51	A	0.51

Notes: LOS = Level of service, V/C = Volume-to-Capacity
 V/C for unsignalized intersections = v/c for worst street, V/C for signalized intersection = v/c for intersection
 X/X for unsignalized LOS = Main street worst LOS/Side street (stop control) worst LOS
 X for all-way stop LOS = Average intersection delay, X for signalized intersections LOS = Average intersection delay

As can be seen in Table 4, with the addition of project traffic from Areas 1 and 2 (Scenario 1), and with the proposed mitigations, all intersections would meet jurisdictional standards. In additions, there is additional capacity at the intersections for more potential redevelopment to occur.

Scenario 2

This scenario is an incremental analysis of the additional development of Areas 3 through 6 to determine how much potential redevelopment can be added to the proposed Areas 1 and 2 until the traffic network reaches or exceeds capacity (volume to capacity ratios at or greater than 1.0). Using the *ITE Trip Generation Handbook*, existing and proposed trip generation for each area was calculated to determine the total new projected trip generation for each sub area.

Utilizing the net new trip generation for Areas 3 through 6, incremental analysis was conducted using one sub area at a time starting with sub area 3. Operations analysis assuming the potential redevelopment of Areas 1 through 3 showed that all intersections were expected to operate within jurisdictional standards, and all are expected to operate at or below a 1.0.

Operations analysis was then conducted assuming Scenario 1 was in place with the addition of Areas 3 and 4. Table 4 shows a summary of the p.m. peak hour results from this operational analysis in comparison to the results from the redevelopment of just Areas 1 and 2.

Table 4: P.M. Peak Hour Intersection Performance: Scenario 1 (Mitigated) vs. Scenario 2 (Mitigated)

Intersection	Intersection Control	2020 Scenario 1 (Mitigated)		2020 Scenario 2 (Mitigated)*	
		LOS	V/C	LOS	V/C
SW D Avenue/OR 43	Unsignalized	A/F	0.97	A/F	1.10
SW D Avenue/SW 1 st Street	All-Way Stop	A	0.15	A	0.19
SW C Avenue/SW 1 st Street	Unsignalized	A/A	0.04	A/A	0.04
SW C Avenue/SW 2 nd Street	Unsignalized	A/A	0.06	A/A	0.07
SW B Avenue/OR 43	Signal	C	0.91	D	0.96
SW B Avenue/SW 1 st Street	Unsignalized	A/D	0.35	A/E	0.54
SW B Avenue/SW 2 nd Street	Unsignalized	A/D	0.29	A/E	0.41
SW A Avenue/OR 43	Signal	C	0.91	C	0.94
SW A Avenue/SW 1 st Street	Signal	B	0.68	B	0.76
SW A Avenue/SW 2 nd Street	Signal	A	0.51	A	0.52

*Scenario 2 includes project traffic from Areas 1 through 4

Notes: LOS = Level of service, V/C = Volume-to-Capacity

V/C for unsignalized intersections = v/c for worst street, V/C for signalized intersection = v/c for intersection

X/X for unsignalized LOS = Main street worst LOS/Side street (stop control) worst LOS

X for all-way stop LOS = Average intersection delay, X for signalized intersections LOS = Average intersection delay

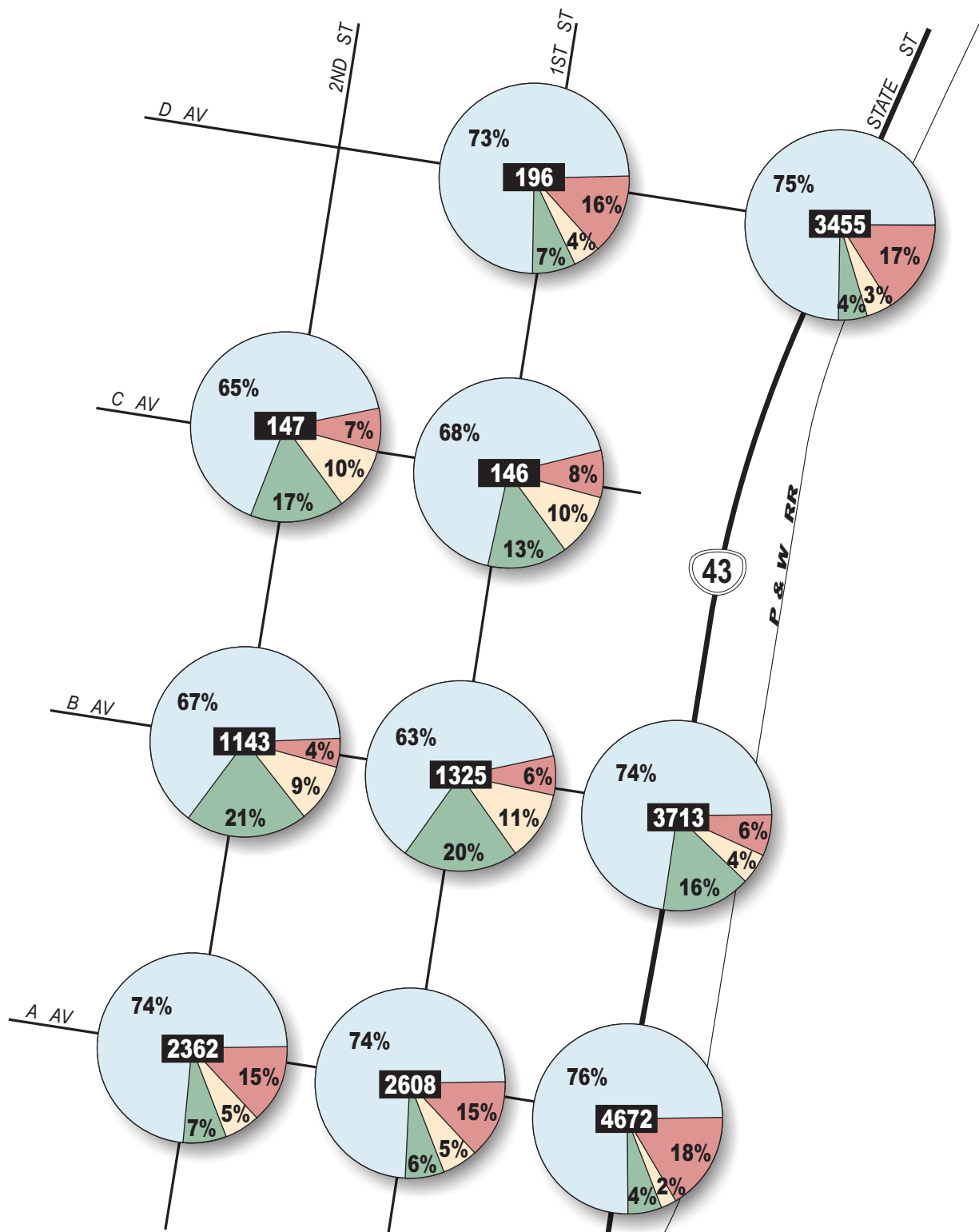
Bold = Intersections not meeting jurisdictional standards

As shown in this table, the only intersection operating above a volume to capacity ratio of 1.0 is the intersection of SW D Avenue/OR 43. It is important to note that the eastbound movement causing the intersection to operate above available capacity is a small fraction of the network traffic. Additionally, the traffic added to that intersection from the project is only a small portion of the total intersection traffic (7% from Scenario 1 and 14% from Scenario 2) and that the total eastbound movement is less than 30 cars. Figure 6 provides a graphical representation of the project traffic contribution by intersection for Scenario 1 (Areas 1 and 2) and Scenario 2 (assumes Areas 3 and 4) and Table 5 provides a summary of the total added project traffic for Areas 3 and 4

Table 1 – Area 3 and Area 4 PM Peak Hour Trip Generation

Redevelopment Area	Total Trip Generation		
	In	Out	Total
Area 3 Existing Traffic Removed	(32)	(47)	(79)
Area 3 Proposed Traffic Added	98	155	253
Area 3 Net New Traffic	66	109	174
Area 4 Existing Traffic Removed	(49)	(63)	(112)
Area 4 Proposed Traffic Added	98	155	253
Area 4 Net New Traffic	49	92	141

Because the intersection of SW D Avenue/OR 43 is over capacity with Areas 1 through 4 project traffic added to the network and because it is not anticipated that any other areas would be developed by 2020, no further traffic operations analysis of additional areas was conducted.



LEGEND

- Existing (2010)
- 2020 No-Build
- Scenario 1 (Area 1 & Area 2)
- Scenario 2 (Area 3 & Area 4)

0000 - Total Entering Traffic Volume (Scenario 2)

DKS Associates
TRANSPORTATION SOLUTIONS



Figure 6

PROJECT TRAFFIC CONTRIBUTION BY INTERSECTION

Additional Traffic Sensitivity Analysis

Additional sensitivity analysis for the future year 2025 was conducted to determine if any additional areas could be redeveloped. All analysis for future years was assumed to be on the mitigated street network with optimized signal timings. Table 5 shows a summary of the 2020 No-Build mitigated network in comparison with the 2025 No-Build mitigated network.

Table 5: 2020 vs. 20205 P.M. Peak Hour Intersection Comparison

Intersection	Intersection Control	2020 No-Build (Mitigated)		2025 No-Build (Mitigated)	
		LOS	V/C	LOS	V/C
SW D Avenue/OR 43	Unsignalized	A/F	0.90	A/F	2.03
SW D Avenue/SW 1 st Street	All-Way Stop	A	0.15	A	0.17
SW C Avenue/SW 1 st Street	Unsignalized	A/A	0.04	A/A	0.04
SW C Avenue/SW 2 nd Street	Unsignalized	A/A	0.05	A/B	0.11
SW B Avenue/OR 43	Signal	C	0.87	D	0.99
SW B Avenue/SW 1 st Street	Unsignalized	A/C	0.24	A/C	0.33
SW B Avenue/SW 2 nd Street	Unsignalized	A/C	0.21	A/D	0.29
SW A Avenue/OR 43	Signal	C	0.90	D	1.02
SW A Avenue/SW 1 st Street	Signal	B	0.68	B	0.77
SW A Avenue/SW 2 nd Street	Signal	A	0.51	A	0.58

Notes: LOS = Level of service, V/C = Volume-to-Capacity
 V/C for unsignalized intersections = v/c for worst street, V/C for signalized intersection = v/c for intersection
 X/X for unsignalized LOS = Main street worst LOS/Side street (stop control) worst LOS
 X for all-way stop LOS = Average intersection delay, X for signalized intersections LOS = Average intersection delay
Bold = Intersections not meeting jurisdictional standards

As can be seen in Table 6, by the year 2025 two intersections are above jurisdictional standards and are over capacity. This indicates that even with the potential improvements in the study area, the transportation network is very sensitive to moderate growth on corridors and would need more extensive mitigation to extend beyond a planning horizon of 2025.

Signal Warrant Analysis

Signal warrants were evaluated at all unsignalized study intersections to see if they would meet signal warrants. As part of this study only p.m. peak hour counts have been collected and therefore only signal warrant three (p.m. peak hour) was evaluated. Table 6 provides a summary of the results from the warrant analysis for all unsignalized intersections. As can be seen in Table 6, these intersections do not meet signal warrants.

Table 6 – Summary of Signal Warrant Analysis

	2020 No-Build	2020 Scenario 1	2020 Scenario 2
Intersection	Warrant Met?	Warrant Met?	Warrant Met?
SW D Avenue/OR 43	No	No	No
SW D Avenue/SW 1 st Street	No	No	No
SW C Avenue/SW 1 st Street	No	No	No
SW C Avenue/SW 2 nd Street	No	No	No
SW B Avenue/SW 2 nd Street	No	No	No

Mitigation Strategies

Based on the traffic analysis for downtown Lake Oswego “North Anchor” area potential recommendations to accommodate the proposed redevelopment of Areas 1 and 2 (and up to Areas 3 through 4) include:

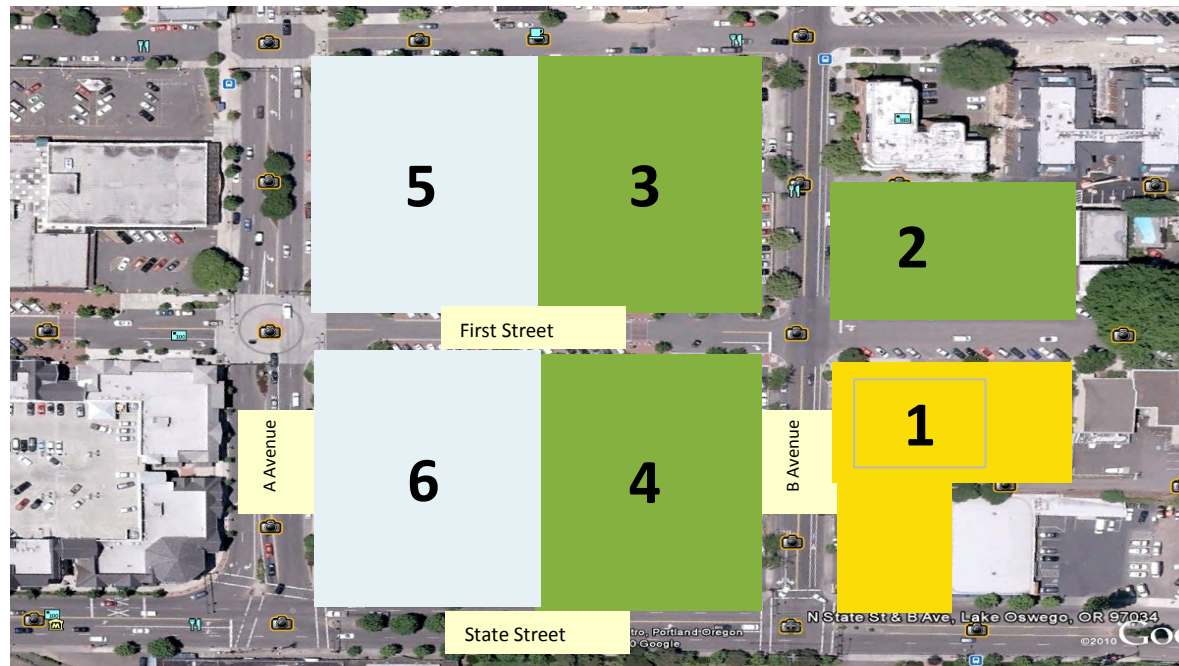
- SW A Avenue/OR 43: add a southbound right turn pocket
- SW B Avenue/OR 43: restripe the eastbound right turn lane to allow a shared right/left turn lane

The analysis in this memorandum focused on a sensitivity of the transportation network for the feasibility of the potential redevelopment of the “North Anchor” area. Additional and more detailed analysis should be done when, and if, the proposed development is moved forward to a development and construction stage because the assumptions in this memorandum related to land use or size of development may change over time.

Attachment A Development Program

Preliminary Lake Oswego Downtown Revitalization Development Program (DRAFT)

	Land Uses: Quantities										
	Library (s.f.)	Hotel (s.f.)	Housing (s.f.)	Housing (units)	Office (s.f.)	Retail (s.f.)	Parking (s.f.)	Parking (stalls)	Conferencing/ Community Space	Public Greenroof/ Courtyard	Total
Area 1	60,000	50,600	50,600	64		1,500			2,600	7,500	122,200*
Area 2			32,200	41		7,300	71,700	200			111,200
Area 3			62,400	79	15,600	30,300	40,300	120			148,600
Area 4			62,400	79	15,600	30,300	40,300	120			148,600
Area 5			62,400	79	15,600	30,300	40,300	120			148,600
Area 6			35,400	45	8,850	14,375	9,300	30			67,925
TOTAL	60,000	50,600	305,400	387	55,650	114,075	201,900	590	2,600	7,500	747,100



Housing as an alternative to hotel in Area 1. Only one or the other.
 Number of units corresponding to square footage (not in addition).

* Total square footage not including housing in Area 1

Attachment B

Trip Generation Calculations

Proposed Land Use

	Library (sf)	Hotel (sf)	Hotel (rooms)	Housing (s.f)	Housing (units)	Office (sf)	Retail (sf)	Library (590)			Hotel (310)			Residential Condo/Townhome (230)			General Office Building (710)			Specialty Retail Center (814)			Total		
								In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
Area 1	60,000	50,600	84	50,600	64		1,500	153	141	295	27	20	47	37	21	58	-	-	-	11	14	25	228	196	424
Area 2				32,200	41		7,300	-	-	-	-	-	-	32	18	50	-	-	-	17	22	39	49	40	89
Area 3				62,400	79	15,600	30,300	-	-	-	-	-	-	40	23	63	16	80	96	41	53	94	98	155	253
Area 4				62,400	79	15,600	30,300	-	-	-	-	-	-	40	23	63	16	80	96	41	53	94	98	155	253
Area 5				62,400	79	15,600	30,300	-	-	-	-	-	-	40	23	63	16	80	96	41	53	94	98	155	253
Area 6				35,400	45	8,850	14,375	-	-	-	-	-	-	33	18	51	15	74	89	25	31	56	72	123	196
Total	60,000	50,600	84	305,400	387	55,650	114,075	153	141	295	27	20	47	222	125	347	64	313	378	177	225	403	644	825	1,469

Existing Land Use

	Sp Retail (sf)	Gen Office (sf)	Med Office (sf)	Hair Salon (sf)	High Turnover Resturant (sf)	Specialty Retail Center (814)			General Office Building (710)			Medical-Dental Office Building (720)			Hair Salon (918)			High-Turnover (Sit-Down) Restaurant (932)			Total			
						In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Area 1	18,700	14,500	-	-	-	29	37	66	16	79	95	-	-	-	-	-	-	-	-	-	-	45	116	161
Area 2	-	-	7,650	3,700	6,500	-	-	-	-	-	-	8	21	29	1	4	5	43	30	72	52	56	106	
Area 3	20,000	-	-	6,500	-	31	39	69	-	-	-	-	-	-	2	8	9	-	-	-	32	47	79	
Area 4	37,800	-	-	-	-	49	63	112	-	-	-	-	-	-	-	-	-	-	-	-	49	63	112	
Total	76,500	14,500	7,650	10,200	6,500	109	139	248	16	79	95	8	21	29	3	12	15	43	30	72	179	281	459	