

MEMORANDUM

DATE: November 6, 2007

TO: Curleigh Carothers, City of Camas

FROM: R. S. McCourt, PE, PTOE
Chris Maciejewski, PE

SUBJECT: **Camas North UGA Expansion Traffic Analysis** P07120-000-000
Future Trips, Framework Plan and Project Cost Evaluation

The expansion of Camas urban growth area (UGA) north of Lacamas Lake will create the need to add several major transportation projects to the City of Camas capital facilities plan (CFP). This memorandum highlights a preliminary analysis of transportation carrying capacity for the area north of Lacamas Lake that is being considered for expansion into the City of Camas. The analysis utilized the RTC 2024 travel demand forecast model as a tool and focused on PM peak hour capacity of roadway "portals" to this expansion area. Portals are roadways that would be the key route providing external access to this proposed expansion of the UGA. The key existing portals include: 28th/Goodwin/13th, Blair Road to the east, 23rd Street to the east and Crown Road to the south.

The following memo highlights the general methodology utilized in the evaluation of the transportation system, the land use assumptions for the analysis, the findings from the future travel demand forecast and the recommended framework of roadways for the north UGA. Preliminary cost estimates are provided and compared to the estimated number of vehicle trips to provides a \$/trip ratio for consideration.

SUMMARY

Key findings from this preliminary analysis include the following:

- Existing roadways in the study area will need to be enhanced to accommodate the new north Camas development. Portals at both ends of the study area (Goodwin and Everett) would run out of capacity with the proposed north UGA development.
- A new diagonal arterial roadway paralleling Leadbetter Road which is three lanes ("north lakefront development road") would be necessary. Leadbetter

would not be utilized for through capacity and a second collector-level roadway would be needed (also linking Everett to 28th).

- Providing a 5-lane connection of Goodwin west to meet 18th improves traffic flow in the west is needed, but by itself does not solve capacity issues on Everett Street to the south and east.
- Providing a new north/south connector roadway between 18th/28th/Goodwin and Parker Street/1st Street would address the remaining capacity issues on both the west and east ends of the lake area.
- An east/west connector road network approximately between 3rd and 10th Streets and from the “north lakefront development road” to 283rd/Blair to the east provides additional capacity that reduces possible intersection problems on Everett, 15th, Blair and Robinson.

The total cost of improvements and right-of-way to provide the framework transportation network would amount to over \$147 million. This would only the framework arterial roadway elements and not include other collector roadways and local street network that would be necessary with development of the north Camas UGA. These collector and local roadways were assumed to be part of the eventual master planning of the land area and would be the responsibility of the developers of the area (such as fronting improvements). Access limitations would be part of the framework roadway network and some access control would be needed on the collector network. These details would need to be part of the development plans submitted to the city for review subsequent to the annexation actions.

It should be noted that the level of development possible with the north UGA will consume all the available capacity on Everett Street and will result in some peak hour congestion. It is unlikely that the solutions to resolve issues on Everett Street (widening) would be acceptable without extensive planning. Master planning of the north UGA is necessary to better understand the actual travel demands and land use patterns that would be proposed. Management of congestion should be possible with the proposed land use designations; however, the level of build out may not be fully to the level outlined in this assessment. The master plan would provide greater understanding of the number of households and employment that are possible, the amount of vehicle trip generation that could be expected and the exact placement of uses to best address future needs (such as placement of commercial uses that internalize trip making within the north UGA).

METHODOLOGY

The RTC travel demand forecast model was utilized for evaluating roadway capacity needs at a conceptual level. The 2024 forecast was used to produce demand-to-capacity ratios for every roadway segment. The objective was to get roadway segments to demand-to-capacity ratios below 1.0 for the PM peak hour for the portals serving the north UGA.

Land use assumptions for the north UGA were made based upon mapping provided by the City of Camas from Clark County. For the 2,046 acres of land in the north UGA, it was assumed that park lands would not develop and 27.5% of the land was allocated toward infrastructure. An additional 25% of the land was assumed to be wetland or other resource lands (undevelopable). The remaining developable areas became the basis for estimating vehicle trips utilizing assumptions regarding the amount of development per acre, building area to land ratios (FAR) and PM peak hour trip generation rates (summarized in Table 1). Combining the land use assumptions with trip generation rates (from ITE *Trip Generation*) created the vehicle trip estimates for the PM peak hour.

Table 1: Land Use Trip Generation and Density Assumptions

<i>Land Use</i>	<i>ITE Land Use</i>	<i>PM Peak Hour Trip Rate</i>	<i>Unit</i>	<i>Density Assumption</i>
Residential Low/Medium Density	Single Family 210	1.01	DU	5 DU/Acre
Residential—High Density	Condominium 210	0.52	DU	15 DU/Acre
Commercial	Shopping Center 820 (assumed 300,000 sf)	3.6	KSF	FAR 0.25 1,000 SF/Employee
Employment Center/ Business Park	Business Park 770	1.29	KSF	FAR 0.20 400 SF/Employee

* FAR: Floor Area Ratio; DU: Dwelling Unit, SF = Square feet of building area

The cost estimation methodology followed the approach utilized previously for the Camas Traffic Impact Fee Study. This approach takes general units of measurement (for grading, pavement, walls, lighting, ...) and applied conceptual planning level unit prices to produce an approximate project cost. Because these are concept level preliminary cost estimates, further work to develop these projects should be undertaken to establish construction budgets. These costs provide approximate order of magnitude costs to construct these improvements.

For future reference in any traffic impact fee studies, the cost estimates also included the cost elements that might be TIF eligible (only those costs between the curbs of the roadway – no frontage costs). Order of magnitude value for right-of-way was also assessed utilizing a general \$10/square foot factor. The cost basis of the data is year 2007. It should be noted that the costs must be escalated to their year of construction. This can be done by factoring the preliminary cost estimates by four to eight percent each year until the year of completion of the project. However, recent escalation of highway construction costs has exceeded this historic trend. Therefore, the WSDOT construction cost index for highway construction should be used to take these 2007 cost estimates forward in the future.

LAND USE AND TRIP GENERATION

The north Camas UGA area was divided into 17 transportation analysis zones relating to the land use designations that were identified by Clark County (Figure 1). Two zones were split due to TAZ boundaries (TAZ 5 and 17). Additionally, an 18th zone was created for the Greg Reservoir annexation area south of 43rd Avenue. Table 2 highlights the land uses and PM peak hour trip potential trip generation based upon the base assumptions. The combined commercial designations would result in about 580,000 SF of commercial development. For this analysis this level of development was considered double what would be appropriate to service the north UGA. Therefore, the trips for the four commercial zones were reduced by half (as shown in Table 1). This was a general assumption for the planning analysis base on the expectation that any commercial/retail uses would be to service the north UGA but not be externally serving. The assumptions for land use generated approximately 4,900 households and 4,250 employees in the north UGA on the nearly 2,050 acres of land. These estimates were made as starting points for analysis of the framework transportation system. It is not likely that the master plan of the north UGA will achieve these levels of development (due to land constraints and transportation capacity limitations). Using these starting points for consideration the future vehicle trip generation capabilities were estimated. The north UGA would potentially generate 6,700 PM peak hour vehicle trips and the Greg Reservoir area would generate about 630 PM peak hour vehicle trips. The total would be about 7,300 trips. There are about 300 vehicle trips in these areas presently resulting in about 7,000 new vehicle trips in the PM peak hour.

PORTAL CAPACITY ANALYSIS

The RTC travel model was utilized for the analysis of demand-to-capacity ratio for roadway segments in the north UGA area and the key access portals. The RTC model was modified to assign enough trips to be comparable to the trip generation analysis of the land development potential (850 trips added to northern areas). The model included about 7,650 PM peak vehicle trips in the key transportation analysis zones (TAZ) that encompass the north Camas UGA (this incorporates the future trips on the UGA lands and the lands within the TAZs that are not part of the UGA - includes TAZs 417, 482, 483, 485, 489 and 490). This provided enough trips to address the north UGA plus residual lands in the TAZs which were not part of the expansion area).

Evaluating the roadway network without enhancements in the 2024 with the north UGA in PM peak hour identified to key portals where demand exceeded capacity in the future (28th/Goodwin/18th to the west and Everett Street/SR 500 to the south). The proposed level of development would place demand to capacity ratios well over 1.0 in the future 2024 PM peak hour (18th at 1.2 and Everett at 1.3).

Table 2: Assumptions for Development and PM Peak Hour Vehicle Trip Generation

Area	Use Types	Residential/Household Areas				Employment Areas				Total Trips In	Total Trips Out	Total Trips		
		Households	Trip Rate	Trips	In	Out	Area - KSF	Trip Rate	Trips				In	Out
1	Single Family - Medium Density	594	1.01	600	390	210	0	0	0	0	0	390	210	600
2	Single Family - High Density	745	0.52	387	252	136	0	0	0	0	0	252	136	387
3	Single Family - Medium Density	342	1.01	346	225	121	0	0	0	0	0	225	121	346
4	Commercial*	0	0	0	0	0	105	3.6	377	188	188	94	94	188
51	Commercial*	0	0	0	0	0	234	3.6	843	422	422	211	211	422
52	Commercial*	0	0	0	0	0	177	3.6	636	318	318	159	159	318
6	Single Family - Medium Density	327	1.01	331	215	116	0	0	0	0	0	215	116	331
7	Single Family - Medium Density	108	1.01	109	71	38	0	0	0	0	0	71	38	109
8	Open Space	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Open Space	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Employment Center/Business Pk	0	0	0	0	0	1,586	1.29	2046	471	1575	471	1575	2046
11	Single Family - Medium Density	55	1.01	56	36	20	0	0	0	0	0	36	20	56
12	Single Family - Medium Density	55	1.01	56	36	20	0	0	0	0	0	36	20	56
13	Commercial*	0	0	0	0	0	64	3.6	231	115	115	58	58	115
14	Single Family - Medium Density	307	1.01	310	202	109	0	0	0	0	0	202	109	310
15	Single Family - Medium Density	332	1.01	335	218	117	0	0	0	0	0	218	117	335
16	Single Family - High Density	803	0.52	417	271	146	0	0	0	0	0	271	146	417
17	Single Family - High Density	1,058	0.52	550	357	192	0	0	0	0	0	357	192	550
171	Single Family - High Density	195	0.52	101	66	35	0	0	0	0	0	66	35	101
TOTAL		4,921		3,598	2,339	1,259	2,165		4,132	1514	2,618	3,331	3,356	6,687

18 Greg Reservoir UGA 626 1.01 632 411 221 221 0 0 0 0 0 411 221 632

* - For commercial uses, development potential assumed to be half of the estimated 580,000 -- trips reduced by 50% in total column to reflect this estimate.

Notes: Greg Reservoir is called out separate from the other 17 North Camas UGA zones.

Trip rates for PM peak from ITE Trip Generation

Land use types from Clark County Comprehensive Growth Management Plan, October 2006

Based upon this, several alternative combinations of roadway enhancements were tested. The recommended framework plan includes 14 project elements for the north UGA. Figure 2 and Table 3 provide a summary of these improvements. First, new east/west circulation needed to be developed for the north UGA. This was accomplished through three framework roadways:

- a new east/west arterial from 283rd to 242nd at 28th Street
- enhancement to 232nd linking 28th to the new east/west arterial
- a previously planned collector road through Greg Reservoir linking 15th Street to the 283rd/Crown Road/23rd intersection

Adequate capacity can be developed to the north via the 28th/18th gateway by widening 28th/Goodwin/18th to five lanes and extending it to 18th Street. This along with new north/south connectivity using Camas Meadows Drive and linking it to Parker Street provides capacity that would exceed future demand with the north UGA.

However, capacity to the south via Everett Street and Crown Road has greater limitations. Everett Street was widened to three lanes north of Lake Road but retained in its existing capacity from Lake Road south toward downtown and 6th Avenue. Crown Road was widened to provide center turn lanes. Everett Street would be at its capacity in the future (2024) with the north UGA and there would be no residual capacity for any subsequent future development, due to the lack of an alternative southern arterial portal. Because of this, significant planning will be necessary for the north UGA to minimize the potential for southern vehicle trips (for example, providing supporting commercial for the future households and employment to minimize external trips to the south).

The three critical portals for north UGA roadway capacity are 28th/Goodwin/18th to the west, Everett Street to the south and Crown Road to the south. With framework transportation elements the demand to capacity ratios in 2024 for the PM peak hour would be:

2024 PM Peak Hour

Portal	Northbound/Eastbound Demand-to-Capacity Ratio	Southbound/Westbound Demand-to-Capacity Ratio
28 th /Goodwin (west of Ingles)	0.76	0.41
Everett Street (north of Lake)	0.97	0.75
Crown Road (north of 3 rd Ave)	0.89	0.77

As part of future master planning, collector and local roadways will be necessary (as were developed for Greg Reservoir in its master planning). These will need to be provided by the developments as they implement the master plan. Collector linkages are not part of the

framework system noted in Figure 2. Their refinement will need to be undertaken with the master planning effort for the north UGA. Routes to consider in the master plan include:

- East/west route north of 28th linking to Ingle Road and providing a northern route for local access as a alternate to 28th Avenue which will need to be limited access
- East extension of Ingles Road toward 232nd to provide local access southern route, as an alternative to 28th Avenue which will have limited access
- East/west collector somewhat parallel to the new arterial roadway through the middle of the north UGA, possibly linking 232nd to 3rd Avenue
- North/south collector linking the new east/west arterial to the planned Greg Reservoir collector

Table 3: North Camas UGA Transportation Improvements

Segment ID	Project	Description	Within Camas UGA?
1	Widen 28 th /Goodwin/18 th from 242 nd west to the intersection of 18 th /192 nd	Five lane extension of 18 th from 18 th /192 nd to Goodwin	No
2		Widening of Goodwin/28 th to five lanes	Yes
3		Widening of 28 th to five lanes east to SR500/242 nd	No
4	Extend Camas Meadows Drive to Goodwin/ 18 th	Extend Camas Meadows Drive as 3 lanes north to intersect with 18 th /Goodwin. Reconfigure intersection of Camas Meadows/13 th Street	No
5	Extend Camas Meadows Drive to 1 st /Lake/Parker	Extend Camas Meadows Drive as 3 lanes south from Payne Street to Lake Road	Yes
6	Reconstruct 232 nd Avenue south from 28 th to 9 th Street	Widen 232 nd Avenue to three lanes from 28 th Street to about 18 th Street	No
7		Widen 232 nd Avenue to three lanes from about 18 th Street to 9 th Street	Yes
8	Construct new roadway from SR 500/242 nd /28 th intersection east to 283 rd Ave	Extend 242 nd as 3 lane roadway south from 28 th to 14 th Street	No
9		Construct new 3 lane east/west roadway from 14 th / 242 nd to 283 rd via Nourse Rd	Yes
10	Widen Everett Street/SR 500 from Lake Road to 4 th	Three lane widening of SR 500/Everett from Lake north to about 4 th Street	Yes
11	Everett/SR 500 – 3 rd Intersection Rebuild	Widen Everett/SR	No
12	Greg Reservoir Collector	Extend two/three lane roadway from 15 th Street at high school to 283 rd /Crown Road	Yes
13	Greg Reservoir Collector	Realign intersection of 23 rd /Crown Road to match new collector alignment	No
14	Widen Crown Road from 3 rd Avenue to Nourse/15 th	Provide three lanes on Crown Road with appropriate turn lanes	Yes/No

COST ESTIMATES

Conceptual, preliminary cost estimates for the north UGA transportation framework plan are summarized in Table 4. This table does not include the collector or local streets that would also become necessary to support the north UGA development. These local roadways would be expected to be fully funded by development and would be defined in the master planning of the north UGA. Table 4 highlights three elements of the potential improvement costs for the 14 elements of the transportation framework plan, broken into three elements:

- Curb-to-curb construction that would commonly be creditable through a TIF program
- Remaining construction costs including frontage such as sidewalks, landscaping, lighting, drainage and driveway adjustments (which would not likely be part of the TIF program – to be provided by the fronting development)
- Approximation of right-of-way value (this may not be part of a TIF program for the projects within the north UGA – could be assumed to be dedicated with development)

A separate cost element was provided for traffic signals and roundabouts. At this general planning level, locating the specific positions of these traffic control devices is not possible, but given the potential traffic flows and the anticipated number of arterial intersections with the proposed transportation framework plan, a least 10 locations were estimated and included in the cost.

Given the costs for the transportation framework and the number of PM peak hour trips, ratios of dollars per trip were developed for reference. The number of trips can be broken into three groups – total for the entire area including the Greg Reservoir area (7,319), trips for the north UGA (6,687) separate from the Greg Reservoir trips (632), and trips for the land west of SR 500 (5,284) separate from the trips east of SR 500 (2,035). Table 5 provides the three different groupings compared with different ways to consider the cost (total cost or just curb-to-curb costs). A further comparison of the ratio with curb-to-curb cost is provided to reduce cost by 30% for what may be obtained through state and/or federal transportation grant funding sources.

Table 5: Transportation Improvement Costs Divided by PM Peak Hour Trips

	Total \$/Trips	Curb-to-Curb \$/Trips	30% Reduction of Curb-to-Curb \$ / trips
Total Area	\$ 20,133	\$ 9,872	\$ 6,910
North UGA Only	\$ 20,265	\$ 9,957	\$ 6,970
Greg Reservoir	\$ 18,734	\$ 8,972	\$ 6,280
West of SR 500	\$ 18,649	\$ 10,405	\$ 7,283
East of SR 500	\$ 23,986	\$ 8,486	\$ 5,941

**Table 4: Concept-Level Preliminary Cost Estimates for Transportation
Improvement Framework Plan in North UGA
2007 Dollars**

No.	Project	Curb-to-Curb Elements	Frontage Elements	ROW	TOTAL
1	Extension NE 18th St - 5 lanes from 192 nd to Goodwin	\$5,090,000	\$2,730,000	\$1,520,000	\$9,340,000
2	Widen NE Goodwin Rd - 5 lanes from 18 th to 232 nd	\$12,330,000	\$5,510,000	\$2,690,000	\$20,530,000
3	Widen NE 28th St - 5 lanes from 232 nd to 242 nd	\$3,540,000	\$2,400,000	\$950,000	\$6,890,000
4	Extend NW Camas Meadows Dr - 3 lanes from 18 th to 13 th	\$1,010,000	\$770,000	\$760,000	\$2,540,000
5	Widen NW Camas Meadows Dr - 3 lanes from 13 th to Lake/1 st	\$2,600,000	\$1,880,000	\$1,310,000	\$5,790,000
6	Widen NE 232 nd Ave - 3 lanes from 28 th to 18 th	\$2,510,000	\$1,710,000	\$660,000	\$4,880,000
7	Widen NE 232 nd Ave and extend 9 th Street - 3 lanes from 18 th to 242 nd	\$4,300,000	\$3,410,000	\$2,630,000	\$10,340,000
8	Extension NE 242 nd Ave - 3 lanes from 28 th to 14 th	\$3,240,000	\$2,510,000	\$2,130,000	\$7,880,000
9	New E-W Arterial - 3 lanes from 242 nd to 23 rd /Crown Rd	\$16,420,000	\$12,760,000	\$11,450,000	\$40,630,000
10	Widen NE Everett St - 3 lanes from Lake Road to 4 th	\$6,200,000	\$5,060,000	\$240,000	\$11,500,000
11	Widen NE Everett Rd - 3 lanes from 4 th to 3 rd + intersection	\$640,000	\$520,000	\$50,000	\$1,210,000
12	New E-W Collector - 2/3 lanes from 15 th to 23 rd /Crown	\$4,430,000	\$1,870,000	\$3,740,000	\$10,040,000
13	SE 23 rd St Realignment - At Crown Rd/283 rd	\$1,240,000	\$200,000	\$360,000	\$1,800,000
14	Widen SE Crown Rd - 3 lanes from 23 rd to 3 rd	\$4,760,000	\$4,990,000	\$290,000	\$10,040,000
	Traffic Control Traffic Signals & Roundabouts	\$3,940,000	0	0	\$3,940,000
	TOTAL	\$72,250,000	\$46,320,000	\$28,780,000	\$147,350,000

AREAS FOR FURTHER STUDY

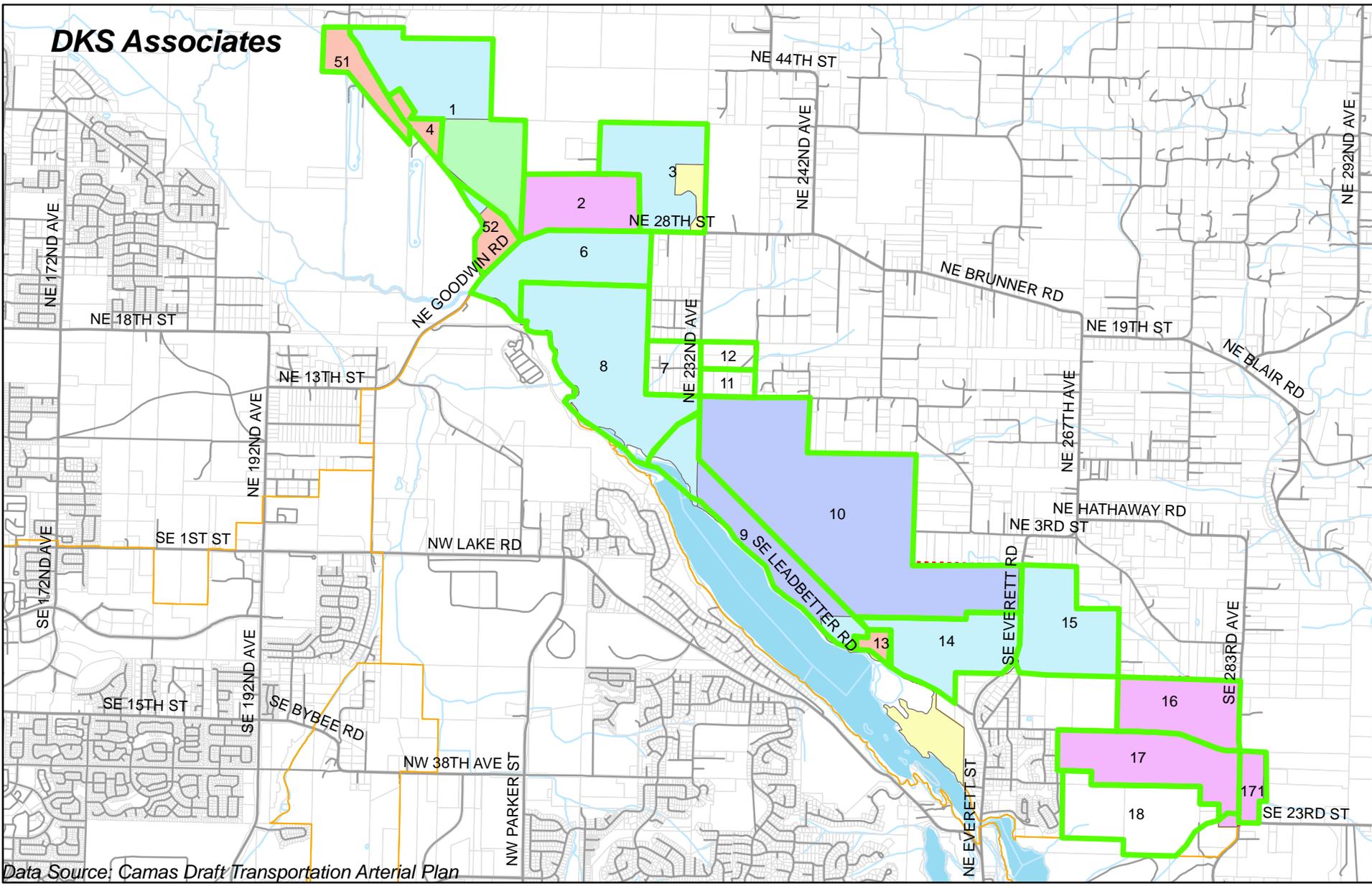
At this conceptual planning level, the extent and nature the detailed of the transportation network cannot be determined at this time. While the arterial street framework plan can be preliminarily identified, the placement/need for collector and local roadways, the placement/selection of specific land uses, the placement/limitation of access and the ability of the proposed development plan to manage transportation impacts cannot be determined. Because of this, a master plan of the north UGA will be necessary to provide the necessary guidance in planning this area. The cost estimates will need to be updated as the transportation framework plan is refined to produce a more accurate portrayal of the costs for construction.

The lack of capacity on Everett Street south from the north UGA to deliver portal capacity will continue to be a significant issue with the future development of the north UGA. It will require monitoring and management as the details of the development emerge in the years to come. Guiding principles for the north UGA should be to develop a plan that reduces dependence on Everett Street for external access, to reduce peak hour vehicle trip making and to maximize the potential for internal trips within the development. This may be accomplished by:

- developing mixes of residential, employment and commercial uses that do not require external vehicle access (mixed use, retail sufficient to serve household and employment needs)
- developing land uses within the site the encourage walking and use of bicycles
- developing a street network of local and collector street that provides alternatives to arterial access to 28th Street
- developing employment opportunities that are not dependant upon traditional AM and PM peak hours of commute access

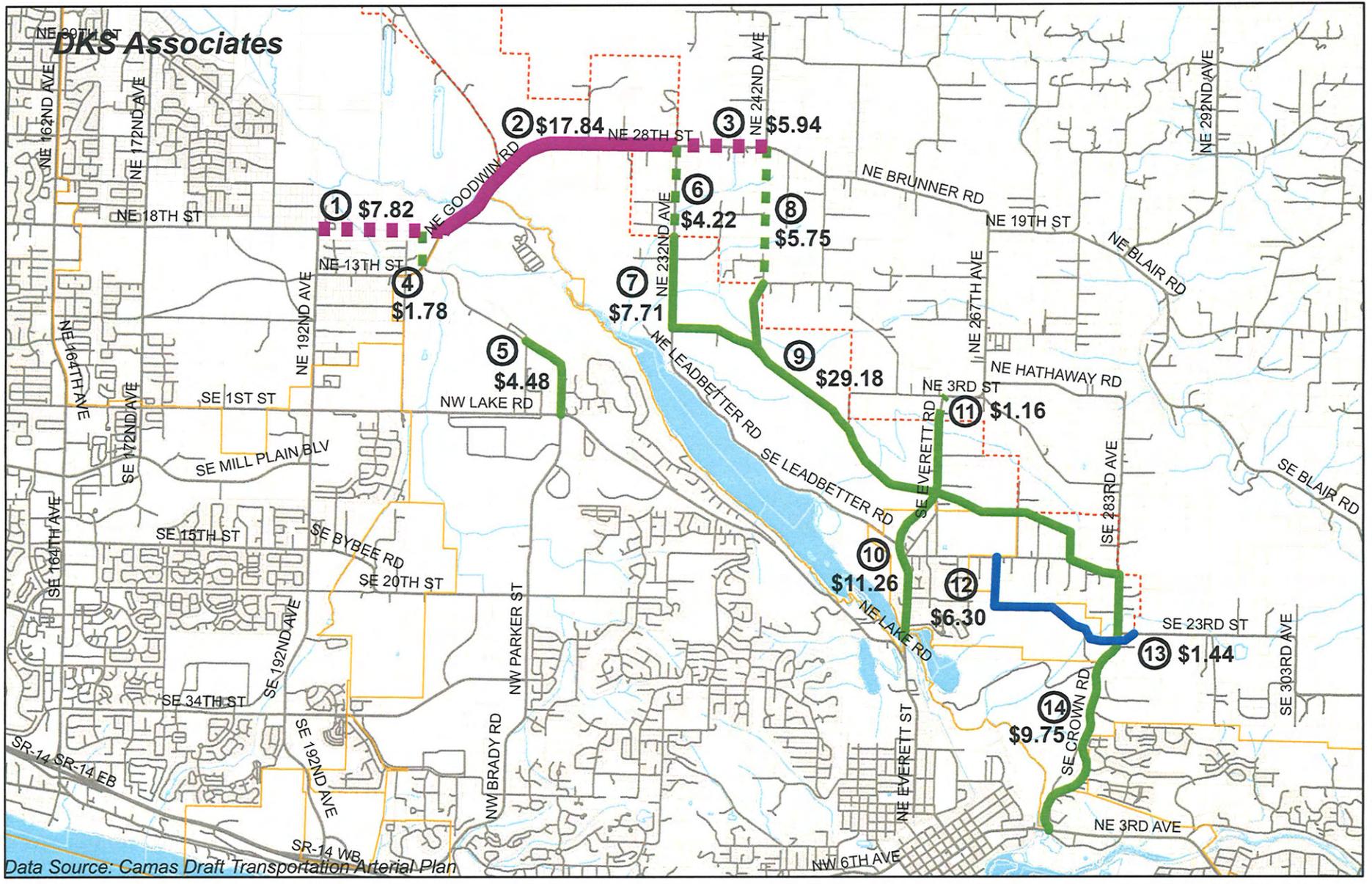
The impact of the north UGA on other arterial roadway projects is another area that will need refinement as part of the TIF update. Based upon the preliminary analysis key intersections of Lake Road/Everett Street and Crown Road/3rd Avenue were tested and found to have adequate capacity with concepts that have been approved in prior TIF updates (for example, a roundabout at Lake/Everett and improvements to Everett/14th). One prior TIF project will need to be reconsidered with the north UGA – 6th Avenue 3 lanes. The added traffic from the north UGA may make the conversion from four lanes to three lanes not possible. This will need to be addressed in the TIF update.

DKS Associates



Data Source: Camas Draft Transportation Arterial Plan

Figure 1
Camas North UGA
Transportation Analysis Zone Areas



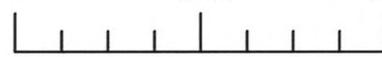
Data Source: Camas Draft Transportation Arterial Plan

LEGEND

- - - Proposed UGB
- City Limits
- Proposed Collector
- Proposed Arterials
- 5 lane inside Camas UGA
- 5 lane outside Camas UGA
- 3 lane inside Camas UGA
- 3 lane outside Camas UGA
- 2 \$ Project ID (2008 Cost x \$1 million - NO ROW)



0 4,000 8,000 Feet



SCALE: 1" = 4000'

Figure 2
Framework Transportation Improvements