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Date: June 1, 2010

To: Matt Morton
City of Cle Elum

From: Gary A. Norris, P.E., P.T.O.E.
DN Traffic Consultants

Subject: Level of Service Policy Development Study

Please find attached a copy of the three technical memoranda summarizing the work performed for the Level of Service Policy Development Study. The three memoranda were prepared to address the critical elements of the Scope of Work and include the following:

Technical Memorandum #1:

- Summarized the data collected to conduct the study including traffic counts at three intersections including Bullfrog Road/Suncadia Trail, Bullfrog Road/I-90 EB Ramps, and Bullfrog Road/I-90 WB Ramps; Kittitas County model forecasts for 2029; Level of Service Policies of surrounding jurisdictions; and,
- Summarized the results of the evaluation of the 2029 traffic forecasts presented in the *Cle Elum Transportation Plan 2009* based on recent changes to the ITE Trip Generation Manual and Kittitas County 2029 model forecasts; and,
- Identified alternative level of service policies for consideration

Technical Memorandum #2:

- Summarized existing and future level of service at selected intersections; and,
- Summarized the analysis of alternative level of service policies; and,
- Recommended a level of service policy; and
- Identified locations with sub-standard road geometry.

Technical Memorandum #3:

- Summarized the recommended implementation strategy for an adopted LOS policy.

It has been a pleasure to assist you in this effort and I look forward to working with you and the City of Cle Elum in the future.

City of Cle Elum

Level of Service Policy Development Study

Technical Memorandum #1

March 15, 2010

The purpose of the Level of service Policy Development Study is to evaluate various factors and make a reasoned determination of a viable level of service policy to guide future development of the City of Cle Elum transportation network. Factors to be considered include consideration of what other agencies in the region which compete for development and transportation funding employ; the City's community goal for transportation service; and the cost of providing the desired level.

The study includes six tasks. This memorandum was prepared to summarize the process findings and conclusions of the following tasks:

- Task 2 – Data Collection
- Task 3 – Evaluate 2029 traffic volume forecasts
- Task 6 – LOS Policy “Best Practices”
- Task 7 – Identify Alternative LOS policy concepts.

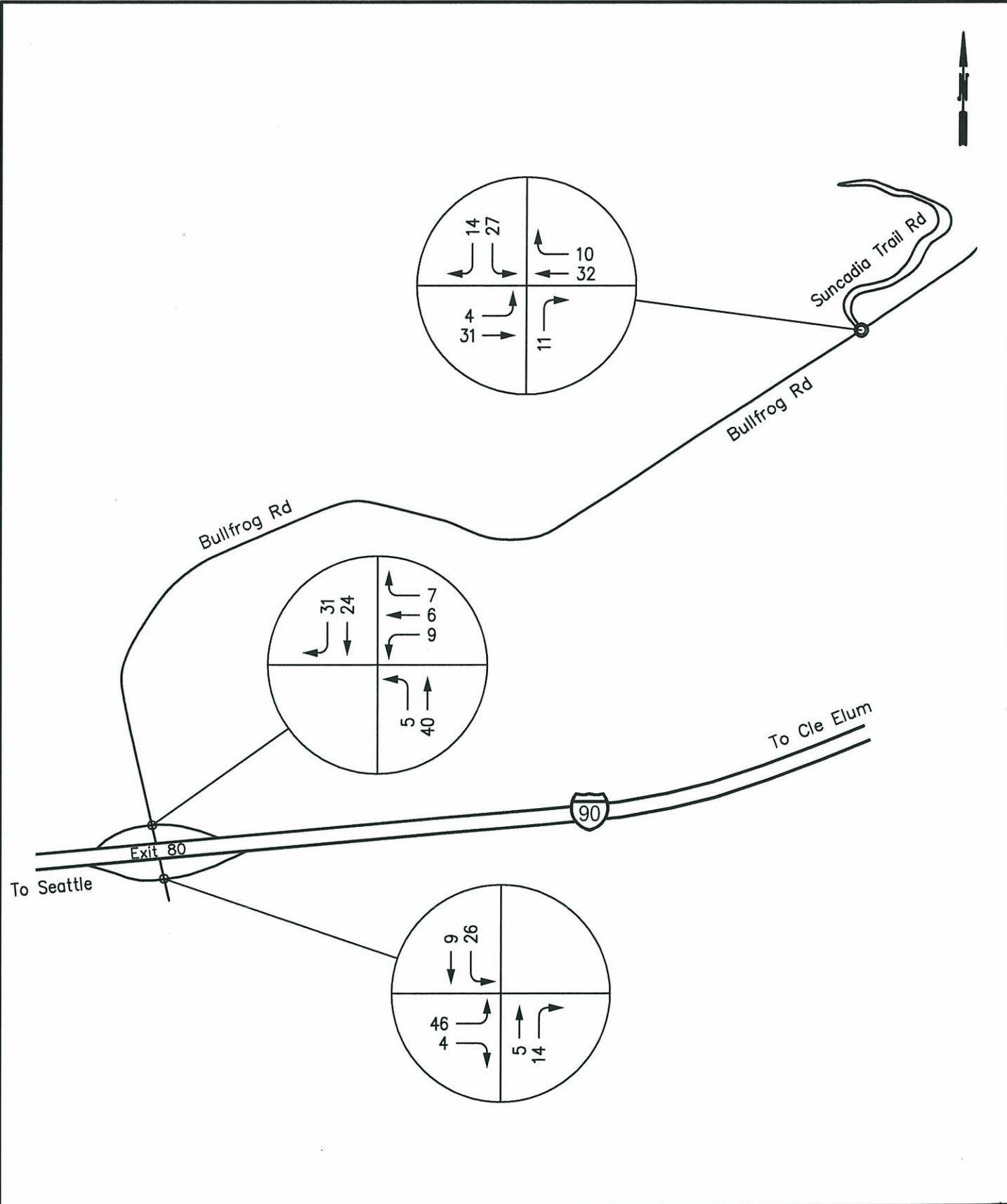
Task 2. Data Collection.

The scope of work called for the collection of the following data to support the study effort:

- PM peak period traffic counts and intersection data at three (3) intersections in the Suncadia-Bullfrog Planned Mixed Use District;
- Long range traffic volume forecasts based on recent updates to the Kittitas County traffic assignment model; and
- Traffic related impacts of current development proposals; and
- Proposed transportation improvements; and,
- Existing and future level of service on the roadway network; and
- Construction cost data for public works improvements; and,
- LOS policies for surrounding jurisdictions.

Traffic Counts

The Consultant collected PM peak period turning movement counts at three intersection including Bullfrog Road/Suncadia Entrance, Bullfrog Road/I-90 Eastbound Ramps and Bullfrog Road/I-90 Westbound Ramps. These counts were collected during November and December 2009. A summary of the counts is presented in Figure 1.



DN TRAFFIC
CONSULTANTS

PM PEAK HOUR
TRAFFIC VOLUMES

FIGURE 1

CITY OF CLE ELUM
LOS POLICY
DEVELOPMENT
STUDY

Kittitas County Traffic Assignment

A PM peak hour forecast of 2030 traffic volumes on the Cle Elum area roadway network was obtained by the Consultant from the Kittitas County Department of Public Works.

Current Development Proposals

The Consultant requested a copy of current development proposals under consideration by the City. A copy of the Preliminary Draft Environmental Impact Statement for the proposed City Heights development was obtained from the City of Cle Elum Planning Department. City Heights is expected to be fully occupied by 2022. City Heights (Alternative 1 – Preferred) includes up to 985 residential units with 30 percent attached (296) and 70 percent (689) detached; and 20,000 gross square feet of neighborhood commercial. City Heights is located in the Sphere of Interest north of the city.

Level of Service

Level of service policies for surrounding jurisdictions were obtained from the following agencies:

- Washington State Department of Transportation
- Quadco
- Kittitas County
- City of Ellensburg
- City of Yakima
- City of Wenatchee

The level of service policies from these agencies will be used to provide a “best practices” for selecting a level of service policy for the City of Cle Elum.

Task 3. Evaluate 2029 Traffic Forecasts

As part of the Level of Service Policy Development effort, City staff requested an evaluation of the 2029 PM peak hour traffic forecasts presented in the *Cle Elum Transportation Plan 2009* to insure they are realistic in light of other traffic forecasts and recent changes in the Institute of Transportation Engineers Trip Generation Report. To accomplish this analysis, the Consultant obtained the 2030 PM peak hour traffic assignment from the Kittitas County Traffic Assignment Model and updated the 2029 PM peak hour volume forecasts presented in the *Transportation Plan* using the trip generation rates presented in the 8th Edition of the Trip Generation Report.

Kittitas County Traffic Assignment Model Results

Kittitas County recently completed an update of its traffic assignment model. The results of the PM peak hour assignment model on the City of Cle Elum street network are presented in Figure 2.

A comparison of the existing PM peak hour volume, the 2030 Kittitas County model PM peak hour forecast, and the 2029 PM peak hour traffic forecasts from the *Transportation Plan* on selected roadway segments within the city are presented in Table 1.

Table 1. Comparison of Future PM Traffic Volume Forecasts

Roadway Segment	PM Peak Hour Volume ¹		
	Existing	2030 Model	2029 PM Peak Hour ²
I-90/Safeway Hill			
WB On Ramp	308	238	2650
EB Off Ramp	462	307	4850
I-90/Oakes Street			
WB Off Ramp	184	315	1740
EB On Ramp	149	195	2090
First St – e/o Airport			
WB	442	275	3333
EB	237	365	1077
First St – e/o Floral			
WB	248	343	3239
EB	261	439	2983
First St – w/o Montgomery			
WB	279	328	2834
EB	306	522	2730

1) In vehicles per hour

2) Obtained from the *Cle Elum Transportation Plan 2009*

As shown in Table 1, it is apparent that the model forecasts have not yet been refined sufficiently to be of value in assessing future traffic assignments in the Cle Elum area. The 2030 model assignments are relatively equal to the existing counts and in some cases are actually lower than existing.

In addition to a comparison with the Kittitas County model assignment, an evaluation of the 2029 PM peak hour forecasts presented in the *Transportation Plan* was made with the use of the trip generation rates presented in the 8th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Report. Trip generation presented in the *Transportation Plan* was generated from data presented in the 7th Edition of the ITE Report. In addition to the change in the ITE trip generation rates, some of the land uses were reevaluated with a significant reduction in estimated trip generation.

Land uses reevaluated included Highway Commercial; Industrial Park; Commercial; Business Park; and residential land uses. For the commercial land uses a more conservative estimate of lot coverage was applied to the various categories consistent with national trends. In regards to residential uses, units per acre and mix of multi-family and single family were reevaluated with the assumption that the multi family would tend towards townhouse/condominiums rather than apartments. Overall, the number of residential units remained consistent with the project number of housing units. The amount of commercial was reduced somewhat. The biggest reduction however is attributed to a typographical error applied to the Mix Commercial/High Residential.

A summary of the comparison is presented in Table 2.

Table 2. Recalculated 2029 Trip Generation Using ITE 8th Edition

Land Use	PM Peak Hour Trip Generation	
	Cle Elum Transportation Plan 2009	LOS Policy Study
<i>Urban Growth Area</i>		
Gateway Commercial	1	1
Highway Commercial	3,049	7146
Light Industrial	81	93
Master Planned Resort	36	29
Rural 3	123	122
Suburban	3	2
Suburban 2	2	2
Agriculture 3	41	40
Unknown		4
<i>Sphere-of-Interest Pipeline Projects</i>		
Industrial Park	557	472
Residential (North)	1493	1407
Mix Commercial/High Residential	14,977	1558
Bullfrog Business/Commercial Park	3342	2223
<i>Suncadia-Bullfrog Planned Mixed Use District</i>		
Residential	1175	1141
Total	24,880	14,240

As shown in Table 2, the revised trip generation estimate based on ITE’s 8th Edition of the Trip Generation Report is considerably less than the PM peak hour trip generation presented in the *Cle Elum Transportation Plan 2009*; approximately 10,640 vehicles per hour less. As stated above the change isn’t predominantly changes in the trip generation rates but rather reconsideration of the applicable rates for various land uses. In the case of the Mix Commercial/High Residential there was an apparent typo as the magnitude of the difference is ten. The overall intent of the adjustments however is to present a “more conservative” view of anticipated trip generation.

Task 6. LOS Policy “Best Practices”

The purpose of this task was to identify level of service polices employed in adjacent jurisdictions which compete with Cle Elum for development and funding of transportation improvements. Level of service policies were obtained from the following jurisdictions:

- Washington State Department of Transportation
- Quadco
- Kittitas County
- City of Ellensburg
- City of Wenatchee
- City of Yakima

Washington State Department of Transportation (WSDOT) – The WSDOT has adopted a state wide level of service (LOS) policy of LOS D for urban areas and LOS C for rural areas.

Quadco – The four county regional planning organization followed the lead of WSDOT and adopted LOS D for urban areas and LOS C for rural areas.

Kittitas County – The County has also adopted the WSDOT and Quadco policy of LOS D in urban areas and LOS C in rural areas. However, the County has recognized that the LOS policy can be modified to be consistent with the LOS standards established for roadways that pass into adjacent jurisdictions.

City of Ellensburg – The City has a more complex level of service policy with LOS B for local access roadways; LOS C for arterials and collectors; and LOS D for arterials intersecting with freeway interchanges. The City of Ellensburg currently requires the LOS standard be met for all approaches to the intersection.

City of Wenatchee – The City adopted LOS D as the general policy for the City with the exception that LOS E would be acceptable on SR 285.

Level of service policies were sought for other agencies in the immediate vicinity such as Roslyn but it doesn't appear these agencies have adopted LOS policies.

Task 7. Identify Alternative LOS Policy Concepts

Level of service (LOS) is a term used to qualitatively describe the operating conditions of a roadway. The level of service criteria are based on operating speed, travel time, maneuverability, delay and safety. Levels of service range from LOS A to LOS F with LOS A representing the best operating conditions and LOS F the worst.

As shown in Table 3, the average travel speed for an arterial with a posted speed of 25 – 35 mph at LOS A is 25 mph. At LOS F, the average travel speed is less than 7 mph. At signalized intersections, under LOS A, the average delay per vehicle is less than or equal to 10 seconds whereas at LOS F, the average delay per vehicle is greater the 80 seconds per vehicle. Under stop sign controlled intersections, the average delay per vehicle at LOS A is less than or equal to 10 seconds and at LOS F it is greater than 50 seconds. The difference in the delay between signalized intersections and stop sign controlled intersections is the motorist has more patience at a signalized intersection as they believe they will eventually receive a green indication whereas under the stop sign controlled intersection there is no guarantee that they will have a sufficient gap in the opposing traffic to cross or enter the traffic stream.

Based on information obtained from the “Best Practices” review and the various LOS policy definitions, it appears that an acceptable LOS for Cle Elum would be LOS C or LOS D. LOS A and B would be very costly to maintain as growth in PM traffic volumes occur. LOS E and F may be acceptable in certain cases where the City desires to

Table 3. Definition of Level of Service (LOS)

LOS	Description	Average Travel Speed ¹	Delay ²		V/C Ratio
			Signal	Stop Sign	
A	Free flow conditions with unimpeded maneuverability. Uncongested operation at intersections. Stopped delay at signalized intersections is minimal.	≥ 25	≤ 10	≤ 10	0.0 – 0.60
B	Reasonably unimpeded operations with slightly restricted maneuverability. Very light congestion at intersections. Stopped delays are not bothersome.	≥ 19	10 - 20	10 - 15	0.61 – 0.70
C	Stable operations with somewhat more restrictions in making mid block lane changes than LOS B. Motorist will experience appreciable tension while driving. Light congestion at intersections with occasional backups on critical approaches.	≥ 13	21 - 35	16 - 25	0.71 – 0.80
D	Approaching unstable operations where small increase in volume produces substantial increase in delay and decreases in speed. Significant congestion on critical approaches but intersection functional. Motorists required to wait through more than one cycle during short peaks. No long standing queues.	≥ 9	36 - 55	26 - 35	0.81 – 0.90
E	Operations with significant intersection approach delays and low average speeds. Any traffic incidences will create congestion lasting the whole peak period. Severe congestion with some long standing queues on critical approaches. Intersection blockage may occur. Ultimate capacity of the roadway.	≥ 7	56 – 80	36 – 50	0.91 – 1.00
F	Operations with extremely low speeds caused by intersection congestion, high delay, and adverse signal progression. Total system breakdown	< 7	> 80	> 50	> 1.00

Source: Transportation Research Board, *Highway Capacity Manual, Special Report #209*

LOS – Level of Service

V/C – Volume to Capacity Ratio

>- greater than

< - less than

≤ - less than or equal to

≥ - greater than or equal to

1) Average Travel Speed – in miles per hour

2) Delay – in seconds per vehicle

discourage use of the automobile and promote alternative forms of transportation such as the proposed downtown pedestrian core and old neighborhood streets.

Level of service C would provide generally stable and consistent traffic operations with only slight congestion at intersections with occasional and infrequent back ups on critical legs of the intersection. The average travel speed including all delay would be greater than or equal to 13 miles per hour under a posted speed of 25 to 35 mph. The average motorist would experience a delay of up to 35 seconds at a signalized intersection and 25 seconds at a stop sign controlled intersection.

Level of service D would provide traffic operations approaching unstable conditions where any increase in volume would produce a substantial increase in travel time and delay. A motorist would occasionally wait through more than one cycle length at a signalized intersection. The average travel speed including all delay would be equal to or greater than nine miles per hour. The average motorist would experience a delay of up to 55 seconds at a signalized intersection and 35 seconds at a stop sign controlled intersection.

Other factors to consider in the selection of an LOS policy are the cost to implement and consistency with other Comprehensive Plan policies. Those factors are the subject of Technical Memorandum #2.

Conclusions

Based on the foregoing discussion, the following preliminary findings were reached:

- Generally speaking, most agencies in the region have adopted WSDOT's level of service policy which provides LOS C in rural areas and LOS D in urban areas. The City of Cle Elum would be considered an urban area. The City of Ellensburg is somewhat more creative in that it allows LOS C on the arterial network with the exception that LOS D is allowed at the freeway interchanges.
- An evaluation of the forecasted PM peak hour trip generation presented in *Cle Elum Transportation Plan 2009* suggests the values are higher than what may be realized under recent changes in the ITE Trip Generation report and adjustments in the anticipated lot coverage for the various land uses.
- The 2029 PM peak hour volumes presented in the *City of Cle Elum Transportation Plan 2009* should be adjusted to reflect the technical updates from the 8th Edition ITE Trip Generation report and the reconsideration of actual development that may occur within the City's urban growth areas.
- Considerations of alternative level of service policies suggest that further evaluation should focus on the development of a policy that addresses the various functions of the City's street network. Areas where efficient mobility is desired should place a value on a relative high level of service whereas in areas that

automobile traffic is discouraged low levels of service should be adopted consistent with overall community goals.

City of Cle Elum

Level of Service Policy Development Study

Technical Memorandum #2

April 30, 2010

The following memorandum is the second of three technical memoranda which will summarize the process, findings, and recommendations of the level of service policy development study. The level of service policy will be used to guide future development in support and implementation of the City of Cle Elum Comprehensive Plan and development of the City's transportation system.

The purpose of this memorandum, Technical Memorandum #2, is to summarize the process, findings, and recommendation of an acceptable level of service policy. The memorandum includes a summary of the existing and future level of service at selected intersections; an analysis of alternative levels of service policies; and an identification of locations with substandard road geometry and design standards.

Technical Memorandum #1 summarized the results of the data collection efforts; evaluated the 2029 trip generation forecasts presented in the 2009 Transportation Plan; summarized level of service policy "best practices"; and identified alternative LOS Policy concepts.

Technical Memorandum #3 will offer implementation strategies for guiding the development review process in the implementation of the LOS policy.

Existing and Future LOS at Selected Intersections

Revised 2029 Traffic Forecasts

An evaluation of the 2029 PM peak hour trip generation forecast presented in the *Cle Elum Transportation Plan 2009* summarized in Technical Memorandum #1 suggested the trip generation estimates for the twenty year build out scenario were overstated. The PM peak volumes presented in the 2009 Transportation Plan were adjusted to reflect changes between the 7th and 8th Edition of the Institute of Transportation Engineer's Trip Generation Report and adjustments in the allocation of proposed development to various land use categories. The results of the revised trip generation estimates are reflected in the 2029 PM peak hour turning movement volume forecasts presented in Figure 1.

It should be noted that the turning movement volumes presented in Figure 1 are representative of anticipated corridor demand volumes and indicators of the need for additional facilities and roadway improvements to support the City's anticipated growth. It is not anticipated that these volumes will be accommodated within the existing corridors but will be re assigned to the proposed new roadway corridors such as the proposed North Hills Road recommended in the *Cle Elum Transportation Plan 2009*.

Figure 1

The 2029 turning movement volumes shown in Figure 1 were used to calculate 2029 PM peak hour level of service at the same intersections. The results of the level of service analysis are presented in Table 2.

Level of Service

Level of service (LOS) is used to qualify the degree of traffic congestion and driver comfort on streets or at intersections. The Highway Capacity Manual (HCM) describes the methodologies for calculating LOS on street segments and at signalized and unsignalized intersections.

According to the 2000 HCM, there are six levels of service by which the operational performance of the roadway system may be described. These levels of service range from LOS A, which indicates a relatively free-flowing condition to LOS F that indicates operational breakdown.

The level of service for two-way stop controlled (TWSC) intersections is determined by the computed or measured control delay and is defined for each minor movement. Level of service is not defined for the intersection as a whole under two-way stop control. Average control delay less than or equal to 10 seconds per vehicle is defined as LOS A. For LOS F, the average control delay is greater than 50 seconds per vehicle.

The LOS for signalized intersections is defined in terms of average control delay per vehicle. The criterion for LOS A is an average control delay of less than or equal to 10 seconds and for LOS F, an average control delay greater than 80 seconds.

A summary of the six levels of service is presented in Table 1.

As shown in Table 1, the average travel speeds range from 25 mph or greater at LOS A to less than seven (7) mph at LOS F. Delay ranges from less than or equal to 10 seconds for LOS A for both signal and stop sign control to greater than 80 seconds under signal operation and greater than 50 seconds under stop sign. The reason the delay threshold is higher for a traffic signal is that the typical motorist believes there is certainty that under traffic signal control eventually they will be served, whereas the same certainty does not exist for the stop sign. The v/c ratio is simply the volume of traffic compared to the capacity for the individual facility.

For the purpose of this study, the City selected 21 intersections for evaluation of the existing and 2029 level of service. These intersections represent the primary intersections and travel corridors in the City. The intersections along with the existing LOS, 2029 LOS, proposed improvements, and estimated LOS with the improvement is listed in Table 2. In addition, Table 2 references for each proposed improvement project the associated policy identified in the *Cle Elum Transportation Plan 2009*.

Level of service for the existing condition and 2029 horizon year was obtained where available from the aforementioned 2009 Transportation Plan. Level of service for the proposed improvements was calculated using Synchro 7.0 where volumes were identified

and estimated where they were not. A summary of the available PM peak hour forecasts are presented in Figure 1.

Table 1. Definition of Level of Service (LOS)

LOS	Description	Average Travel Speed ¹	Delay ²		V/C Ratio
			Signal	Stop Sign	
A	Free flow conditions with unimpeded maneuverability. Uncongested operation at intersections. Stopped delay at signalized intersections is minimal.	≥ 25	≤ 10	≤ 10	0.0 – 0.60
B	Reasonably unimpeded operations with slightly restricted maneuverability. Very light congestion at intersections. Stopped delays are not bothersome.	≥ 19	10 – 20	10 - 15	0.61 – 0.70
C	Stable operations with somewhat more restrictions in making mid block lane changes than LOS B. Motorist will experience appreciable tension while driving. Light congestion at intersections with occasional backups on critical approaches.	≥ 13	21 – 35	16 - 25	0.71 – 0.80
D	Approaching unstable operations where small increase in volume produces substantial increase in delay and decreases in speed. Significant congestion on critical approaches but intersection functional. Motorists required to wait through more than one cycle during short peaks. No long standing queues.	≥ 9	36 – 55	26 - 35	0.81 – 0.90
E	Operations with significant intersection approach delays and low average speeds. Any traffic incidences will create congestion lasting the whole peak period. Severe congestion with some long standing queues on critical approaches. Intersection blockage may occur. Ultimate capacity of the roadway.	≥ 7	56 – 80	36 – 50	0.91 – 1.00
F	Operations with extremely low speeds caused by intersection congestion, high delay, and adverse signal progression. Total system breakdown	< 7	> 80	> 50	> 1.00

Source: Transportation Research Board, *Highway Capacity Manual, Special Report #209*

LOS – Level of Service

V/C – Volume to Capacity Ratio

> - greater than

< - less than

≤ - less than or equal to

≥ - greater than or equal to

1) Average Travel Speed – in miles per hour

2) Delay – in seconds per vehicle

Table 2 illustrates that the current level of service is at the major intersections within the City is predominantly LOS B. There are 13 intersections with a PM peak hour level of service of B; six (6) intersections with a PM peak hour level of service of A; and two (2) intersections with LOS D. There are currently no intersections with a failing level of service (LOS F). According to Table 1, LOS B represents “reasonably unimpeded operations”. Travel speeds are typically equal to or greater than 19 mph. For

intersections operating at LOS A, travel speeds are equal to or greater than 25 mph and overall operations are unimpeded. For intersections operating at LOS D, operating speeds are typically greater than or equal to 9 mph. Traffic flow is approaching “unstable conditions”. For the most part, the City enjoys a relatively high level of service.

Table 2. Level of Service

Intersection	Existing Condition		2029			
	Traffic Control	LOS	LOS	Proposed Improvement	Project #	LOS with Improvement
W First Street/Cemetery Road	Stop	D	F	Signal/Widen		B
W First Street/N Pine Street	Stop	B	F	Signal		D
W First Street/S Cle Elum Way	Signal	A	F	Roundabout	B-3	C
W First Street/Oakes Avenue	Signal	B	F	Signal Modifications	B-7	C
W First Street/Pennsylvania Avenue	Signal	B	F	Signal Modifications		C
E First Street/Montgomery Avenue	Stop	B	F	Signal	B-2	B
E First Street/Columbia Avenue	Stop	B	F	Signal	B-2	B
E First Street/Short/Spansky Avenue	Stop	B	F	Roundabout	B-3	B
E First Street/Teaway Avenue	Stop	D	F	Signal		B
E First Street/Floral Avenue	Stop	B	F	Signal		B
Airport Road/White Road	Stop	A	F	Signal	B-2	B
SR 903/Airport Road	Stop	B	F	Flyover	B-5	C
SR 903/SR 970	Stop	B	F	Flyover	B-5	C
SR903/Ranger Station Road	Stop	B	F	Signal/Widen	B-2	B
SR 903/N Pine Street	Stop	B	F	Signal/Widen	B-2	B
Bullfrog Road/SR 903	Roundabout	A	A			na
Bullfrog Road/Suncadia Trail	Roundabout	A	A			na
Bullfrog Road/I-90 WB Ramps	Stop	A	B			na
Bullfrog Road/I-90 EB Ramps	Stop	A	C			na
W Second Street/N Stafford Avenue	Stop	B	F	Signal		B
W Second Street/N Oakes Avenue	Stop	B	F	Signal		B

na – not applicable

In the 2029 horizon year, without improvements in the arterial capacity, the majority of the City’s intersections (17) will operate at LOS F during the PM peak hour; two (2) are estimated to operate at LOS A; and one each at LOS B and LOS C. At LOS F, operating speeds are less than seven mph and total operational breakdown (gridlock) has occurred. For the four (4) intersections estimated to operate at LOS C or above in the 2029 time horizon, no remedial measures are required.

The *Cle Elum Transportation Plan 2009* identified 12 policies and strategies aimed at addressing the long range traffic and roadway need of the City to accommodate future growth. Of the 12 policies and strategies, seven focus on capital facility improvements necessary to address anticipated traffic volumes. The seven capital policies include:

- B.1 Upgrade and designate Railroad street as SR 903, the primary east-west traffic arterial in the downtown
- B.2 Modernize certain City streets with operational improvements for continuity and connectivity
- B.3 Create gateways to the downtown and UGA with modern traffic roundabouts
- B.4 Construct a new east-west collector traversing the UGA and north hills annexation area
- B.5 Construct a “flyover” at State Routes 903/970 for improved connection and safety
- B.7 Complete the I90/Oakes Avenue interchange for full service
- B.8 Construct a second Yakima River crossing from Oakes Avenue to Lower Peoh Point Road

These policies include projects to address the overall need for better definition of traffic flow and preservation of the downtown core; additional arterial capacity to facilitate proposed growth; connectivity of existing routes into developing areas; and operational improvements to accommodate overall community circulation.

To address the 17 intersections with level of service deficiencies, an evaluation of alternative road improvements were considered to determine the extent of improvement necessary to achieve a satisfactory level of service. The results of the evaluation indicated four separate categories of improvement.

The first category of improvements includes projects which will provide the backbone of the future transportation network for the City. These proposed roadway projects will have a significant impact on improving the overall future level of service throughout the City. The projects will provide alternative access to the current arterial corridors, redirect traffic to preserve existing community features, and provide necessary connections to regional facilities. The projects included in the category are listed in Table 3. The information presented in Table 3 was obtained from Table 37 page 91 of the *Cle Elum Transportation Plan 2009*.

It is expected that the additional facilities will offer and provide a high level of service standard. The estimated cost of these facilities and corridor improvements is \$72,500,000.

Table 3. Major Corridor Improvements

Phase	Policy #	Project	Cost	Responsible Agency
I	B-1	Begin: Railroad Street Emphasis w/signs and promenade	\$6,875,000	City/State/Private
	B-2	Start: Extend White Road	\$833,000	City/Private
II	B-1	Continue: Railroad Street Emphasis w/signs and promenade	\$6,875,000	City/State/Private
	B-2	Complete: Extend White Road	\$1,667,000	City/County
	B-4	Start: Construct North Hills Road	\$10,000,000	City/County
	B-5	Start: Construct SR903/SR 970 Flyover	\$1,875,000	State
	B-7	Start: Oakes Avenue-I-90 Interchange	\$8,125,000	State
	B-8	Start: Construct 2 nd River Crossing	\$4,687,500	City/County/State
III	B-1	Complete: Railroad Street Emphasis w/signs and promenade	\$6,875,000	City/State/Private
	B-4	Complete: Construction North Hills Road	\$10,000,000	City/County/Private
	B-5	Complete: Construct SR 903/SR970 Flyover	\$1,875,000	State
	B-7	Complete: Construct Oakes Avenue	\$8,125,000	State
	B-8	Complete: Construct 2 nd River Crossing	\$4,687,500	City/County/State
TOTAL			\$72,500,000	

Phase I – 2009 to 2014

Phase II – 2015 to 2020

Phase III – 2021 to 2029

Project # - Reference from Table 37 – Cle Elum Transportation Plan 2009

The second category of projects includes intersection reconstruction to provide additional turn pockets; minor widening of the roadway to provide additional through lanes; and signal additions or modifications which will provide an acceptable level of service. The intersections in this category include SR 903/Ranger Road and SR 903/N Pine Street. With these improvements LOS B would be achieved. Since capacity is only purchased in increments, there are no other lower cost remedial measures which would provide a level of service above F. The estimated cost of intersection reconstruction improvement is approximately \$350,000 per intersection for a total of \$700,000. These projects are generally included the Transportation Plan Policy B-2 *Operational Improvements*.

The third and largest category of improvement projects would simply be signalization of the intersection to serve all traffic within the acceptable limits of delay. These intersections include:

- W First Street/N Pine Street, and
- E First Street/Montgomery Avenue, and
- E First Street/Columbia Avenue, and
- E First Street/Short/Spansky Avenue, and
- E First Street/Teaway Avenue, and
- E First Street/Floral Avenue, and
- Bullfrog Road/I-90 EB Ramps
- W Second Street/N Stafford Avenue
- W Second Street/N Oakes Avenue.

In this category simple signalization of the intersection would provide an acceptable level of service. In fact, the 2029 PM peak hour level of service is estimated to be B for all intersections with signal improvements. The estimated cost for signalization is approximately \$200,000 per intersection for a total of \$1,800,000. These improvements are also considered as part of Policy B-2 *Operational Improvements*.

The final category would be intersection modifications which simply require rechannelization of the existing roadway to delineate additional lanes through the intersection. These intersections include W First Street/Pennsylvania Avenue and W First Street/Oakes Avenue. At these locations there is sufficient space within the roadway prism to stripe additional lanes. The estimated cost of this work is approximately \$50,000. These projects would also be included in Policy B-2 *Operational Improvements*.

The conclusion of this analysis indicates that in general LOS B is achievable in the 2029 horizon year through the implementation of the recommended Transportation Plan as stated in the *Cle Elum Transportation Plan 2009*. The cost of these improvements has generally been estimated and the source of potential funding identified. New development would be required to fund a substantial amount of the cost of the new roadway corridors and intersection improvements necessary to support the projected growth in vehicular traffic through the imposition of trip generation fees and required road improvements.

Analysis of Alternative LOS Policies

In Technical Memorandum #1, alternative level of service policies were presented for consideration. A restatement of the alternative policies is presented here to provide a basis for this discussion.

Alternative Policies

Level of service (LOS) is a term used to qualitatively describe the operating conditions of a roadway. The level of service criteria are based on operating speed, travel time, maneuverability, delay and safety. Levels of service range from LOS A to LOS F with LOS A representing the best operating conditions and LOS F the worst.

As shown in Table 1, the average travel speed for an arterial with a posted speed of 25 – 35 mph at LOS A is 25 mph. At LOS F, the average travel speed is less than 7 mph. At signalized intersections, under LOS A, the average delay per vehicle is less than or equal to 10 seconds whereas at LOS F, the average delay per vehicle is greater the 80 seconds per vehicle. Under stop sign controlled intersections, the average delay per vehicle at LOS A is less than or equal to 10 seconds and at LOS F it is greater than 50 seconds. The difference in the delay between signalized intersections and stop sign controlled intersections is the motorist has more patience at a signalized intersection as they believe they will eventually receive a green indication whereas under the stop sign controlled intersection there is no guarantee that they will have a sufficient gap in the opposing traffic to cross or enter the traffic stream.

The results of the “Best Practices” review indicated surrounding jurisdictions selected LOS C or D as the preferred policy. LOS D was the policy of choice in urban areas for most Cities as well as Kittitas County, WSDOT and QUADCO. Alternatively, the City of Ellensburg selected LOS C as the general policy for the City’s arterial network. A summary of the LOS policies adopted by surrounding jurisdictions is discussed below; *Washington State Department of Transportation (WSDOT)* – The WSDOT has adopted a state wide level of service (LOS) policy of LOS D for urban areas and LOS C for rural areas.

QUADCO – The four county regional planning organization followed the lead of WSDOT and adopted LOS D for urban areas and LOS C for rural areas.

Kittitas County – The County has also adopted the WSDOT and QUADCO policy of LOS D in urban areas and LOS C in rural areas. However, the County has recognized that the LOS policy can be modified to be consistent with the LOS standards established for roadways that pass into adjacent jurisdictions.

City of Ellensburg – The City has a more complex level of service policy with LOS B for local access roadways; LOS C for arterials and collectors; and LOS D for arterials intersecting with freeway interchanges. The City of Ellensburg currently requires the LOS standard be met for all approaches to the intersection.

City of Wenatchee – The City adopted LOS D as the general policy for the City with the exception that LOS E would be acceptable on SR 285.

For the sake of consistency with adjacent jurisdictions, it is assumed that the City of Cle Elum should opt for either LOS C or LOS D as the preferred policy. Other potential levels of service were eliminated from further consideration because of the inconsistency with adjacent jurisdictions, the cost for the City to improve the level of service at arterial intersections to LOS A would be prohibitive; and adoption of a policy below LOS D would be contrary to the City’s stated goal of maintaining the rural character of the community.

For the purposes of this analysis, the following criteria are used to select the appropriate policy for the City.

Evaluation Criteria

The evaluation of the alternative level of service policies focus on several criteria. The criteria included:

- Support of the Comprehensive Plan
- Cost of Implementation
- Compatibility with Adjacent Jurisdictions
- Community Acceptance

An evaluation of the alternative levels of service, LOS C or D, in terms of the four criteria is discussed below.

Support of the Comprehensive Plan

The Comprehensive Plan is used to guide the development of the community to achieve a community consistent with community desires. The plan covers a full range of goals and objectives, not all of which would be impacted by the adopted level of service policy. However, there are several Comprehensive Plan Goals that will be directly impacted by the policy. To ensure the adopted LOS policy adequately supports the Comprehensive Plan Goals and Policies; those Goals most impacted by the level of service have been considered here.

A cursory review of the Comprehensive Plan identified several goals upon which an evaluation of the alternative levels of service could be made. The goals identified include the following:

- LU-2 Maintain residential quality and livability suitable for a rural town;
- LU-4 Preserve and Protect Residential Neighborhoods
- T-A Create a comprehensive street system, that provides reasonable vehicle circulation throughout the City while enhancing safety and function of the overall local transportation system;
- T-I Encourage the development and use of alternatives to single occupancy vehicles
- T-N – Minimize the impact of truck traffic on general traffic circulation on Cle Elum neighborhoods.

Table 4 presents an evaluation of the alternative LOS policies against the relevant Comprehensive Plan goals to determine which of the alternative LOS policies provides the “best support” for that particular goal. Table 4 also provides a justification statement why the particular LOS policy was selected as the one that “best” supported that goal.

Table 4. Evaluation of LOS Policy Support of the Comprehensive Plan

Goal	Best Support		Justification
	LOS C	LOS D	
LU-2 Maintain residential quality and livability suitable for a rural town	X		LOS C was selected as it minimizes the potential for traffic congestion
LU-4 Preserve and Protect Residential Neighborhoods	X		LOS C was selected as traffic congestion is minimized motorists will not seek alternative paths generally through residential neighborhoods
T-A Create a comprehensive street system, that provides reasonable vehicle circulation throughout the City while enhancing safety and function of the overall local transportation system;	X		LOS C will provide reasonable vehicle circulation and reduce the potential for congestion related collisions.
T-I Encourage the development and use of alternatives to single occupancy vehicles		X	LOS D was selected as there will be increased congestion creating a desire for motorists to use other modes.
T-N – Minimize the impact of truck traffic on general traffic circulation and on Cle Elum neighborhoods.	X		The reduced congestion offered by LOS C will serve to minimize the impact of truck traffic.

As shown in Table 4, level of service C offers the best support of the overall comprehensive plan goals and policies as it offers the highest speeds and least congestion for the arterial network. LOS D is supportive of goals which seek to promote alternative modes of transportation as it encourages lower speeds and increased congestion. LOS C would be a reasonable policy for the City arterial street network which serves circulation through and around the City. LOS D may be more appropriate for the proposed pedestrian emphasis district (PED) bounded by Railroad Street, 2nd Street, Oakes Avenue, and Wright Avenue.

Cost of Implementation

Once the policy is adopted, it is incumbent on the City to ensure that the existing arterial network meets the desired policy. In other words, if there are intersections currently operating below the LOS standard, the City must fund the necessary improvements to provide an acceptable level of service. Furthermore, according to the Growth Management Act, new development is not required to fund existing system deficiencies. Therefore, what ever policy is selected, the City would be required provide it under the existing condition. New development would be required to pay for the additional capacity required to meet future demand created by new development.

As shown in Table 2, the majority of intersections operate at LOS B (13); six (6) at LOS A; and two (2) at LOS D. If LOS D were adopted as the policy the City would bear no responsibility for improving any of the intersections as all intersection currently operate at LOS D or above such that the policy would be achieved. If LOS C were selected, the City would be responsible for improving the two intersections currently operating at LOS D to LOS C. The intersections include W First Street/Cemetery Road (Safeway Drive) and E First Street/Teaway Avenue. Under current volume conditions, it is estimated the deficiencies could be eliminated through signalization of W First Street/Cemetery Road (Safeway Drive) and channelization modifications at E First Street/N Teaway Avenue intersections. The estimated cost of these improvements is approximately \$250,000

In the 2029 horizon year, major capacity improvements will be provided through the construction of new roadways which will be required to meet the circulation and capacity demands of forecasted development. No matter what LOS policy is selected these improvements would be required and could be constructed on an as needed basis by future development. These improvements are estimated to cost approximately \$93 million.

For the second category of intersections, the level of service analysis presented in Table 2 indicated LOS B could be achieved through widening of the intersection to provide additional capacity and signalization. Neither improvement alone achieved a viable level of service nor did both measures together provide a relatively high level of service. The estimated cost of these improvements is approximately \$700,000 for the two intersections. Again these improvements could be constructed on an as needed basis by future development.

For the third category of intersections, a high level of service can be achieved simply through the provision of a traffic signal. The estimated cost of signalization for all nine intersections is \$1.8 million. Again signalization can be constructed on an as needed basis and funded by future development.

The fourth category involves simply rechannelization at critical intersections on First Avenue. The total cost of these improvements is estimated at \$50,000 and can be constructed on an as needed basis by future development.

The conclusion of this analysis is adoption of a relatively high level of service policy will not cost the City or new development a significant amount of money beyond the roadway and traffic control infrastructure necessary to provide adequate circulation and capacity for projected growth. Capacity is not purchased in finite amounts but rather in blocks. As was shown above, the simple installation of a traffic signal can improve the intersection level of service from LOS F to LOS B. There may be no other acceptable improvements available that would provide an improvement from LOS F to LOS D. In the final analysis, there may be no overall differential cost between providing LOS C and LOS D. With the adoption of LOS C, however, the City would be faced with funding the cost of improving two intersections currently operating at LOS D to LOS C. The estimated cost as stated above is approximately \$250,000.

Compatibility with Adjacent Jurisdictions

The results of the “Best Practices” research indicated the surrounding jurisdictions adopted level of service policies that ranged between LOS C and LOS D. Most jurisdictions adopted LOS D for urban conditions and LOS C for rural conditions. Both Kittitas County, WSDOT, and QUADCO adopted this policy. The City of Ellensburg adopted LOS B for local access streets, LOS C for arterials and LOS D for arterial intersections with freeway interchanges.

Since the City of Cle Elum desires to maintain a rural character, LOS C is certainly justifiable and comparable with the surrounding jurisdictions. The City of Ellensburg has adopted a LOS C for urban conditions which could be applied to the new urbanization of Cle Elum.

Therefore, the conclusion of this assessment is that LOS C should be the service standard for the City of Cle Elum arterial street network and is supported by the policies of the adjacent jurisdictions as well as the key policies of the City’s Comprehensive Plan, as shown in Table 4 above.

Community Acceptance

It is intended that the results of this study will be reviewed by and receive input during a community forum. Community acceptance of the recommended policy will be determined at that time. It is assumed that in the final analysis the wishes of the community will be recognized.

Locations with Sub Standard Road Geometry

A cursory field trip was conducted to identify existing locations with sub standard road geometry. The purpose of this exercise is to identify locations where as traffic volumes increase, safety issues and potential collisions will occur as the roadway presents sub standard conditions.

Often times these locations may not have congestion related issues that are identified in a level of service analysis, however as a result of the sub standard roadway geometry incidents and collisions are likely to occur as traffic volumes increase.

Table 5 identifies a sample of the various sub standard road geometry locations in the city. A map of these locations is presented in Figure 2.

Table 5. Locations with Sub Standard Road Geometry

Roadway	Section		Issue
	From	To	
N Stafford Avenue	W 4 th Street	W 5 th Street	- Narrow lane width - Sharp curves - Sight distance - Extreme drop off
N Montgomery Avenue	E 3 rd Street	North Termini	- Narrow lane width - Sharp curves - Sight distance
N Columbia Ave/Columbia Ave N	E 4 th Street	North Termini	- Narrow lane width - Sharp curves
S Cottage Avenue	E 1 st Street	North Termini	- Narrow lane width - Sharp curves
Airport Road @ SR 903	Intersection		- Intersecting street too close to intersection
S Cle Elum Wy@Railway/I-90 under crossing	Intersection		- Intersection too close to railway
Billings Avenue	W 4 th Street	W 5 th Street	- Narrow lane width - Sharp curves - Extreme drop off
E 1 st Street	Airport Road	S Cottage Ave	- Narrow lane width - Sharp curve

As shown in Table 5, the majority of the locations has narrow roadway conditions with sharp curves and in some locations extreme drop offs. Fortunately most of these roadways have a very low daily volume. In the future, as development occurs in the city and traffic volumes increase, the potential for collisions and other incidents will dramatically increase. A map of these locations is presented in Figure 2.

The City has defined the following road standards for guidance in constructing City streets. When substantial deficiencies exist, the roadway should be reconstructed to meet these standards for vehicles, bicycles, and pedestrians. The guidelines are presented in Table 6.

Figure 2

Table 6. City of Cle Elum Road Standards

Criteria	Arterial	Access Road	Local Residential	Alley
Design Speed ²	35	25	20	20
Pavement Width ³	52	36	32	16
Right of Way ³	80	60	58	20
Travel Lanes ⁴	2-12	2-12	2-10	2-8
Turn Lanes ⁵	1-12			
Parking Lane ³	8	8	6	None
Sidewalks ³	Both Sides	Both Sides	Both Sides	None
General ⁶	7	6	6	
Commercial ⁷	12	12		
Sight Distance	AASHTO	AASHTO	AASHTO	
Intersection Radius	AASHTO	AASHTO	AASHTO	

Source: City of Cle Elum Municipal Code Section 16.12A.060

- 1) AASHTO – American Association of State Highway and Transportation Officials – Roadway Design Guidelines
- 2) Design Speed measured in miles per hour
- 3) Pavement Width measured in feet
- 4) Travel Lanes - # and width in feet
- 5) Turn Lanes - # and width in feet. Turn lanes determined by traffic analysis
- 6) Sidewalks outside of commercial areas measured in feet
- 7) Sidewalks inside commercial areas measured in feet

As development occurs, an analysis of the development’s proposed traffic generation impact on these locations should be considered.

Conclusions

The purpose of this technical memorandum was to summarize the process, findings and conclusions of the selection of an appropriate level of service policy for the City of Cle Elum. The determination was based on an evaluation of the existing level of service; the 2029 horizon year level of service with proposed growth; the compatibility with Comprehensive Plan Goals; cost of implementing the recommended policy; and alternative policy consistency with the LOS policies of adjacent jurisdictions.

The process considered two alternative LOS policies as being most appropriate for consideration. The main factors of consideration were the ability to achieve the policy and the cost to implement. As a result, LOS C and LOS D were selected for further consideration.

In the final analysis, it was determined that, in general, LOS C would best support the City’s Comprehensive Plan Goals and is affordable for the City as a whole. Secondly it was determined that LOS D would support development of the proposed Pedestrian Emphasis District (PED) bounded by Railroad Street, 2nd Street, Oakes Avenue and Wright Avenue in the Cle Elum Old Town Historic District.

As discussed in Chapter IV, Section F of the *Cle Elum Transportation Plan 2009*, the purpose of the proposed PED is to support the walk mode; enabling a safe and enhanced environment for pedestrian activity and shopping in the Cle Elum retail core. If a higher

level of vehicular travel and service were permitted in and through the PED, the pedestrian environment would be compromised. Moreover, the City's goal to create an environment for improved pedestrian access and mobility within its retail core would be diminished.

Finally, it was determined that LOS C was consistent with the desired rural character of the city and consistent with the adopted LOS C for rural areas in the adjacent jurisdictions.

Recommendation

It is recommended that the City of Cle Elum adopt LOS C as the general level of service policy for the City's arterial network and LOS D for the proposed Pedestrian Emphasis District.

City of Cle Elum

Level of Service Policy Development Study

Technical Memorandum #3

May 15, 2010

The following memorandum is the third of three technical memoranda which will summarize the process, findings, and recommendations of the level of service policy development study. The level of service policy will be used to guide future development in support and implementation of the City of Cle Elum Comprehensive Plan and development of the City's transportation system.

The purpose of this memorandum, Technical Memorandum #3, is to recommend for the City's consideration an implementation strategy presented in the form of an outline for a future transportation management ordinance. The memorandum identifies the elements of a Transportation Management Program which includes transportation concurrency; a funding mechanism in the form of traffic impact fees; level of service standards for intersections and arterial corridors; and evaluation criteria to mitigate sub standard road conditions. The focus of this memorandum is the level of service and sub standard road conditions.

Technical Memorandum #1 summarized the results of the data collection efforts; evaluated the 2029 trip generation forecasts presented in the 2009 Transportation Plan; summarized level of service policy "best practices"; and identified alternative LOS Policy concepts.

Technical Memorandum #2 summarized the process, findings, and recommendation of an acceptable level of service policy. The memorandum included a summary of the existing and future level of service at selected intersections; an analysis of alternative levels of service policies; and an identification of locations with substandard road geometry and design standards.

Components of a Transportation Management Plan

The components of a Transportation Management Plan (TMP) include the following:

- Concurrency Management consistent with RCW 36.70A.070 which require jurisdictions to provide adequate transportation improvements to maintain level of service standards; and,
- Impact Fees – Assessed against new development to insure a fair and equitable distribution of the transportation improvement costs among developers, the City, Kittitas County, and Washington State Department of Transportation (WSDOT); and,

- Road Standards – A mechanism to evaluate roadways and intersections impacted by new development to assure safe and efficient future operation of the roadway network.

The development and integration of concurrency management and traffic related impact fees into the Transportation Management Plan will be left for future discussions. The focus of this memorandum is the Road Standards.

Road Standards

The purpose of the Road Standards is to assure a safe and efficient roadway network in the City of Cle Elum now and in the future. The Road Standards include levels of service standards for intersections and roadways within the City, and design standards to guide the future development such that safe and efficient roadway systems are provided.

The Road Standards will:

- Assure adequate levels of service, safety, and operating efficiency on the City of Cle Elum street system and at intersections directly impacted by proposed new development; and,
- Establish standards for roadway operation and define the relationship between new and existing traffic on the roadway system;
- Identify development requirements to assure roadway capacity, safety and operational efficiency; and
- Require that owners of new developments pay their proportionate cost of required roadway improvements.

Roadway standards will assist the City and development community in the mitigation of significant adverse impacts on the roadway network.

Significant Adverse Impacts

A significant adverse impact is defined as any traffic condition directly caused by proposed development that would reasonably result in one or more of the following conditions at the time any part of the development is completed and able to generate new traffic:

- A roadway intersection that is estimated to operate at a level of service worse than “C” and will carry ten (10) or more development generated vehicles in any one hour period; or
- A roadway intersection or approach lane impacted by ten (10) or more development generated vehicles in any one hour period, where the SEPA official determines that a hazard to safety could result; or
- Any sub standard roadway segment that will carry ten (10) or more added vehicles generated by the proposed development where the SEPA official determines that a hazard to safety could result.

A hazard is defined as any roadway condition which is likely to create an unsafe condition for vehicular traffic. An unsafe roadway condition is defined as any condition which lies outside the roadway standards as defined by the City's Design Guidelines. Elements of any analysis would include recent collision history, sub standard stopping sight distance, insufficient clear zone or extreme cross slopes.

Mitigation Measures

If, upon sufficient investigation as determined by the SEPA official, it is determined that the Roadway Standards are adversely impacted, the owner of a proposed development shall be required to provide improvements which:

- Bring the intersection or roadway into compliance with the Road Standards; or is,
- Returned to its pre-project condition, as may be required by the SEPA official.

Approval to construct the proposed development shall not be granted until the owner has agreed to build or pay a fair and equitable amount to build the improvements required by the SEPA official within the time frame required by the official.

Based on the technical analysis provided as part of the development review, the SEPA official may require the owner of a proposed development pay the full cost of the required Roadway Standards improvements.

Interjurisdictional Agreements

The City of Cle Elum is encouraged to enter into agreements with the WSDOT, Kittitas County and other jurisdictions for the collection of fees and the mitigation of traffic on state highways, county roads, and city streets caused by development occurring within the City of Cle Elum. The Road Standards used in such agreements shall be those of the City, WSDOT, Kittitas County, other jurisdiction, or combination thereof as provided in the agreement.

Conclusions and Recommendations

It is imperative that the City of Cle Elum adopt a level of service policy to guide new development in the formulation of a transportation system that meets the needs of the City and new development and maintains the desired community qualities.

With the adoption of a LOS policy, a strategy must be adopted to implement the policy and manage the City's overall transportation plan. Technical Memorandum #3 offers such a strategy for consideration by the City. The information provided above should be a starting point which the City may use for discussion and brain storming the evolution of and adopted strategy.