TRANSPORTATION

Introduction

As a result of the Growth Management Act, transportation planning requirements are extensive and attempt to relate transportation to land use. To accomplish this, Lincoln County is required to develop a circulation element that correlates with the land use element, and the County may adopt a transportation element showing a comprehensive system of transportation.

According to the Growth Management Act, the following components must be addressed within the transportation element of a comprehensive plan:

- An inventory of existing services and facilities.
- The future land use assumptions, used in estimating travel.
- Regionally coordinated level of service standards for all arterials, and transit routes.
- Identification of current and future deficiencies in the transportation system which must be met to accommodate current and future demands.
- A finance component.
- An action plan for bringing into compliance any services or facilities that fall below the established level of service.
- Intergovernmental coordination efforts, including an assessment of the impacts of the transportation plan and land use assumptions on adjacent jurisdictions.
- Transportation Goals and Policies.

MAJOR ISSUES

A number of important issues and questions regarding Lincoln County's vision of the future and preferences for accommodating growth and development have been raised and explored in the land use and housing elements. As Lincoln County continues to develop, transportation related issues will join the many concerns stemming from this additional development. Increasing amounts of traffic will focus attention on issues which include:

- Lincoln County is a rural area that is crossed by several state routes including SR2, SR 21, SR28, SR25 and SR231 plus I90 carrying a substantial amount of fast moving traffic. SR2 and SR28 also serve as the main thoroughfares in Reardan, Davenport, Creston, Wilbur and Odessa passing through areas of high pedestrian traffic. This issue may be a stronger concern for the cities and towns, but how can the City, County, and State work together cooperatively to increase pedestrian safety.

- Lincoln County area residents feel their tax dollars should be spent on improving roads. Where should the funds be spent, and which roads should be prioritized.

• Lincoln County currently has one state route that is not considered an all weather road and subject to seasonal restrictions.

• The topography of the county is such that a large percentage of existing and new development is taking place in the vicinity of Lake Roosevelt. These areas are served by few county roads many of them unpaved. These gravel roads are experiencing heavy residential and recreational traffic leaving wash boarding due to light traffic and aggregate loss requiring frequent maintenance. By considering these issues associated with growth in developing the future transportation policies and plans, the County can take a proactive stance in anticipating and mitigating these problems. Or it can approach these problems one at a time depending on the availability of funds. The intent of the Growth Management Act is that Lincoln County's management and regulation of land uses be supported by policies relating to the provisions of transportation networks and facilities. If the link between land use and transportation is achieved, the result will be a vital community served by good transportation facilities and services, efficient use of public funds, strong local economies, and preservation of the natural environment.

ANALYSIS OF THE EXISTING TRANSPORTATION NETWORK

This section of the plan presents an inventory of the existing transportation system, and begins to analyze current and projected needs. The inventory and analysis of services and facilities are intended to provide an assessment of the capability of the existing system to meet existing needs, as well as to correlate system needs with estimates of projected land uses and growth in Lincoln County.

Roads throughout Lincoln County are generally paved, graveled, or surfaced with native materials, most have little or no shoulder, and the majority are without road mile markers. Stop signs regulate traffic at major intersections; there is only one flashing caution light and it is in the Town of Davenport at the intersection of SR 2 and SR 28.

Transit Service

In Lincoln County, the primary mode of transportation is the automobile. However, there is limited private transit service available between Davenport and Spokane.

Pedestrian Circulation

Similar to many small towns, pedestrian facilities are limited within the communities of Lincoln County due to its rural character.

Bicycle Routes

At this time, there are no projections for the number of bicyclists, hikers, horseback riders or other trail / road users who use and enjoy the scenic roads of Lincoln County.

Emergency Services
Lincoln County residents are served by well trained and prompt EMT and fire response units from Lincoln County communities, and the Department of Natural Resources.

Miscellaneous Services
Lincoln County is served by many small airstrips.

RURAL AND COUNTY-WIDE LEVEL OF SERVICE (LOS) ISSUES

Background
Level of service (LOS) is a multi-dimensional measurement of the quality of service provided by the existing transportation system. It can be described by one or more factors, such as travel times, levels of congestion, volume of use compared to system capacity, frequency of service, comfort, and convenience or safety.

The Growth Management Act requires the establishment of a *level of service standard* as a gauge for evaluating the performance of the existing transportation network, including roads and transit. It is also used to determine whether transportation improvements or transportation services will be available to serve proposed development at the time of development or within six years. This requirement is called "*concurrency*". If services which will operate at the established level of service standard will not be concurrent with a proposed development, either financing for the improvement must be expedited or the development cannot be granted approval. Level of service standards are also used in the establishment of traffic impact mitigation fees in other counties.

Finally the level of service standards are used as a tool in the programming of transportation improvement funds to determine priorities between needs.

Determining Existing Level of Service - Roadways
The method that is used throughout the United States is one established by the Transportation Research Board. It uses a measure called "Level of Service" (LOS) that allows for consistent comparison among alternative transportation options. Although LOS is quantitative, it is also a qualitative measure that examines how the roadway operates and how drivers perceive these conditions. It is related to the physical characteristics of the highway and the operating characteristics that can occur when the highway supports different traffic volumes. It generally describes these characteristics in terms of such factors as speed, delay at intersections, freedom to maneuver, traffic interruptions, driver comfort and convenience, and safety.

The following provides general definitions for level of service (LOS) categories. Six levels of service are defined. Each level is given a letter designation from A to F, with LOS A representing the best operating condition and LOS F the worst.

Exhibit 8-1: Level of Service Criteria for Two-Lane Highways

Level of Service	General Operating Conditions
A	Describes completely free-flow conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and by driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed without a change in travel speed.
B	Describes free-flow conditions, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS 'A', but drivers have slightly less freedom to maneuver. In simple words, it can be defined as "reasonably free flow traffic".
C	The influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Minor disruptions in traffic stream can cause serious local deterioration in service, and queues will form behind any significant traffic disruption. LOS 'C' can be defined as a "stable flow condition".
D	The ability to maneuver is severely restricted due to traffic congestion. Average travel speed reduces by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating. LOS 'D" can be defined as "approaching unstable flow conditions".
E	The traffic operation is at or near capacity, an unstable flow condition, in this LOS. Vehicles will operate with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate further. The traffic flow in this LOS can be defined as "unstable flow condition".
F	This LOS represent forced or breakdown flow conditions. This type of traffic occurs when the forecast demand exceeds the computed capacity of a planned facility.

Level of service is used to determine the function of existing transportation systems as well as to design for the proper sizing of new improvements. The American Association of State Highway and Transportation Officials (AASHTO) state "As may be fitting to the conditions, the highway agency should strive to provide the highest level of service feasible. In heavily developed sections of metropolitan areas, conditions may necessitate the use of level–of-service D for freeways and arterials, but such use should be rare and at least level-of-service C should be strived for. For some urban and suburban highways, conditions may necessitate the use of level-of-service D."

An Alternate Methodology for Determining LOS for Rural Roads (See Attachment A)

LOS standards for two-lane rural roadways are also significantly different from the LOS standards for two-lane urban roadways. Traditionally, Level of Service is measured based upon the delay experienced when traveling a roadway segment or when going through an intersection. However, in rural areas, the traditional system is ineffective because of the relatively low traffic volumes. This is not to say that the service level expected or needed is satisfactory, rather, the measuring system is inappropriate. Because of this difference, an alternative LOS system is proposed for two-lane rural

roadways. The proposed LOS standards for two-lane rural roadway systems rate its *Operation* and its *Condition*.

> *Operation* LOS rates a roadway in terms of how its characteristics compare with those necessary for it to function as intended.
>
> *Condition* LOS rates a roadway in terms of how its physical characteristics compare to those of an ideal facility.

The roadway system in Lincoln County is generally classified as two lane rural roadway. Two lane rural roadway systems operate under uninterrupted flow between points of fixed interruption. They are, however, significantly different in basic operating characteristics from multi-lane facilities. Passing maneuvers must take place in the opposing lane of traffic. Thus, flow in one direction limits and interacts with flow in the other direction. Passing is severely restricted under higher density conditions, and gaps forming in front of slow moving vehicles cannot be as efficiently filled as on a multi-lane facility. Consequently the Volume Capacity ratio (V/C =rate of flow/capacity) can be low. The capacity of a two-lane roadway is described in terms of the total flow in both directions. The capacity of two-lane rural roadways is 2,800 Passenger Car Per Hour (PCPH) under ideal conditions. Ideal conditions for two-lane rural roadways include: design speed 60 mph, twelve-foot minimum lane widths, six-foot minimum shoulder widths, no 'NO PASSING' zones, 50/50 directional distribution, and level terrain. Terrain influences capacity on rural two-lane roadways because of the increased difficulty in passing as terrain affects visibility.

Unsignalized Intersections

Two-way Stop Controlled (TWSC) and All Way Stop Controlled (AWSC) intersections are two types of unsignalized intersections. The 2000 Highway Capacity Manual provides methodologies and models to estimate control delays at unsignalized intersections.

LAND USE AND TRANSPORTATION

In 2000, Lincoln County had a population of 10,184. By 2010, the County's estimated population was estimated to have increased 1.21% to 10,393. Population forecasts predict an increase in population to 10,994 by the year 2015. Lincoln County's forecast population of 13,601 persons by 2030 is almost 30.9% greater than the 2010 population. This increase must be carefully planned and guided in order to accommodate future growth while maintaining the high quality of life in Lincoln County.

There are also significant changes occurring in the distribution of population and employment in Lincoln County that affect the future transportation system. The County is seeing a large increase in development in areas near the Lake Roosevelt area. This

type of new land use will make serious new transportation demands away from the traditional agricultural based demands.

Exhibit 8-2: LINCOLN COUNTY POPULATION FORECAST

Year	Population	% Change
2000	10,184	
2005	10,100	-0.82%
2010	10,393	+2.9%
2015	10,994	+5.8%
2020	11,907	+8.3%
2025	12,790	+7.4%
2030	13,601	+6.3%

Lincoln County's comprehensive plan contains the County's long-range land use plan, which provides direction for development in the County. It establishes the County's goals, and regulations. The purpose of this comprehensive plan is to translate community values and goals into a framework for specific decisions on growth, land use, and public facilities and services. This functional plan provides detailed information for the provision of the County transportation facilities that carry out the policies of the comprehensive plan. The land use and transportation elements of the comprehensive plan will work together to support and carry out the policies adopted by the County to guide future development and provision of public services. These plans are implemented through the development regulations.

County Road Traffic Forecast

Two percent (2%) was chosen as the annual growth rate for all County roads. Several factors were considered in arriving at this growth rate. WSDOT has used approximately two percent as the growth rate on state routes in the county. The determination was based on analysis of an extensive roadway count history, as well as experience elsewhere in eastern Washington.

While travel historically increases at a greater rate than population, population is still a good indicator of overall growth for rural areas. Through trips are anticipated to grow faster than local trips. However, most of the long distance, through trips, will be on state routes. Overall it was determined that a 2% per year growth rate is appropriate for County roads.

Growth factors were calculated for a six-year forecast and a 20-year forecast, based upon a 2% average growth rate: The growth factors are as follows:

2009-2015	1.13 Growth Factor $(1+0.02)^{6}$
2009-2029	1.49 Growth Factor $(1+0.02)^{20}$

The 2009 average daily traffic (ADT) was then multiplied by these factors to arrive at the six-year and twenty-year design traffic. The tabular results are shown in Exhibit 8-4.

Planned and Programmed Improvements

Each year the County files a six-year road plan for road improvements with the State. The six year road plan contains the maximum number of projects the County can reasonably expect to finance and complete. They are listed in order of priority to portray a true needs list. The most critical projects and those that are eligible for joint financing with the State Department of Transportation stand a better chance of being moved into construction. The currently adopted or amended Six Year Transportation Improvement Program is hereby incorporated by reference.

Potential Funding Sources

SAFETEA-LU (FHWA) Funds These funds are made available from the Federal Transportation Program, and Regional Surface Transportation Program (STP).

Private Contributions These are amounts contributed by the private sector to the cost of certain County projects.

Public Works Trust Fund Loan These funds are made available through a low interest loan program instituted by the State of Washington to assist in financing repairs/improvements required to maintain major public facilities, providing the county have met the requirements of the program. *(Currently Lincoln County is not eligible for grants or loans from the PWTF)*

Transportation Impact Fees These fees are assessed to developers to provide a portion of the funding for reasonable and necessary off-site transportation improvements to mitigate the cumulative impacts of growth and development in the planning area.

Freight Mobility Strategic Investment Board (FMSIB) In 1996, the Legislative Transportation Committee (LTC) designated the Freight Mobility Advisory Committee (FMAC) to analyze the state's freight mobility needs, identify high-priority freight transportation projects, and recommend policy to the legislature. The FMAC recommended that the state take the lead in implementing a freight mobility transportation program that would form funding partnerships among all the interested parties for improvements statewide along strategic freight corridors.

County Road Administration Board (CRAB) Rural Arterial Program These revenues represent a contribution from the Motor Vehicle Fuel Tax to specific County projects focusing on haul routes in rural areas. Funding is provided by CRAB Rural Arterial Program.

County Arterial Preservation Program (CAPP) In 1990, the legislature established the County Arterial Preservation Program (CAPP) to assist in funding preservation of county arterial pavements. CAPP provides some $12+ million per year to counties for a program similar to WSDOT's pavement preservation program.

Road/Local Improvement District & Others These programs can be established within the County to help with individual projects.

Transportation Benefit Districts (TBDs) Similar in basic intent to the Road Improvement District (RID) is the Transportation Benefit District or TBD. The TBD was authorized in 1987 and is codified as RCW 36.73. The TBD is an independent benefit district (and taxing authority) involving both public and private participation as well as allowing for the inclusion of both the WSDOT and cities. Due to the size and complexities of forming the TBD, defining the district, determining both the specific projects and the benefits, and receiving general approval from all the likely participants a TBD has the potential to be a very powerful funding source, if all the hurdles can be overcome.

Local Option Transportation Taxes In 1990, the legislature authorized several transportation taxes that can be implemented at the option of local government. Codified in RCW 82.80, the taxes available to counties are the vehicle license fee, the commercial parking tax, and a local motor vehicle fuel tax. There is the stipulation that the revenues generated must be used for general transportation purposes that are the result of a formalized planning, coordination, and programming process. They cannot be used to supplant existing transportation revenues. Revenues are collected by the state treasurer and are shared with incorporated cities within the county according to population, with the unincorporated population multiplied by a factor of 1.5 for the calculation.

The three local option transportation taxes available to counties are:

- **Vehicle License Fee (VLF):** [RCW 82.80.020] This is the simplest tax to implement, requiring no prior voter approval although it is subject to referendum. The maximum fee is $15 per year per vehicle with exemptions authorized for elderly, low income, and disabled people.

- **Local Motor Vehicle Fuel Tax:** [RCW 82.80.010] This tax, which can total ten percent of the statewide rate (currently at 36 cents per gallon), requires prior voter approval. While this tax could generate significant revenues in some counties, it is the most politically volatile.

- **Commercial Parking Tax:** [RCW 82.80.030] This tax is levied on parking spaces for which a fee is paid. It requires no voter approval and, if enacted by a county, applies only to unincorporated areas. Unlike the prior two local options, all revenues generated in unincorporated areas are retained by the county

Each of these potential funding sources have requirements and restrictions the county would need to address prior to taking advantage of the particular program.

RECOMMENDED ROAD PLAN

Road system improvements may be required to correspond to the intensity and location of residential, commercial and industrial development. The projected growth and development for Lincoln County requires that a number of the roads and State Routes be upgraded to provide a continued satisfactory level of service. A number of roads would need to be widened, and straightened. The maintenance of roads should be taken into consideration as part of the priority process.

Needs Identification

Identification of needs begins with an accurate inventory of transportation system components. Once an inventory is in hand, the condition and performance of the system can be determined using generally accepted methods. Various Management Systems are available for counties to use in evaluating both condition and performance. Systems of primary interest to counties include:

Pavement Management

A pavement management system (PMS) is a systematic method used to manage the preservation, rehabilitation, and maintenance of paved road systems by analyzing pavement life cycles; to assess overall system performance and costs; and to determine the alternative strategies and costs necessary to prevent significant road deterioration. A key element of an effective PMS is its ability to provide pavement preservation alternatives based upon a predictive pavement deterioration model. WAC 136-70 requires all counties to use a PMS to "guide the pavement preservation and rehabilitation activities on all county paved arterial roads". Counties must a computer-based PMS that meets the requirements of WAC 136-70-040. The condition data obtained must be provided to CRAB, which has responsibility for maintaining the statewide pavement condition data file, organized by county. Use of a PMS is a Standard of Good Practice and is required to maintain eligibility for CAPP funds.

Bridge Management

Bridges of many kinds are an integral part of every county road system. The safety and adequacy of these bridges is of vital importance to the traveling public. A program of regular periodic inspection and reporting is necessary to fully inform each county legislative authority about the condition and adequacy of all bridges. WAC 136-20-020 requires that the county engineer "have available in his or her office a complete inventory of all bridges on the county road system". The county engineer is responsible for all routine and special inspections of all bridges on the county road system in accordance with the National Bridge Inspection Standards (NBIS) as promulgated and periodically revised by WSDOT H&LP and FHWA. Inspection information is to be forwarded to WSDOT annually.

Maintenance Management

Maintenance management is a method of utilizing resources to accomplish a predetermined level of service for road assets. Formal maintenance management includes the primary management functions of planning,

organizing, directing and controlling. A maintenance management system (MMS) can be described as a systematic process to manage a maintenance program. Another way of describing maintenance management—a systematic work management process that applies good common sense to help people work together to improve maintenance operations.

Priority Programming

Priority Programming is the development and application of techniques designed to rank any array of potential projects in order of importance to serve as a guide in assisting a county legislative authority in the formulation of road programs and the distribution of limited resources. WAC 136-14-030 requires each County Engineer to "develop a priority programming process tailored to meet the overall roadway system development policy" determined by the county legislative authority. While each county may develop its own process, all processes must include consideration of the following:

1. Traffic volumes;
2. Roadway condition;
3. Geometrics;
4. Safety and accident history; and
5. Matters of significance local importance.

A successful priority programming process must be clearly defined and will be documented so that the general public and private investors can easily understand it. Public input and review should be encouraged, with the goal of obtaining public consensus on the priority array. In general, the process should include:

- Systematic identification, evaluation, and prioritization of problems;
- Broad review of recommended solutions; and
- Consistent incorporation of results into transportation programs and budgets.

Six-Year Transportation Improvement Program (TIP)

For more than thirty years, cities and counties have been required to prepare, adopt, and submit 'long-range' advance road and bridge construction programs. For many years, these programs have been required to span a six-year period. Six-year programs must be adopted by the county legislative authority and a copy of the adopted program must be submitted to WSDOT, CRAB, and – for counties containing urban areas – to TIB. [RCW 36.81.121-122] The six-year program must be updated and adopted annually.

TIP and STIP Inclusion

With the passage of ISTEA and following federal transportation acts, the annual and six-year road programs take on an added value. All federal aid projects must be planned and included in a regional Transportation Improvement Program, and

ultimately the State Transportation Improvement Program (STIP). Regional planning organizations work with the counties to select and include projects in their TIP for federal funding that are then forwarded for inclusion in the STIP. The plans should all coincide.

Annual Construction Program

The annual road program requirement has been around at least as long as the six-year program requirement. The annual road program is typically the first year of the six-year program with additional specifics such as priority, work method (contract or county forces construction), and new equipment list. The annual road program must be adopted before the actual road budget is adopted.

Capital Facilities Plans

The Growth Management Act requires participating counties to prepare Capital Facilities Plan (CFP) to ensure that necessary infrastructure is available for planned growth. The CFP must include all county facilities (solid waste, parks, stormwater, sewer, water, buildings, roads, etc.) and consists of not only an inventory of capital facilities but also a forecast of future needs and at least a six-year financing plan. [RCW 36.70A.070] For transportation facilities, the CFP element is essentially an extension of the six-year program requirement.

CAPITAL FACILITIES PROGRAM

The Capital Facilities Program calls for investments in water, sewer, and road facilities. Because of the financial constraint on the County, many of these projects will be funded by Grants, or low interest loans. Through the Department of Community and Economic Trade, the county applies for CDBG grants to assist the county in funding essential facilities. Other grants available to the county are the Centennial Clean Water Fund and federal and state funds.

Roads

Road system improvements are financed through a local match and various state and federal grant programs made available to rural counties.

ATTACHMENT A

An Alternate Methodology for Determining LOS for Rural Roads

Operation Level of Service Standards

The Operation LOS rates a roadway in terms of how its characteristics compare with those necessary for it to function as intended. The roadway is rated on how it compares to its rated tonnage classification and how often it is open for use. A high operation rating indicates a roadway that is always available to be used and exceeds the rated strength for its tonnage classification; a low rating indicates a roadway that is rarely available for use and has a strength well below what is required for its tonnage classification.

It is important for major County roads to remain open during winter and spring months. Due to their surfacing, condition and location, some roads may be closed or have their load limits restricted on a short term basis. Some of these closures are regularly scheduled each year, usually based on weather conditions such as snow or spring thaws. The operation LOS will use a scale from 01 to 05, with 01 representing the highest LOS and 05 representing the lowest LOS. The Operation LOS rating system is described in Exhibit 5-1.

Condition Level of Service Standards

The Condition LOS rates a roadway in terms of how its physical characteristics compare to those of an ideal facility. An ideal facility standard includes width, surface type and thickness, and vertical and horizontal geometry. A high Condition LOS rating is given to roadways constructed to a high standard and providing a high level of driver comfort and safety; a low rating is given to roadways that are physically deficient, providing little driver comfort or safety. LOS for condition rating is from C1 to C5; C1 represents the highest LOS and C5 represents the lowest LOS. The Condition LOS rating system is described in Exhibit 5-2.

Based on the definition of Operation and Condition LOS standards, roadway segments throughout the County are rated. The rated roadway segment is a function of roadway classification (principal arterial, minor arterial, major collector, minor collector, and access roads). Exhibit 5-3 shows a preliminary proposed Operation LOS for each roadway classification, and Exhibit 5-4 shows a preliminary proposed Condition LOS for each roadway classification.

EXHIBIT 5-1: OPERATION LEVEL OF SERVICE STANDARDS

LOS	Description
01	Weight restrictions imposed 5 days or less per year. Closed only in extreme circumstances. Lane capacity never reaches its maximum. Presence of trucks and recreational vehicles cause no delay. Presence of non-motorized vehicles (bikes and pedestrians) cause no delay or safety concern.
02	Weight restrictions imposed 5 to 15 days per year. Rarely closed. Presence of trucks and recreational vehicles cause no delay. Presence of non-motorized vehicles (bikes and pedestrians) is limited.
03	Weight restrictions imposed 15 to 30 days per year. Sometimes closed. Presence of trucks and recreational vehicles causing noticeable delay.
04	Weight restrictions imposed 30 to 60 days per year. Sometimes closed. Presence of trucks and recreational vehicles causing delay.
05	Weight restrictions imposed more than 60 days per year. Often closed. Presence of trucks and recreational vehicles cause delay and forms long queue. Presence of non-motorized vehicles (bikes and pedestrians) cause delay.

EXHIBIT 5-2: CONDITION LEVEL OF SERVICE STANDARDS

LOS	Description
C1	Meets all appropriate County standards. Meets all appropriate WSDOT standards. Surface material in excellent condition. Driving is comfortable and safe. Number of accidents due to roadway condition is zero.
C2	Meets most appropriate standards. Meets minimum lane width for classification. Meets minimum shoulder width for classification. Vertical and Horizontal curves on existing roadway reasonably conform to design standards. Short sections on roadway may exceed standard grade. Surface material appropriate for classification and in good condition. Number of accidents due to roadway condition is limited.
C3	Meets many of the appropriate standards. May not meet minimum lane width and shoulder width. One or more substandard curves 10 mph below design standards. Up to 10% of roadways exceeds standard grade. Surface material may not be appropriate for classification, and in fair condition. Number of accidents due to roadway condition is low.
C4	Deficient in meeting appropriate standards. Does not meet minimum lane and shoulder width. One or more substandard curves 15 mph below design standards. Over 10% of roadways exceeds standard grade. Surface material not appropriate for classification, and is in poor condition. Number of accidents due to roadway condition is noticeable.
C5	Deficient in meeting standards. Creating hazardous condition. Needs immediate attention. Number of accidents due to roadway condition is high. No sidewalk, no shoulders.

EXHIBIT 5-3: PRELIMINARY PROPOSED OPERATION LEVEL OF SERVICE

Roadway Classification	**Operation LOS**
Principal Arterial	O1
Minor Arterial	O2
Major Collector	O3
Minor Collector	O4
Access (local) Road	O5

EXHIBIT 5-4: PRELIMINARY PROPOSED CONDITION LEVEL OF SERVICE

Roadway Classification	**Condition LOS**
Principal Arterial	C1
Minor Arterial (over 2,000 ADT*)	C2
Major Collector (400 -2,000 ADT)	C2
Minor Collector (under 400 ADT)	C3
Access (local) Road (under 200 ADT)	C4

*ADT: Average Daily Traffic in numbers of vehicles using the roadway. If ADTs greater than the typical range shown, use the design standards for the next higher roadway classification.

LEVEL OF SERVICE FORECASTS

The conventional LOS defined by the 2000 Highway Capacity Manual, has limited value in a rural County such as Lincoln. . Congestion, which is an indicator that a roadway is approaching capacity, is generally not an issue in Lincoln County. A conventional LOS analysis of the County would conclude that there are no needs for roadway improvements while the citizens of the County recognize the need for improvements on some roadway sections. These improvements may take the form of street/road widening to meet standards, resurfacing to improve comfort, passing lanes to address seasonal RV's and trucks, spot safety improvements, or any of a variety of others.

As a result, composite LOS was developed to measure overall roadway performance. The composite LOS is intended to identify and prioritize the need for roadway improvements, not just relative capacity. The goal is to assist decision makers in programming limited transportation funding in an efficient and effective manner.

To evaluate the roadway system in the county and cities of Lincoln County, an Operation Level of Service and Condition Level of Service was performed by Lincoln County officials. The evaluation of the roadway system depends on the experience and knowledge of local government. A scoring system was established to evaluate the roadway system as shown on the Level of Service determination form (Exhibit 8-5). Level of Service was divided into two parts, Operation Level of Service, and Condition Level of Service. The Operation Level of Service rates a roadway in terms of how its characteristics compare with those necessary for it to function as intended. The Condition Level of Service rates a roadway in terms of its physical characteristics when compared to those of an ideal facility.

After the roadway systems in Lincoln County and each city were evaluated, the scoring system was used to determine the existing Level of Service. For example, if a roadway section scored 45 on Operation Level of Service and 35 on Condition Level of Service, the roadway section achieved a Level of Service B. Figure 8-4 is used to determine Level of Service based on the operation and condition of a roadway section. In addition, Figure 8-5 is used to determine the six-year depreciation factor for each existing Level of Service, based on the total score (operation score and condition score). The slope of the line represents the depreciation factor. "The depreciation factor is then multiplied by the existing score to find the projected Level of Service from Figure 8-4. Appendix C-3 shows the procedure of determining existing and forecasted Level of Service.

Using the concept of "useful life" or depreciation, Level of Service Determination Graphs were developed, as described above. Appendix C-3 shows the depreciation graphs in addition to the procedure of determining existing and projected Level of Service factors. For example, following the deterioration curve, the calculated LOS of B described in the paragraph above, deteriorates to a LOS of B-within six years. By applying the LOS Forecast Graphs to each current rating, then, an improvement program can be developed keyed to when various roadway segments deteriorate below the accepted standard.

Exhibit 8-6 shows a summary of existing and projected (six-year and 20-year) LOS ratings for Lincoln County roads. The LOS evaluation is based on data obtained from Lincoln County staff. The evaluated LOS is an indicator of the Operation and Condition levels of a given roadway section.

Exhibit 8-7 shows a summary of existing and projected (six-year) Level of Service Operation and Condition levels for Lincoln County roads. The Level of Service evaluation is based on data obtained from Lincoln County staff. The projected Level of Service for the six-year period is based on the depreciation factor obtained from Figure 8-5(procedure is shown in Appendix C-3). The projected Level of Service is an indicator of the Operation and Condition levels of a roadway section after six years.

Exhibit 8-8 shows a summary of existing and projected (20-year) Level of Service ratings for Lincoln County roads. The Level of Service evaluation is based on data obtained from Lincoln County staff. The projected Level of Service for the 20-year time frame was based on the depreciation factor obtained from Figures 8-6, 8-7, and 8-8 (a detailed procedure is shown in Appendix C-3). The projected Level of Service is an indicator of the operation and condition level of a roadway section after 20-years.

Figure 8-9 shows existing and projected (six and twenty-years) Level of Service for County roads.

EXHIBIT 8-5: LEVEL OF SERVICE DETERMINATION

Scoring:

OPERATION LOS (50 points)

ROAD NAME/DESCRIPTION:

_____

			Score (Please fill In the boxes only)
1	Weight restriction (10 points)		
	5 days or less per year	8 -10	
	5 to 15 days	6-8	
	16 to 30 days	4-6	
	31 to 60 days	2-4	
	more than 60 days	0-2	
			Maximum 10
2	Road closure (8 points)		
	closed in extreme circumstances	6-8	
	rarely closed	4-6	
	sometimes closed	2-4	
	often closed	0-2	
			Maximum 8
3	Lane Capacity (12 points)		
	never reached max. capacity	8-12	
	average	4-8	
	reached max. capacity	0-4	
			Maximum 12
4	Presence of trucks & RVs (12 points)		
	cause no delay	9-12	
	noticeable delay	6-9	
	cause delay	3-6	
	cause delay and form queue	0-3	
			Maximum 12
5	Presence of non-motorized vehicle (8 points)		
	safe and cause no delay	6-8	
	limited	3-6	
	unsafe and cause delay	0-3	
			Maximum 8

TOTAL # OF OPERATION POINTS
(Maximum 50 points)

CONDITION LOS (50 points)

ROAD
NAME/DESCRIPTION:_____

1. MEET COUNTY / WSDOT / OTHER STANDARDS (16 POINTS)

lane, shoulder, sidewalk, geometry,...		
all	12 -16	
most	8 -12	
many	4-8	
deficient	0 -4	
		Maximum 16

2 SURFACE CONDITION (13 POINTS)

Excellent/new	10 -13	
good	6-10	
fair	3-6	
poor	0-3	
		Maximum 13

3 DRIVING CHARACTERISTIC (6 POINTS)

comfortable	0-3 Maximum 3	
safety	0-3	
		Maximum 3

4 ACCIDENTS (15 POINTS)

NO accidents due to road conditions	12 -15	
limited accidents due to road conditions	9 -12	
low accidents due to road conditions	6-9	
noticeable accidents due to road conditions	3-6	
high accidents due to road conditions	0-3	
		Maximum 15

TOTAL # OF CONDITION POINTS
(Maximum 50 points)

TOTAL # OF CONDITION AND OPERATION POINTS:
(maximum 100 points)

APPENDIX C-3

LOS PROCEDURE

PROCEDURE FOR DETERMINING EXISTING LEVEL OF SERVICE (LOS)

Operation and condition level of service data is collected by the County staff, local agencies, and the consultant research. The data is tabulated for each County road and major city road. For each road, there is a score for operation level of service (maximum 50 points) and another score for condition level of service (maximum 50 points). These scores are entered into Figure 8-4. In Figure 8-4, the X-axis represents the condition level of service and the V-axis represents the operation level of service. For example, if a roadway section scored 30 points on the condition level of service and 40 points on the operation level of service, using Figure 8-4, the roadway section has a C+ LOS. Scoring forms are shown in Exhibit 8-5. Data collected for County roads and major city roads are shown in (three ring binder) Appendix C-4.

Figure 8-4 is developed based on the results of operation and condition level of service, experience with Pavement Management Systems (PMS). and discussions with other professionals. For condition and operation level of service, the following scores were adapted.

CONDITION SCORE	CORRESPONDING LOS
00-11	F
11-19	E
19-26	D
26-34	C
34-44	B
44-50	A

OPERATION SCORE	CORRESPONDING LOS
00-10	F
10-20	E
20-28	D
28-38	C
38 -46	B
46-50	A

The summary of Existing Level of Service (LOS) is tabulated as shown in Exhibit 8-7 (condition scoring, operation scoring and total scoring). In addition, the existing level of service is tabulated in the same exhibit.

PROCEDURE FOR DETERMINING PROJECTED (SIX YEAR) LOS

Once the existing LOS is determined for various roadway sections, a projected six-year LOS is calculated as follows: using the slope of a depreciation graph, Figure 8-5, each level of service (including the upper

and the lower limit of level of service) has a different slope. The value of the slope represents the percentage of depreciation of the roadway section. The V-axis represents the total scoring (operation and condition level of service, total score is 100), the X-axis represents time in years, bearing in mind the average life of the roadway section is considered 20-years. This graph is used only to calculate the percentage of depreciation not the projected level of service. The total scoring (operation and condition) in the V-axis corresponds to the level of service as below:

TOTAL SCORE	CORRESPONDING LOS
00 – 30	F
30 – 47	E
47 – 63	D
63 – 81	C
81 -93	B
93 -100	A

Based on the average slope of the depreciation graph, **Figure 8-5**, the following slopes were determined for each level of service (including the upper and lower limit of level of service):

LOS	CORRESPONDING SLOPE
A	5.6%
B+	6%
B	7%
B-	8%
C+	8.5%
C	10%
C-	12%
D+	15%
D	20%
D-	25%
E	27%
F	35%

For example, if the existing condition level of service scores 30 points, and the existing operation level of service scores 40 points, total score is 70 points. From the depreciation graph, **Figure 8-5**, this total scoring corresponds to level of service C. The average depreciation slope of C level of service is 10%. This means the roadway section as a whole depreciated 10% on condition level of service and 10% on operation level of service. The new value of condition level of service is [30 -(0.10 x 30)] =27. By the same way, the new value for operation level of service is [40 -(0.10 x 40)] =36.

Figure 8-4 is used to find the projected (six year) level of service, using the new values of condition and operation. In this case, the new value of condition is 27, and the new value of operation is 36, then the projected level of service based on the new values is C-(the existing level of service for the above example is C).

This procedure is valid for short term i.e. six-years and applied for each roadway section. The results are tabulated as shown in **Exhibit 8-8**.

PROCEDURE FOR DETERMINING PROJECTED (20-YEAR) LOS

The methodology used to determine the projected level of service (20-year) is different than the one used for the projected level of service (six-year). As defined in chapter Five, condition level of service rates a roadway in terms of how its physical characteristics compared to those of an ideal facility. An operation level of service rates a roadway in terms of how its characteristics compared with those necessary for it to function as intended.

The projected (20-year) condition level of service is a function of time (age) and presence of traffic including trucks (presence of trucks on roads causes the most damage on pavement). With time, pavement ages, and the percentage of pavement ages is indicated in Figure 8-6. Y-axis represents percentage of depreciation and X-axis represents time in years (it is assumed that 20-years is an average life of a roadway). The percentage of depreciation for each level of service is defined below:

LOS	YEAR	TIME FACTOR
A	0-1	0.98
B+		0.97
B	1-3	0.96
B		0.94
C+		0.92
C	3-6	0.91
C		0.90
D+		0.88
D	6-10	0.88
D		0.85
E	10-14	0.82
F	14-20	0.74

Figure 8-6 is used to calculate the time factor. The Figure is developed based on research done at the University of Washington. The theory behind this graph is if a road section was constructed, the expected life of the road is assumed to be 20 years. During the first year, the road will depreciate 2% (100% -time factor, 0.98) due to aging alone. For a roadway 14 to 20 years old, the depreciation factor is 26%, see Figure 8-6 (100% -time factor from 14 to 20 year).

Presence of heavy trucks is the major distribution of pavement failure. The percentage of trucks in the County roads is estimated/counted by the County staff and the consultant research. Figure 8-7 shows the depreciation factor caused by the presence of trucks.

% OF TRUCKS	TRUCK FACTOR
00-05	0.95
05 -10	0.91
10 -15	0.86
15-20	0.83
20-25	0.80
> 25	0.77

The depreciation factor for condition LOS will be calculated by multiplying the time factor by the truck factor. This new factor is then multiplied by the existing condition level of service score to produce a new score.

The projected (20-year) operation level of service is a function of the presence of traffic on the road. The projected (20-year) operation level of service is found as follows:

Traffic projection for 20-years was calculated based on growth. Figure 8-7 shows the existing traffic counts on the X-axis, and the depreciation on V-axis. The ADT factor was estimated using the depreciation curve, Figure 8-7.

ADT RANGE	ADT FACTOR
0000 - 1000	0.91
1000 - 2000	0.88
2000 - 3000	0.82
3000 - 4000	0.76
4000 - 5000	0.70
> 5000	0.68

The ADT factor calculated from Figure 8-7 is multiplied by the existing operation score to get a new value 20-year operation score. To get a new value for projected condition level of service, the new factor (new factor =time factor x truck factor) is multiplied by the existing condition level of service.

Figure 8-4 is used to determine the 20-year projected LOS using the new values of condition level of service and operation level of service.