Final Report

Prioritization of Gravel Road Upgrades
Grant County
Phase 3 – 2011

Reid C. Wheeler, Consultant
Wheeler Management Assistance
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Background

In 1999, Grant County embarked on a program of upgrading existing gravel roads to paved. Th program anticipated directing as much as $7 to $8 million of the County Road Fund over the nex to 7 years to placing a bituminous surface treatment on the most important gravel roads. Grant County did not have a method to prioritize the extensive amount of gravel roads (1,200+ miles) and desired to develop such a priority programming process to insure gravel roads are identified and scheduled for improvement in a logical, cost effective manner. The Board of County Commissioners also directed the use of a stakeholder advisory group to assist and advise in the development of such a priority programming process.

On December 21, 1999 the Grant County Department of Public Works entered into a contract w Wheeler Management Assistance (WMA) to develop and implement a priority programming method for evaluating and ranking gravel roads (and less) within Grant County such as to provid both a methodology and an immediate rank-ordered list of such roads for upgrading to a paved surface. This process included the establishment, management and use of a Stakeholder Advisor Committee to assist in this process, specifically the development and establishment of appropriat criteria, including weighting. It is important to note that only potential projects proposed by the Stakeholder Advisory Committee members and Public Works were considered; the option to soli projects from the general citizenry was not done. A total of 93 potential projects were identified and evaluated.

On December 18, 2000 the project was finished, providing the County a rank-ordered list of the projects. As a result, the County has followed the ordered list – project by project – in its annua work program from 2001 through 2007. By 2007, the first 40 of the 93 projects will be constructed. The details of the process and the results are contained in the final report; a copy is available at the Grant County Public Works office.

Because of the completion of the initial six years in 2007, the likelihood that the remainder of the 9 project array are probably lesser valued projects and that the process was not opened up to the publ the County decided that it would be prudent to revisit the process if it is to be continued. Overall, t County has been quite satisfied with the program and does wish it to continue at least for the next t to three years depending on the funding availability.

To that end, the County retained the services of the original consultant to perform an update (refer to as Phase 2) to the original study. This entailed a reconstitution of a Stakeholders Advisory Committee to work with the consultant to revisit - and modify as may be appropriate - the original characteristics and the recommended weighting for each characteristic, to open up the solicitation

new projects to the public at large (yet still keeping the remaining, unfunded list of the original projects), and develop a new priority listing for funding beyond 2007.

A contract between the Grant County Department of Public Works and Wheeler Management Assistance to implement this 'Phase 2' was signed on March 29, 2006.

In September of 2006, Phase 2 was completed. Including the carryover projects from the original project list, a total of 102 projects cover slightly over 200 miles of gravel roads were evaluated. N traffic counts (including truck traffic) were taken for each of the projects. A revised set of characteristics and weightings were developed with the new advisory committee and a new update priority listing was developed and forwarded to Public Works for the next round of implementatio

Phase 3 Project History

In late September of 2011, Wheeler Management Assistance was contacted by Grant County Publi Works as to the availability of the Consultant to once again update the gravel road upgrade list. A a meeting on September 28, 2011 between the Consultant and the Public Works Director to discus the proposed Phase 3 work program and requested work product, an agreement was executed between the Consultant the County on October 3, 2011. Specifically the contract provided for:

1. Gathering supplementary data, both office and field, as will be required to fulfill the data needs the gravel road upgrade priority programming process;
2. Reviewing in the field to update existing and gathering new field data as specified in the 2006 priority characteristics all carry-over projects from the 2006 array as well as all new candidates
3. Preparing one or more rank-ordered lists of gravel roads for upgrading to paved using the 2006 priority characteristics and scoring methodology;
4. Preparing a final rank-ordered list of gravel road upgrade projects, and preparing a final report.

It was also agreed that a Stakeholder Advisory Committee would not be needed and the project characteristics and weightings from 2006 would be used (See Appendices A-1, A-2 and A-3). Als 2006 traffic and truck counts would be used unless newer numbers were available. New accident data would be used and extracted from the County's Mobility road log database. Agricultural land values from 2006 would be used.

During the remainder of October 2011, the Consultant re-field inventoried all carryover (i.e., unconstructed) projects from the 2006 project list plus four additional projects submitted by the County. Also updated traffic counts (where available) and 2006 to present accident history was extracted from the Mobility database. All data was entered into the priority array calculation spreadsheet from 2006 (as modified to remove completed projects, amended to reflect other projec that were partially or completely paved under the existing Cost Share Program, and the addition of the four new projects – see Appendix B). New project vicinity maps were also prepared as needed (see Appendix D).

A final rank-ordered priority listing of all of the final 2011 projects (91 projects covering 169.81 miles) was completed and is included herein as Appendices C-1 (summary only), C-2 (detailed unsorted) and C-3 (detailed sorted).

Comparison of 2006 and 2011 priority listings

Because much of the 2006 data was used for the 2011 array (except for the four new projects), it would be expected that the two arrays would be quite similar. Upon making a line-by-line comparison on the first 28 projects in the 2011 array, a few significant differences were noted and close review was made on each of the individual characteristics to see if a rational explanation cou be made.

Some notable differences include:

1. Project 130 – 9-SW; #36 in 2006, now #3. The main difference is that this project is significantly shorter due to the paving of most of the west end. It is now completely borde by orchards and Mobility shows a higher ADT dated 2010.
2. Project 134 – 10-SW/F-SW; #53 in 2006, now #8. Review of the data shows that the netw completion characteristic was incorrectly scored in 2006 and was changed for 2011. There are also more crops along side the road.
3. Project 150 – Baseline .5-SE; #61 in 2006, now #13. This project ranked higher due to increased accident history and additional crops.
4. Project 157 – Lower Crab Creek; #71 in 2006, now #15. A significant increase in accident caused the higher rating.
5. Project 136 – 11.5/F-SW; #74 in 2006, now #18. Additional crops plus more accidents increased the rating.
6. Project 64 – 3-NW; #67 in 2006, now #20. A new traffic count in 2008 showed a three-fol increase in ADT.
7. Project 62 – Baseline .5-SE; #57 in 2006, now #25. Again, new traffic count in 2009 nearl tripled from 2006.
8. Project 125 – 4-NW; #82 in 2006, now #28. Additional adjacent crops plus more accidents increased this project's rating.

Of the remaining first 28 projects, the new rating is reasonably close to the 2006 rating; most of th differences is due to the amount of adjacent crops.

All in all, it appears that the 2011 priority array is either in relatively close conformance with the 2006 array or the major differences are explained by significant changes in characteristic values.

Recommendations

The consultant has the following recommendations to the Department of Public Works and the Bo of County Commissioners:

1. Accept the resultant rank-ordered list of the initial project list as shown in Appendix C-1[1] to se as the basis for selecting specific projects to be constructed in 2012; if sufficient funds are available, continue through 2016.

2. Maintain the existing Cost Share Program as it provides an alternate means of funding gravel r upgrades for projects that do not rank well or not at all on the priority array.

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[1] A copy of the complete priority calculation spreadsheet as well as individual project location maps are contained in tl appendices.

APPENDIX A

A-1 Characteristic Weightings by Stakeholder Advisory Committee 2006 - Unadjusted

A-2 Characteristic Weightings by Stakeholder Advisory Committee 2006 – Adjusted

A-3 Definitions and Scoring of Gravel Road Characteristics

Grant County Gravel Road Update - 2 Characteristic Weights

Appendix A-1

Weightings as of September 5, 2006
RAW VOTES

	1 General Traffic + Trucks	2 Adjacent Residences	3 School bus routes	4 Missing Links/Network	5 Road Maintenance costs	6 Dust Susceptible crops	7 Safety	8 Arterial/Non-arterial	9 Agricultural land value	*Total*
Bennett, J	15	20	10	10	20	0	15	0	10	*100*
Billingsley, B	20	10	0	20	20	0	10	20	0	*100*
Eckenberg, J	20	10	0	20	10	0	20	10	10	*100*
Edwards, M	20	10	10	0	10	10	30	5	5	*100*
Ferguson, C	15	15	10	10	20	10	15	0	5	*100*
Hendricks, D										
Hendrickson, D	40	20	0	0	20	0	20	0	0	*100*
Lawrence, J	5	10	0	10	5	30	10	0	30	*100*
Perkins, R	10	10	5	10	10	20	10	5	20	*100*
Prchal, J	10	15	5	5	5	20	10	10	20	*100*
Reynolds, J	0	0	30	50	0	0	20	0	0	*100*
Wentworth, D	10	10	15	5	10	15	15	0	20	*100*
	11	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	
	15.0000	**11.8182**	**7.7273**	**12.7273**	**11.8182**	**9.5455**	**15.9091**	**4.5455**	**10.9091**	
2000 numbers =>	*28.1000*	*12.9000*	*n/a*	*19.3000*	*15.8000*	*4.1000*	*8.2000*	*5.8000*	*5.8000*	

Grant County Gravel Road Update - 2 Characteristic Weights

Appendix A-2

Weightings as of September 5, 2006

ADJUSTED VOTES Hi-Low Each Characteristic

	1 General Traffic + Trucks	2 Adjacent Residences	3 School bus routes	4 Missing Links/Network	5 Road Maintenance costs	6 Dust Susceptible crops	7 Safety	8 Arterial/Non-arterial	9 Agricultural land value	*Total*
Bennett, J	15	20	10	10	20	0	15	0	10	*100*
Billingsley, B	20	10	0	20	20	0	10	20	0	*100*
Eckenberg, J	20	10	0	20	10	0	20	10	10	*100*
Edwards, M	20	10	10	0	10	10	30	5	5	*100*
Ferguson, C	15	15	10	10	20	10	15	0	5	*100*
Hendricks, D										
Hendrickson, D	40	20	0	0	20	0	20	0	0	*100*
Lawrence, J	5	10	0	10	5	30	10	0	30	*100*
Perkins, R	10	10	5	10	10	20	10	5	20	*100*
Prchal, J	10	15	5	5	5	20	10	10	20	*100*
Reynolds, J	0	0	30	50	0	0	20	0	0	*100*
Wentworth, D	10	10	15	5	10	15	15	0	20	*100*
	9	*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*	
	13.8889	12.2222	6.1111	10.0000	12.2222	8.3333	15.0000	3.3333	10.0000	91.1111
Adjusted values=>	**15.2400**	**13.4100**	**6.7100**	**10.9800**	**13.4100**	**9.1500**	**16.4600**	**3.6600**	**10.9800**	100.0000
2000 numbers =>	*28.1000*	*12.9000*	*n/a*	*19.3000*	*15.8000*	*4.1000*	*8.2000*	*5.8000*	*5.8000*	

xxx = deleted high values xxx = deleted low values

Grant County Gravel Road Upgrade Project – Phase 3- 2011

SCORING OF GRAVEL ROAD CHARACTERISTICS

Each of the selected characteristics of a gravel road has been scored on a 0 to 10 scale. This paper describes how each of the characteristics was evaluated and scored.

1. General Traffic Volume/Commercial Traffic (trucks)

In generally accepted road maintenance practice, gravel roads become good candidates for paving when the average annual daily traffic (AADT) count exceeds 150 to 200. At around that point, the cost to maintain a gravel road in a good driving condition frequently exceeds the long te cost to place and maintain a paved (BST[1]) road. High levels of truck traffic are hard on gravel roa especially as speeds increase. Truck volume and classification information is not available for the gravel road system in Grant County. Typically, truck counts are only done in preparation for some grant funding programs or for new road design.

Method to Determine

General traffic volume

Each of the roads in the final project list (except projects 200, 201, 202 and 203) was counted in Ju and August of 2006 using automatic traffic counters for a minimum period of 3 days. The traffic counters now in use have the capability to determine both car and truck counts. In some cases, eac end of a road was counted. In those cases, the highest value was used. These traffic counts are 'ra that is they have not been seasonally adjusted; the seasonal adjustment factors have been reviewed and have virtually no effect. In all cases, the County has attempted to determine the best, most correct traffic count numbers. As has been discussed several times, the absolute accuracy of any o traffic count cannot be precisely determined without performing an actual count for an entire year. This is impractical and the shorter count periods are adjusted where necessary to provide an estima of the annual count figures. This problem is further compounded by the relatively low counts for t projects on the final project list. Low counts are subject to a much larger variation for any given ti period. In those cases where there are traffic counts post-2006 for the listed projects, the later valu are used and the truck counts have been adjusted proportionately.

Commercial Traffic (trucks)

All roads (except those noted above) that are on final project list have been counted using special classification counters that can determine the amount of truck traffic as part of a total traffic count.

[1] *BST stands for Bituminous Surface Treatment in which after a gravel road is properly graded and compacted, liquid asphalt is sprayed on the road and then covered with select small aggregate.*

Scale

As general traffic count and commercial (truck) traffic are combined into one characteristic the two variables were combined into a single score with a maximum value of 10 points. As the general traffic volume is the more important of the two, 80% or 8 points maximum was assigned to this variable. 20% or 2 points were assigned to commercial traffic.

Assigning a maximum 8 points for general traffic volume, the 8 points are scaled as follows:

- Less than 50 AADT = 0 points
- 50 to 99 AADT = 2 points
- 100 to 149 AADT = 4 points
- 150 to 249 AADT = 6 points
- Over 250 AADT = 8 points

Assigning a maximum 2 points for commercial traffic, the 2 points are scaled as follows:

- Average Daily Truck traffic of less than 10 = 0 points
- Average Daily Truck traffic of 10 to 24 = 1 points
- Average Daily Truck traffic of 25 to 39 = 1.5 points
- Average Daily Truck traffic of 40 or more = 2 points

Scoring

The final number of points assigned to the General Traffic Volume/Commercial Traffic (trucks) characteristic is the sum of the general traffic volume and the commercial traffic score.

2. Number of Residences Near

A count of residences (dwelling units) adjacent to a gravel road is an indicator of the relativ severity of any dust problems as they affect personal comfort and quality of life. How close or far away a residence adjacent to a gravel road is from the road will also be important to assessing the probable impacts. For this analysis, a distance of 500 feet has been used. To adjust for the differe in project length, the final computation is in residences per mile.

Method to Determine

This data is not readily available and has been gathered by a site-specific field review of th actual residences on or adjacent to each road segment. Each road was inventoried and the number residences within 500 +/- feet of the road were counted. This is limited to those residences that are appear to be at least semi-permanent and occupied. Trailers and mobile homes that are blocked up were counted as residences.

Scale and Scoring

Assigning a maximum 10 points for number of residents near, the 10 points are scaled as follows:

- No residences on or adjacent to road = 0 points
- Residence density adjacent is 1 to less than 4 per mile = 3 points
- Residence density adjacent is 4 to 8.9 per mile = 5 points
- Residence density adjacent is 9 to 11.9 per mile = 7 points
- Residence density adjacent is 12 or more per mile = 10 points

If a road is less than one mile in length or there is only one residence on road more than on mile in length, the actual number of residences is used to compute the points (residence density les than 1 is scored as having 1 per mile).

3. **School Bus Routes**

A new characteristic that was not considered in the 2000 study, school bus routes were considered in the 2006 phase 2 study as well as the 2010 Phase 3 update. School buses, like trucks also create a high wear and tear on gravel roads. Many of the children being transported wait at th edge of the gravel road and are thus subject to being dusted during the dry months. Public Works also indicate that many of the complaints the receive concern school bus traffic on gravel roads bei a major contributor to the dust being created.

Method to Determine

This data is not readily available and was solicited from the various school districts with routes within Grant County. Each of the transportation 'directors' of the various school districts w contacted and a determination was made regarding each project within each school district as to whether the project was on a school bus route and the total number of times the route was used dur a typical school day. For the 2010 update, the 2006 figures were used; current figures were obtain for the projects added for the 2010 update (Numbers 200 thru 203).

Scale and Scoring

Assigning a maximum 10 points for school bus routes, the 10 points are scaled as follows:

- Not a school bus route = 0 points
- School bus route – 1 to 2 uses per day = 6 points
- School bus route – 3 to 4 uses per day = 8 points
- School bus route – 5 or more uses per day = 10 points

4. **"Missing Link"/Network Completion**

Missing links are those unpaved pieces of a road system that connect between paved sectio for route continuity and provide alternate (and often shorter) connections between paved portions c the road system. Missing links are most often on the major (arterial or classified truck routes) route

Network completion refers to a characteristic that takes into account the general existing surfacing of the roads in the immediate vicinity of a gravel road. Locations where there are unpave connections between existing paved roads are most likely good candidates for paving. Improveme to such locations can improve overall network circulation (more options for traffic routing and mo direct point-to-point travel options) on the paved road system. When all of the roads surrounding a connecting to (at both ends) a gravel road are paved, there is some utility in upgrading to paved as road graders do not have to be 'deadheaded' to pick up an isolated section. Roads categorized as "network completion" sections are typically fairly short sections with a total length of 2 miles or le and must be connected to other county or state paved roads at both ends.

Dead end roads are not considered as being either a 'missing link' or will be scored for network completion.

Method to Determine

Missing Links
Each proposed road was located on a county map of sufficient scale and detail to determine the functional class (arterial or non-arterial) and the FGTS[2] classification (is on FGTS system or is not as well as those characteristics for the roads connecting to the proposed gravel road.

Network Completion

Each proposed road was located on a county map of sufficient scale and detail to determine the roa surface (paved or not paved) for all roads connecting at each end of a proposed gravel road.

Scale

Assigning a maximum 10 points for "missing links", the 10 points are scaled as follows:

For all gravel roads that appear to be a missing link, score as follows:

- On the county road arterial system and the county FGTS = 10 points

[2] In 1993 and in accordance with State requirements, all counties have evaluated their road systems and designated wl is called the Freight and Goods Transportation System (FGTS). This system of roads (which also includes all of the S highways) maps the major truck routes based on annual estimated tonnage being moved. Most of the designated FGT routes are on paved roads, however there some 64 miles of the gravel and less road system that are designated FGTS routes.

- On the county road arterial system only = 8 points
- On the county FGTS only = 6 points

If not on the county road arterial or FGTS system:

- Connection to county arterials and/or state highways at both ends = 5 points
- Connection to county arterial or state highway at one end = 4 points

Assigning a maximum 10 points for network completion, the 10 points are scaled as follows:

For all gravel roads that appear to be part of a network completion, score as follows:

- All other roads within 1 mile of each end are paved = 10 points
- 80% of all other roads within 1 mile of each end are paved = 7 points
- If less than 80% of all roads within 1 mile of each end are paved, but the road does otherwise provide a connection between two paved roads = 5 points

Scoring

Because of the similarity between missing links and network completion, a proposed road section was scored under "network completion" or "missing link", not both. The higher of the two values was used.

5. **Road Maintenance Costs**

Those gravel (or less) roads with the highest maintenance costs should rank high on any upgrade priority list. Such high-cost roads may have the average annual maintenance cost reduced through upgrading to paved.

A related issue is that of transporting 'soft' fruits. Roads with a high maintenance cost experience more frequent periods of potholing and general road roughness. This requires that the transporting vehicles must go very slow to reduce fruit damage. Roads in areas where such fruit is grown and the transport period coincides with the worst roughness should be good candidates for paving.

Another issue of concern to road maintenance supervisors is reducing the amount of gravel road grading in urban areas (chiefly those adjacent to the city of Moses Lake) and in the small rura unincorporated town-like areas such as Trinidad and Schawana. Parked cars and right-of-way encroachments make periodic grading difficult on both the Public Works department and the local residents.

Method to Determine

It is possible to obtain at least some relative 'cost to maintain' rankings by interviewing the road maintenance staff. Such a review of gravel roads has been done by each of the three county road supervisors. Specific gravel road sections that are considered unusually high in gravel road maintenance cost for which the maintenance costs may be lowered by paving have been identified and tabulated. In addition, gravel road segments that have other, unique maintenance problems (fo example, steep grades, excessive grader travel to maintain, short miscellaneous pieces within urbai areas, and rural unincorporated town-like areas) have been identified.

Scale and Scoring

Assigning a maximum 10 points for high road maintenance cost, the 10 points are scaled as follows:

- Roads designated as high maintenance = 10 points
- Roads designated as rural unincorporated town-like areas = 4 points

Roads that are designated as being in out-of –the-way locations or as isolated pieces requiring excessive grader travel time will be rated under the "Missing Link"/Network Completion characteristic.

6. Dust Susceptible Crops

Some field and row crops are more highly susceptible than others to diseases and market value reduction when exposed to road dust. Such locations should be good candidates for paving. According to the WSU Extension service, both fruit trees and grapes are clearly adversely affected dust. As part of a similar project done for Yakima County in 2004, the consultant was able to find additional supportive research done by the New Zealand Ministry of Agriculture and Forestry in 1999. The relative effect of dust on the commercial value of crops, using the very limited data available, provides the following relative effects by general crop type. For simplicity, the highest effected crop was assigned a value of 1.0.

Table 1 – Crop Dust Sensitivity

Crop	Sensitivity Factor
Peaches	1.0
Cherries	1.0
Blueberries	1.0
Apples	1.0
Pears	1.0
Vegetables	0.7
Hops	0.7
Potatoes	0.7
Apricots	1.0
Grapes, All	1.0
Corn, all	0.7
Asparagus	0.7
Mint, all	0.7
Prunes & Plums	1.0
Hay, Alfalfa	0.2
Hay, Other	0.2
Grain	0.2
Irrigated Pasture	0.1

Method to Determine

Each road on the initial project list was field-inventoried to determine the amount of each c currently being grown on each side of the road.

Scale and Scoring

Assigning a maximum 10 points for dust susceptible crops, the 10 points are scaled as follows:

1. Determine the total length in miles along each side of the road devoted to each of the agricultural uses as per Table 1.
2. Multiply the miles in step 1 by the associated sensitivity factor.
3. Total the results of step 2.
4. Divide the results of step 3 by twice the total length of the road.
5. Multiply the results of step 5 by 10 to determine the final score.

7. **Safety**

Safety problems are generally determined from accident history records. Many grant programs require that at least a three-year accident history be submitted. There are, however, two problems with placing too much emphasis on accident history in the prioritization of gravel road upgrades:

1. Typically, gravel roads have a very low accident rate. Just one recorded accident can overl skew the priority.
2. In rural areas, most minor accidents are not recorded or filed. We can have locations that have a relatively large number of these low severity accidents but no one would know.

There are also combinations of grade and vertical/horizontal alignment that may create less than desirable driving situations even if there is no recorded accident history. Relatively steep grac on gravel roads are prone to 'washboarding' during dry weather. This is a particular problem for vehicles going uphill as the uphill lanes are far more prone to washboarding than the down hill lan A possible result is that vehicles may use the 'wrong' lane when going uphill to avoid the washboa surface. If this combines with minimal sight distance with on-coming traffic (the grade and the vertical/horizontal alignment are not well coordinated), there is a potential for accidents.

Method to Determine

The available accident records available as computer files identified by county road log number and milepost cover the five + year period of 2006 to date. The county's computerized Cou Road Information System (i. e., Mobility) was queried to identify all recorded accidents on the project list.

As part of the field inventory of each road on the project list, a visual observation was mad identify those locations where there are poor combinations of steep grade and vertical/horizontal alignment.

Scale

Assigning a maximum 10 points for safety, the 10 points are scaled as follows:

- 2.00 or more accidents per mile 2001 through 2005 = 10 points
- 1.00 to 1.99 accidents per mile 2001 through 2005 = 7 points
- 0.50 to 0.99 accidents per mile 2001 through 2005 = 4 points
- Zero to 0.49 accidents per mile 2001 through 2005 = 0 points

If there are locations where there are poor combinations of steep grade and vertical/horizon alignment deficiencies noted on the field inventories, they are scored as follows:

- Two or more locations = 6 points
- One location = 3 points

Scoring

Both the accidents and the poor steep grade and vertical/horizontal alignment locations are scored. The final score is the higher of the two values.

8. **Arterial/Non-Arterial**

Roads that are on the county arterial system serve a higher function to convey traffic than d local access roads. Gravel road arterials should rate higher than gravel road local access roads.

Method to Determine

Each county maintains an up-to-date designation of all arterial roads within its computerize road log.

Scale and Scoring

Assigning a maximum 10 points for arterial/non-arterial, the 10 points are scaled as follows:

- If a rural major collector[3] (arterial) or urban arterial, score 10 points
- If a rural minor collector(arterial), score 7 points
- If not a collector (arterial), score 0 points

[3] Road systems are fundamentally broken down into arterial and local access. Rural "collectors" are a subdivision of t arterial definitions.

9. **Land Value (Agricultural)**

Agricultural land value is a measure of the relative property values and generated tax incon The theory is that the higher valued land grows the higher valued crops and thus generates a higher commercial 'value' to the county as a whole. A higher priority for roads that serve and support thi higher commercial (and tax) value to the county is implied.

Method to Determine

Each road on the project list was field-inventoried to determine the agricultural land use on each side of the road. The amount of mileage of each agricultural land use was multiplied by the assessed value from figures (2006) provided by the County Assessor's office. As there are a range assessed valuation for most agricultural land uses (the exact figure is determined for each parcel by the Assessor's office periodically and is based on more specific information than can be gathered b a field inventory), a figure slightly more than one-half of the way from the lowest to the highest assessed value was used. The per-acre figures (2006 values) used are as follows:

- Dryland grain - $500
- Orchards - $11,000
- Irrigated row crops[4] - $2,000
- Asparagus - $2,500
- Uncultivated/unimproved - $200
- Hay/alfalfa - $1,300
- Grapes - $7,000
- Irrigated pasture - $850

Using the above values and the mileage of each current agricultural use along side a road, a weighted average value was determined ranging from a low of $200 per acre to a high of $11,000 p acre. Only agriculture land being served or supported by each of the gravel road sections was considered; land primarily devoted to business, homes, public use, etc. was not included in these calculations.

Scale and Scoring

Each road was scored as follows:

1. Determine the total length in miles along each side of the road devoted to each of the agricultural uses as shown above.
2. Multiply the miles in step 1 by the associated agricultural land value[5].
3. Total the results of step 2 and divide by twice the total length of the road.
4. Divide the results of step 3 by 11,000.
5. Multiply the results of step 5 by 10 to determine the final score.

[4] Includes tree nurseries and turf farms

[5] All values were reduced by $200 as unimproved and uncultivated land was not inventoried and they have a base land value of $200 per acre.