CHAPTER 7 - CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The models presented in this report predict the performance and behavior of paved and unpaved roads. These are preliminary models based on limited data. Additional data should be collected to validate these models.

Pavement performance prediction models, in terms of roughness and cracking, were developed in this investigation through empirical analysis. Pavement rut depth measured on the study sections was very low. Consequently, no effort was spent on developing a rut depth prediction equation.

Paved road roughness prediction models were developed as a function of traffic, age, and one of the following independent variables: (a) corrected structural number; (b) Benkelman beam deflection; (c) Dynaflect deflection; (d) corrected structural number and Benkelman beam deflection; or (e) corrected structural number and Dynaflect deflection.

Empirical relationships for predicting asphaltic concrete cracking were developed as a function of traffic, age, and one of the following: (a) Benkelman beam deflection; (b) Dynaflect deflection; (c) corrected structural number. In the prediction of cracking it was shown that if more than 10 percent of the area of the road is cracked, then cracking will reflect through a slurry seal within one year. Further, the rate that reoccurring cracking develops following a slurry seal exceeds the progression rate associated with the original cracking. Therefore, the utility of using a slurry seal for resealing may be questioned.

Unpaved road deterioration relationships were developed for the roughness and rut depth after blading and the change in roughness and rut depth as a function of time. In addition, a prediction for the rate of gravel loss was developed. The major factors influencing these relationships are traffic distribution, road geometric characteristics, and surface material properties. Although a concerted effort was made to consider the widest possible range of road and oper-

ating conditions in the development of the deterioration models, it is conceivable that more extreme conditions can be found. For example, heavier trucks, steeper grades or sharper curves than studied. Application of these extreme conditions would mean extrapolating beyond the range in which the models were developed. Since no other information is currently available for these extreme conditions, judgement and care should be exercised when using the predicted results. Additional adjustments and refinements may be needed as experience permits.

7.2 *RECOMMENDATIONS*

A considerable amount of time and money has been spent on characterizing and measuring the test sections included in this investigation. However, some paved sections have not yet shown any sign of cracking, and most of them still exhibit relatively low levels of roughness. It is therefore recommended that data collection be continued in the field until more sections exhibit higher levels of pavement deterioration. Further data collection can be accomplished at a relatively low marginal cost and will enhance the data base so that future analysis can yield improved prediction models.

The Pavement and Maintenance Studies were executed primarily in the central portion of Brazil where the climate is relatively uniform and the subgrades usually strong. It is recommended that satellite studies be made in regions of differing climate, and for conditions where heavy traffic is associated with poor quality subgrades.

Three experimental sections of road were constructed where alternative maintenance and rehabilitation procedures could be studied. Also, further sections should be constructed to complete the experimental design matrix. Continued monitoring and analysis of these sections should provide answers about the relative efficiencies of surface treatments and asphaltic concrete overlays to seal pavements and influence performance. At the time of analysis, these sections had shown very few distress manifestations, and consequently were not included in the analysis. Further data collection on these experimental sections will be invaluable for developing an overlay

design method applicable to Brazil. The data should be associated with observation of the test sections which were overlayed during this project. It is also recommended that the data base from this project be analyzed in conjunction with the information which is being obtained on the IPR (Brazilian Road Research Institute) overlay research project.