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Pavement Management System for Canadian Forces Bases

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Karachi, Pakistan, 1994

A thesis submitted to the Faculty of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of
Master of Engineering

Department of Civil and Environmental Engineering

Carleton University
Ottawa, Ontario
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Faculty of Graduate Studies and Research acceptance of the thesis
“Pavement Management System for Canadian Forces Bases”

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ABSTRACT

The purpose of this research was to design a protocol for initiating and implementing a Pavement Management System (PMS) for Department of National Defence (DND) Bases to determine maintenance strategies. This protocol uses Equivalent Annual Cost (EAC) Analysis and Bayesian Approach to keep the road network at an acceptable quality of service under constrained budgets. Canadian Forces Base (CFB) Kingston was used as a test site for a pilot implementation of the PMS protocol. The current PMS practice at CFB's, what was desired, what personnel requirements were expected, and the typical amount of resources that could be committed to a PMS were also surveyed. A summary of the survey is reported in the thesis.

Equivalent Annual Cost methodology is demonstrated as a practical tool for identifying the best alternative for a given section of a road, based on capital cost of improvement and the yearly maintenance cost. This information is used as an input to the process of prioritising the road improvement strategies. The Bayesian methodology is illustrated in terms of treating the uncertainty of pavement performance loss and role of additional information in decision-making.

The importance of this study lies in its ability to demonstrate the effectiveness of a PMS within DND. It also attempts to establish a methodology through which each CFB could manage the road network economically and efficiently, and permits a Base Construction Engineering Officer (BCEO) to select the most appropriate maintenance and construction strategies enhancing the life of the road network.

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ABBREVIATIONS

AADT	=	Annual Average Daily Traffic
AASHTO	=	American Association of State Highway Officials
ADM IE	=	Assistant Deputy Minister Infrastructure and Environment
BCEO	=	Base Construction Engineering Officer
CBR	=	California Bearing Ratio
CEU	=	Construction Engineering Unit
CFB	=	Canadian Forces Base
CRCP	=	Continuous Reinforced Concrete Pavements
DM	=	Distress Manifestation
DMI	=	Distress Manifestation Index
DND	=	Department of National Defence
E_i	=	Extent Weighting Factor
EAC	=	Equivalent Annual Cost
ESAL	=	Equivalent Single Axle Load
FWD	=	Falling Weight Deflectometer
HMA	=	Hot Mix Asphalt
JPCP	=	Jointed Plain Concrete Pavements
JRCP	=	Jointed Reinforced Concrete Pavement
MERG	=	Military Engineering Research Group
MP	=	Military Police
MSE	=	Mobile and Support Equipment
MTO	=	Ministry of Transportation of Ontario

MTQ	=	Ministry of Transportation of Quebec
NDHQ	=	National Defence Headquarters
NI	=	Need's Index
PCC	=	Portland Concrete Cement
PCI	=	Pavement Condition Index
PCR	=	Pavement Condition Rating
pcu	=	Passenger Car Unit
PQI	=	Pavement Quality Index
PMS	=	Pavement Management System
PS	=	Priority Scoring
PURD	=	Portable Universal Roughness Device
RCI	=	Riding Comfort Index
RCR	=	Riding Comfort Rating
RTAC	=	Roads and Transportation Association of Canada
S_i	=	Severity Weighting Factor
SAI	=	Structural Adequacy Index
SDI	=	Surface Distress Index
TA	=	Treatment Alternative
TAC	=	Transportation Association of Canada
TF	=	Truck Factor
TP	=	Percent Truck (Heavy Vehicles)
W_i	=	Distress Weighting Factor
YMC	=	Yearly Maintenance Cost

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CHAPTER 1: RESEARCH PROBLEM AND METHODOLOGY

1.1 GENERAL BACKGROUND

The efficient management of a road network, including the process of updating the serviceability and structural integrity of road infrastructure, is vital. Efficient methods are required to assist organizations with a significant backlog of maintenance work, many roadways that no longer offer an acceptable quality of service, constrained funds, and little or no experience in managing pavements. Methods are required that can summarize maintenance needs and assist in determining priorities. It is essential to develop a process, which allows the organization to maintain the road network so as to attain a serviceable condition under budget constraints. Such methods and the process will assist in maintaining streets or highways in good condition in a cost-effective manner and therefore will prevent pavements to deteriorate to the point where extensive rehabilitation or reconstruction becomes necessary [Haas, 1994].

1.2 PROBLEM IDENTIFICATION

The Department of National Defence (DND) is responsible for managing a large network of roads on Canadian Forces Bases (CFB's) across Canada. The funding required for pavement maintenance and rehabilitation flows to the various CFB's via National Defence Headquarters (NDHQ). Therefore, the relative need of each CFB regarding pavement management must be assessed by NDHQ as part of the funding process. All Bases have experienced considerable funding reductions in the past few years. In addition, spending authority has steadily devolved from Headquarters to Command and finally, to Bases. This has resulted in fewer available funds but increased Base responsibility for prioritization of road construction and maintenance projects.

Concurrently, the roads are slowly deteriorating. Therefore, any decisions to rebuild, and maintain the existing roads should be based on good engineering principles and require a proper management tool. In order to address this problem, in 1998 the Assistant Deputy Minister Infrastructure and Environment (ADM IE) approached the Military Engineering Research Group (MERG) of the Royal Military College of Canada. Specifically, he asked

MERG to investigate the possibility of using Pavement Management Systems to optimize Canadian Forces Bases roads infrastructure.

A Pavement Management System (PMS) is a tool to maximise the long-term quality of a pavement network for a given level of spending. Specifically, PMS can provide information regarding the current condition of pavements, the extent of pavement deficiencies, cost-effective strategies to repair the deficiencies, and programming of improvements. It offers the potential for achieving the best use of funds in improving road conditions.

In a preliminary study (MERG Report 4-99), it was determined that there was no commercially available off the shelf PMS that would address the needs and budget constraints of DND. As a result, MERG was asked to research and develop a framework or protocol for initiating and implementing site specific Pavement Management's Systems for Canadian Forces Bases.

1.3 RESEARCH OBJECTIVES

The research contained in this thesis is intended to develop a protocol for initiating Pavement Management System for Canadian Forces Bases.

The following major steps accomplished the main objective:

- a) Review of the current use of pavement maintenance practices within DND. Collection of background information on PMS at selected bases to identify the levels of sophistication present and collect background information on pavement maintenance practices.
- b) Defining key PMS requirements, which include pavement inventories, condition survey, data collection techniques, cost-effective maintenance alternatives, economic analysis and prioritization tailored from general PMS for use by Canadian Forces Bases.
- c) Developing an Equivalent Annual Cost model, Prioritization Method and Bayesian model for use within the pavement management protocol for DND Base-Roads,

d) Using the developed models, drawing conclusions on potential maintenance and rehabilitation options that could be used to improve the serviceability of the pavement network under constrained budget environment for the DND Base-Roads.

1.4 RESEARCH FRAMEWORK

The research framework is shown in Figure 1. The major components of the research framework are as follows:

- (a) Review of prior studies
- (b) Problem identification
- (c) Development of PMS for DND Bases
- (d) Recommendations

1.4.1 PRIOR STUDIES: LITERATURE REVIEW

A thorough review of literature was carried out prior to embarking on the synthesis of the framework as well as defining its components. Benefits of maintenance programs, the state of knowledge in methodology and current practices were reviewed. Next the special needs and circumstances of DND Forces Bases were defined. The knowledge gained from literature review as well as an understanding of the DND needs and circumstances were used as guides in tailoring methodology.

1.4.2 PROBLEM IDENTIFICATION

The issue of maintaining road sections within an acceptable level of service and under economic constraints is the biggest challenge faced by DND personnel. Preliminary observations suggest that even under the condition of high pavement loss, there is lack of data to address the problem. There is no formal work plan. The budgeting is carried out on an ad hoc basis and there is a lack of a list of prioritized projects. They began to realise that a systematic cost-effective method of dealing with the problem was necessary. To meet the challenge, the Military Engineering Research Group approached the Royal Military College with proposals for developing a protocol for maintaining pavement sections tailored to the needs of DND Base-Roads.

1.4.3 PROPOSED SOLUTION

Detailed information on the practices of DND Forces Bases is a useful input to the PMS protocol development. A survey questionnaire was developed and used to collect information from responding bases. Following a review of the survey data collected from various DND Bases, it was decided to develop a Pavement Management System (PMS) as a prospective solution. This selection was deemed obvious, because the Bases do not have formal procedures for prioritizing improvement projects. Program development including budget allocation has never been done in the past and most of the roadwork is done on an ad hoc basis.

The following methodologies serve as the components of the PMS.

- (a) Methods for collection and analysis of pavement and related data to be collected from a Base.
- (b) Definition of maintenance alternatives at the road section level, compilation of cost estimates, quantification of the equivalent annual cost model factors,
- (c) Development and application of the Bayesian Model
- (d) Evaluation of alternatives, selection of optimal alternatives for each section of the road network, prioritization of road improvements, and development of road improvement program.

All the data for the case study were collected from CFB Kingston, which serves as a prototype implementation of the research study. Details on the methodologies as well as case study are reported in the following chapters.

1.5 SCOPE

The general aspects of PMS are well known. A number of manuals and guidebooks have been written on this subject. Also, PMS software of a general nature is available. However, tailoring a specific PMS for application to a well-defined network such as DND Base Roads requires research. An analogy can be provided by noting that Geographic Information System (GIS) text books/manuals and software can only provide a starting point for the development of a GIS for a specific application.

In this research, in addition to developing a set of efficient tools, the intent is to advance the state of knowledge through methodological innovations. Available literature appears to be oriented mostly to cycles of rehabilitation of pavements that carry high volumes of traffic. The time horizon for such analyses is normally much longer than frequent maintenance activities of a road network such as the DND Base-Roads. The focus of a PMS for DND Base-Roads with low volumes of traffic should be on a finer coverage of maintenance works.

Another innovation that is intended in this research is to relax the assumption implicit in most existing PMS that pavement deterioration can be forecasted with certainty. Due to a number of causes of pavement deterioration that cannot be modelled with certainty, it is logical to treat loss of pavement performance as uncertain. Further description of the nature of innovations is covered in the research framework section.

The review of road maintenance activities for DND Base-Roads is to be carried out on the basis of the information acquired through a questionnaire study. Budget limitations precluded visits to all DND Bases.

As in any research study that results in methodology and tools, a number of assumptions have to be made in this thesis research. The key assumptions are as follows. Other detailed assumptions are covered at the appropriate locations in this thesis document.

- (a) Developing a protocol for initiating and implementing a PMS for Canadian Forces Bases. The protocol is only applicable to the Hot Mix Asphalt (HMA) roads and parking areas on Canadian Forces Bases. It does not cover, Portland Concrete Cement (PCC) pavements, Airfield Pavements or un-surfaced roads.
- (b) For any road network, the use of a PMS is an improvement over ad hoc decisions on selection of pavement improvements. Since the PMS for Base-Roads is to be developed by using systematic approaches, its application would enhance the maintenance practices in DND Bases.

- (c) Since the general approaches of PMS have wide applications, these are used as the starting point in the development of the PMS for DND Base-Roads. Prior to actual use of the PMS each base will be required to input site specific data and make changes for site specific practices. The model is not intended to be an end product but rather a set of instructions for a particular base on how to establish a PMS.
- (d) Given the limited extent of the Base-Roads, modest budget for road maintenance, and the geographic separation of Bases, less emphasis is placed on the procurement of expensive equipment for automated surveys of pavement condition.
- (e) All estimates of costs are based on information provided by a contractor in Kingston. In instances where a range for cost or other parameters was suggested, the author made the final decision in refining the figures. It should be noted that the intent of this research is to develop the methodology and show an example application. Although there is a high degree of realism in cost and other factor estimates, these should not be regarded as ultimate answers.
- (f) Since a large number of maintenance alternatives are to be analyzed, it is beyond the scope of this study to test the sensitivity of answers to variation in inputs. Also, a Monte Carlo Simulation module was not included. The approach developed used the Bayesian model for the treatment of risk and uncertainty.
- (g) The protocol assumes typical base traffic volumes and characteristics and thus is not intended for typical municipalities.
- (h) The protocol, at this time is limited to a fairly short planning horizon of 5 years or less. However, life cycle costs of different rehabilitation strategies are fully accounted for.

1.6 THESIS ORGANIZATION

Following this introductory chapter, Chapter 2 provides an introduction to generic PMS and to its potential benefits. Chapter 3 describes the state of practices in the Department of National Defense (DND) in maintaining pavements. A detailed discussion of results observed, are mentioned in this chapter. Chapter 4 presents the Pavement Management Protocol for Canadian Forces Bases (CFB's). It contains data collection techniques, maintenance and construction strategies, cost analysis using Equivalent Annual Cost

(EAC) model and Prioritization method. The cost analysis and network prioritization for CFB Kingston are presented in Chapter 5. Chapter 6 discusses the Bayesian Model for pavement management system. A comparison is made in this chapter between the two approaches, namely the EAC methodology and the Bayesian approach. Conclusions and recommendations are given in Chapter 7.

Figure 1.1: Research Methodology

CHAPTER 2: INTRODUCTION TO PAVEMENT MANAGEMENT SYSTEM (PMS)

2.1 INTRODUCTION

As indicated in Chapter 1, DND had decided that it needed to develop site specific Pavement Management System for its Canadian Forces Bases. However, prior to describing the protocol that was developed to fulfill this goal, it is useful to examine in some detail what is meant by Pavement Management Systems.

2.2 FUNCTIONAL DEFINITION OF PAVEMENT MANAGEMENT SYSTEM

A Pavement Management System, in the context of pavement rehabilitation, can be defined as follows:

“It is a system that will produce a multi-layer program for pavement rehabilitation to utilize available funds in the most cost-effective manner. The degree of sophistication required to accomplish this can range from the “lone engineer” equipped with eyeball, pad, pencil and file cabinet to an extremely complex computerized system which relies on data gathered by gadgets and produces rehabilitation programs untouched by human, let alone engineering, hands” [Maynard, 1986].

Another definition was provided by the first Roads and Transportation Association of Canada Guide [RTAC, 1977]:

“The basic purpose of a pavement management system is to achieve the best value possible for the available funds and to provide safe, comfortable and economic transportation. This is accomplished by comparing investment alternatives both at the network and project levels, coordinating design, construction, maintenance and evaluation activities, and making efficient use of existing practices and knowledge. It, therefore, encompasses a wide spectrum of activities including the planning or programming of investments, design, construction, maintenance, and the periodic evaluation of performance”.

Pavement Management Systems (PMS) offer the potential for improved road conditions and reduced pavement maintenance costs simultaneously. It is a process of overseeing the maintenance and repair of a network of roadways. Many local communities and government agencies with a backlog and budget constraint will find Pavement Management Systems a very useful tool in managing their maintenance and rehabilitation work problems. Figure 2.1 indicates three phases in the life of a pavement, emphasizing the need for proper maintenance, preventing road infrastructure deterioration, and maintaining a specified level of service. Inappropriate and ill-timed maintenance efforts can lead to earlier maintenance or reconstruction needs and are an uneconomical drain on scarce funds. The maintenance assessment should, therefore, include quantitative road network information in the database with properly defined standards, and systematic procedures for monitoring and evaluating pavement performance. Projects should be prioritized according to the maintenance assessment.

Figure 2.1: Pavement Serviceability and Pavement Life Relationships (Adapted from Pinard, 1987)

2.3 LEVELS OF PAVEMENT MANAGEMENT AND ITS OPERATION

There are two levels of Pavement Management Systems based on agency objective that address present and future maintenance and rehabilitation strategies, evaluation of projects and implementation of the optimal treatment selected.

2.3.1 LEVEL 1: NETWORK PRIORITIZATION

The first level is concerned primarily with present and future maintenance and rehabilitation strategies, and requires the whole road network to be monitored in order to isolate the areas of high structural damage and diagnose the proper strategies to effectively and economically update the damaged structure to the required serviceability status. On the basis of network priorities, the amount of deterioration can be compared with the prescribed serviceability criteria and budget availability in order to achieve the required goal of preventing the specific section of road from deteriorating. It also encompasses the policies of given budget restraints to the future needs of evaluation.

2.3.2 LEVEL 2: PROJECT EVALUATION AND IMPLEMENTATION

The second level involves technical evaluation of alternative maintenance and rehabilitation strategies of a particular section or subsection of the network. It incorporates pavement performance prediction relationships using a number of structural and surface indicators. It also involves cost cycle analysis, cost benefit analysis, and fund allocation leading finally to project selection and execution. This level deals mainly with matching treatments to problems in an optimal manner considering the available budget in mind and according to the prescribed criteria laid down in Level 1. The objective is to implement section specific projects on the basis of priorities determined under budget limitations as discussed in Level 1.

2.4 BENEFITS OF PAVEMENT MANAGEMENT SYSTEM

Some of the possible benefits gained using Pavement Management Systems are noted below:

a) Facts and data let decision-makers know the impact of their decisions when developing long-range plans and annual budgets, thus reducing reliance on guesswork and political pressures.

- b) Responses can be made to the public/politicians with factual knowledge of the situation, plans for correcting the problem, and how individual roads fit into the overall operation of the road network.
- c) Performance (or the time history) of roadway conditions can be predicted along with maintenance activities, saving money for future needs, and assisting policy and decision makers to effectively utilize the funds for roads under consideration by using various optimization techniques readily available in this management system.
- d) The consequences of past and future maintenance and rehabilitation decisions can be determined, hence, enhancing the life of the road network by adapting different maintenance strategies suitable in terms of conditions pre-specified and any budget constraints.
- e) The coordination gap between various interrelated activities like planning or programming, construction, maintenance and rehabilitation, and evaluation are decreased, giving maximum benefit to the available funds.
- f) Priority programming in Pavement Management Systems is a weighting factor, which directs the use of available funds to the appropriate sections, thereby saving money.

Table 2.1 summarizes the benefits and costs of a pavement management system [Haas, 1994].

	GENERAL	ELECTED REPRESENTATIVE	SENIOR MANAGEMENT AND/OR ADMINISTRATORS	TECHNICAL STAFF
BENEFITS	Realize the magnitude of the pavement investment. Better chance of correct decisions. Improved intra-agency coordination. Improved technology use. Improved communication.	Justify maintenance and rehabilitation programs. Assurance of best expenditure of tax funds. Less pressure for arbitrary program modifications. Objective answers to effects of lower funds or lower standards.	Comparative view of network status (current and future). Objective answers to: Funding level effects on status, implications of deferred work and/or lower standards. Justifying programs to elected representatives. Assurance of best use of available budgets. Defining the "management fee" (percent of budget).	Improved recognition of various agency elements. Increased awareness of available technology. Improved communication between design, construction, maintenance planning and research. Satisfaction of providing best value for available funds.
COSTS	Software development. Data collection, processing, storage and analysis. Actual operation of the system, computer hardware and staff. Indirect costs.	Some general costs. Reporting. Processing special requests.	Developing, installing and operating costs of the PMS. Data collection, processing and analysis. Staff and organizational changes.	Making changes in procedures. Time and effort to upgrade skills. Training costs.

**Table 2.1: Summary of Benefits and Costs of a PMS
(Adapted from Haas, 1994)**

2.5 GENERAL FRAMEWORK OF PAVEMENT MANAGEMENT SYSTEM

There are four phases addressing different aspects of Pavement Management System. The first phase acts as an information platform, the second phase assesses the pavement needs, the third phase involves evaluation of various treatment alternatives and the final phase leads in selecting the optimal strategy.

For the effective use of a Pavement Management System, coordination among the various activities is the key. The first phase involves data collection, and its requirement varies from a simple to very complex data set involving condition surveys, construction history, traffic inventory, drainage conditions, and structural evaluation. All these input variables are recorded in a data bank and are updated on a regular interval depending on budget allocations [Schake, 1987]. The database acts as an information base for all the activities and it is generally computerized (even for smaller agencies).

The second phase evaluates the present and future needs of road infrastructure analyzed using prediction modeling (Figure 2.2 illustrates a typical performance curve, indicating performance prediction of the roadway), incorporating priority programming for the specified road network.

Figure 2.2: Performance Curve Relating the Pavement Condition Rating to the Age of the Pavement (Schacke, 1987)

The third phase considers alternative strategies for the maintenance and rehabilitation of roadways, taking into account all the budgetary considerations. In an ideal model, cost

parameters incorporate maintenance costs, which include rehabilitation and reconstruction, road user costs (travel time costs, and vehicle operating costs) and finally social costs (such as noise, accident, and pollution costs). For different maintenance strategies and cost and benefit considerations, the performance curve differs.

Often a debate arises whether to consider user or social costs in economic analyses. Ivar, Schacke and H.J, Ertman Larsen in 1987, proposed to exclude all or part of road user and social costs from decision-making models and gave the following reasons:

- a) Precise quantitative data are not presently available.
- b) The extremely high relative level of these costs may lead to maintenance norms being selected that are incompatible with budgetary constraints. However, they suggested that the variable proportion of these user costs is often quite small and not of the same order of magnitude as construction and maintenance costs.
- c) Finally, the reduction in user costs does not necessarily lead to an increase in the funds available for maintenance.

The salvage value may also not be included in the analyses. The reasons for ignoring salvage value are as follows:

- a) For most preventive or corrective measures, the salvage value is almost negligible.
- b) The small salvage value is offset by the cost of ripping up the deteriorated pavement at the end of the life of the improvement.

The fourth phase deals with selecting the optimal strategy. This is one of the most important steps in decision making and leads it to the implementation of the project. (Figure 2.3 summarises all of the phases in a flow chart format).

Figure 2.3: Flow Chart Showing General Framework for a Pavement Management System

CHAPTER 3: STATE OF PRACTICES IN THE DEPARTMENT OF NATIONAL DEFENCE (DND)

3.1 INTRODUCTION

This chapter describes a review of current pavement management and maintenance practices within Canadian Forces Bases (CFB's). A survey was carried out in 1998, in order to determine the potential of implementing Pavement Management System (PMS) within the Department of National Defence (DND).

3.2 OBJECTIVES OF THE SURVEY

The survey was initiated with two main objectives. The first objective was to understand current pavement maintenance and rehabilitation practices within DND. A questionnaire was specifically designed to collect background information on road maintenance and construction practices and associated issues. These, in turn, were beneficial for the second objective which was to write a protocol promoting a standardized approach to pavement maintenance and rehabilitation across all CFB's and to allow an accurate, objective assessment of the needs of individual CFB's.

The questionnaire served as a guidance tool, identifying the restrictions in terms of technology, personnel and budgetary constraints. It provided a mechanism to improve communication and the flow of information to and from NDHQ and the various CFB's.

3.3 STRUCTURE AND DESIGN OF QUESTIONNAIRE

The questionnaire was similar to a Canada wide survey carried out in 1993 by the Transportation Association of Canada [TAC, 1997]. The survey was designed so that the information collected could be compared to data typically required for a PMS [RTAC, 1989].

The ten-page questionnaire, included in Appendix A, was prepared for the Military Engineering Research Group (MERG) [Stewart, 1999]. The information collected is divided into four sections. These are:

- a) Construction History
- b) Planning and Design Considerations
- c) Pavement Evaluation
- d) Budgeting Practices

3.3.1 RESPONDENTS TO THE SURVEY

The questionnaire was mailed to all 21 Military Bases in Canada (Figure 3.1). The respondents to the survey were:

- a) Ontario: CFB Borden; CFB Kingston
- b) Quebec: CFB Alouette; CFB Valcartier
- c) Alberta: CFB Cold Lake; CFB Edmonton; CFB Suffield
- d) Manitoba: CFB Shilo; CFB Winnipeg
- e) New Brunswick: CFB Gagetown

The return rate was 47.6%. The response rate, though very good was lower than expected. This may be due, in part, to the fact that many of the Bases do not provide systematic maintenance for their pavements and were either unable to answer most of the questions or were not familiar with Pavement Management System.

3.4 SURVEY RESULTS

The construction history section obtained information regarding pavement length, type and average age of most road pavements within DND. The section also incorporated traffic and environment related records. The results of this section are shown in Table 3.1.

The planning and design consideration section collected information necessary to identify requirements that are needed for implementing a PMS tailored for DND bases. It included sources of construction history records, frequency of various distress, safety data, any special considerations given while executing a project, priority treatment assigned, prediction modelling performed, and current status of pavement maintenance. Table 3.2 summarizes the results of this part of the survey.

In the pavement evaluation section, information acquired includes practices for collecting data on deflection, roughness, surface distress, equipment used and the time interval in obtaining the particular information. It also determined the most commonly used maintenance and rehabilitation practices on individual CFB's for flexible, rigid and/or composite pavements. Table 3.3 presents the results of this section.

The last section collected cost and budget information for each CFB. The information, shown in Table 3.4, illustrates the many technical and financial resources that are needed in implementing a PMS for DND bases.

3.5 ANALYSIS OF FINDINGS

The survey results provided an overall picture of the current pavement maintenance and management practices in DND. Table 3.5 and Figures 3.2, 3.3, 3.4 and 3.5 summarize the survey results. Following is an observation of the key findings of the survey:

- a) Most Bases use 2-layered, partial depth flexible pavements. The average age of the pavement is in the range from 5 to greater than 20 years.
- b) A significant number of Bases have planning horizons of less than five years.
- c) Pavement data base sources are evenly split between personal computers, main frame, record drawings and manual filing.
- d) Most of the bases do not use any common referencing method, although many Bases using manual PMS are using Geographic Information Systems (GIS) for referencing their road network. CFB Kingston created attributes to integrate their road network with other infrastructure facilities. CFB Borden only keeps track of date and type of construction, and drawing number. CFB Shilo and CFB Valcartier did not specify their construction record keeping history.
- e) 80% of Average Annual Daily Traffic (AADT) is <10,000 for arterial and collector roads, and <5,000 for local roads. Only CFB Winnipeg, MB. has an AADT of >30,000 for local roads, and 50,000 to 100,000 for collectors and arterials.
- f) 20% of the Bases do not compile Equivalent Standard Axle Loads (ESALs) information. 50% compile this information, which falls under 10,000 kips (45,360 kN) for arterials and collectors, and <5,000 kips (22,680 kN) for local roads. CFB Winnipeg has ESAL values of 20,000 to

50,000 kips (90,720 to 226,800 kN) for collectors and arterial, and >30,000 kips (136,080 kN) for local roads.

g) For most of the bases, drainage is inspected less than once per year.

h) Most Bases oppose the idea of privatising their road maintenance work. However, contractors perform most of the maintenance and rehabilitation work.

i) The main measurement devices used for collecting deflection data are the Benkelman Beam, CBR, and plate-bearing test. However, 60% of the respondents do not collect deflection data. CFB Gagetown uses more than one non-destructive testing method for deflection measurements after every five years for local roads only whereas, CFB Borden collects such data every two years. CFB Suffield collects data only every 20 years. It is important to note that CFB Suffield has an average road age of just over 20 years. Therefore, it has collected data only once. CFB Cold Lake performed deflection measurements in 1978 and 1997. 70% of the respondents do not collect roughness data. CFB Borden and CFB Gagetown collect roughness measurements after every two and five years, respectively. CFB Shilo collects surface distress annually, whereas the range of time intervals varies from two to five years. 90% of the Bases do not collect skid measurements. Only CFB Gagetown employs prediction modeling using the Pavement Condition Index (PCI). Therefore, the absence of any performance-based prediction models leads most of the CFB's to manage road networks based on visual inspection of the pavement. Maintenance and rehabilitation projects are then ranked accordingly. Most of the maintenance and rehabilitation projects are implemented subject to availability of funds.

j) The pavement design procedure most commonly used is the standard sections type. Overlays are mostly based on deflection observation and visual performance of the pavements.

k) Most Bases are not using any indices for structural adequacy, surface condition, and safety evaluations. Engineering judgement and experience are used to determine the scope of most maintenance and rehabilitation work.

l) The most common maintenance and rehabilitation strategies for flexible pavements are crack sealing, full depth patching and asphalt cement concrete overlay. Bases also perform various other operations for maintaining pavements, which include rejuvenators,

slurry sealing, aggregate surface treatment, fog sealing, and hot recycling. For rigid pavements, maintenance and rehabilitation operations include joint sealing, crack sealing, full depth and partial-depth patching, cold milling, asphalt concrete overlays, hot mixing and saw cut patching. CFB Edmonton has 10 kms of rigid pavement for which no maintenance or rehabilitation program was developed. The program period is variable; most of these strategies are based on done-when-required approach. Very few Bases select their treatment on the basis of all relevant cost components. Most of the bases do not perform life cycle cost analysis.

m) No software-based Pavement Management System is implemented at any of the Bases. CFB Valcartier has initiated PMS studies but it is not operational. CFB Borden, CFB Gagetown and CFB Shilo have made use of a rudimentary PMS.

n) The amount of money allocated each year for pavement construction, maintenance and rehabilitation varies widely from base to base. CFB Suffield showed a budget of \$1,000,000 for the fiscal year 1998-99 for new construction (a 20 year re-build project), and spent \$600,000 in 1999. Whereas, CFB Allouette and CFB Winnipeg have no funds allocated to new construction, but spent \$150,000 and \$500,000, respectively, on their road infrastructure for the fiscal year 1997-98. CFB Shilo also had a 1998-99 budget of \$600,000 (\$100,000 less than previous year's budget), mainly for local road construction and underground replacements. CFB Cold Lake also has no funds allocated to new construction, but spent \$59,000 during fiscal year 1997-98. For the fiscal year 1998-99 budget for maintenance and rehabilitation project was from \$20,000 to \$800,000; higher than previous year's budget, which ranged from \$18,000 to \$50,000.

o) Environment and recycling are the two main priority issues when initiating a project for maintenance and rehabilitation work.

3.6 SUMMARY

It is apparent from the analysis of the results of the survey that, in general, Canadian Forces Bases have no systematic means of assessing pavement maintenance, rehabilitation or reconstruction needs. In addition, there are no systematic procedures commonly used to prioritize capital and maintenance works. Even more importantly, most bases do not collect sufficient data that would permit the making of informed

decisions with respect to budgeting or prioritization. The results of the survey confirmed the necessity of establishing a protocol for initiating and implementing site specific Pavement Management Systems.

Pavement History of Various Canadian Forces Bases

CFB	Total Length (km)			No. of Layers	Type of Pavement		Average Age of Road Infrastructure			
	Flexible	Rigid	Composite		Rigid	Flexible	Arterial	Collector	Local	Others
Suffield, AB	18	19	-	2 (100%)	JRCP 100%	Partial-Depth 100%	>20			5-10
Borden, ON	62	-	1	2 & 3	JPCP 100%	Partial-Depth 100%	Not provided			
Alouette, QC	5	-		1 (90%) 2 (10%)	N/A	Partial-Depth 100%	16 - 20			
Gagetown, NB	7	20	-	2 (100%)	JPCP 100%	Full-depth 100%	> 20			
Cold Lake, AB	29.5	-		2 (35%) 1 (65%)	N/A	Partial Depth 100%	> 20			
Edmonton, AB	30	10	-	2 (90%) 1 (10%)	JRCP 100%	Full-depth 100%	-	> 20 (30%) < 5 (70%)	Not mentioned	
Shilo, MB	20 120 (Gravel Surface)	-		2 (90%) 3 (10%)	N/A	Partial Depth 100%	5 - 10		16 - 20	
Winnipeg, MB	5 8.6 (Gravel)	7	1	1 (100%)	JPCP 5% JRCP 50% CRCP 45%	Full-depth 90% Thick-Lift 10%	N/A	> 20		
Valcartier, QC	30 125 (Gravel)	1	-	2(100%)	JRCP	Not Specified	-	> 20		
Kingston, ON	23 5 (Gravel)	-	-	1 (20%) 2 (80%)	N/A	Partial Depth 60% Full-depth 40%	-	> 20		

JRCP: Jointed Reinforced Concrete Pavements

JPCP: Jointed Plain Concrete Pavements

CRCP: Continuous Reinforced Concrete Pavements

Table 3.1: Pavement History of Various CFB's

Pavement History of Various Canadian Forces Bases (cont'd)

CFB	Construction History Records Collected						
	Width	No. of Lanes	Shoulder Type & Width	Grade	Curvature	Curb Dimensions	Layer Properties
Suffield, AB	Yes		No	Yes	No	Yes	No
Borden, ON	No (Date of construction, type of construction, and drawing number)						
Alouette, QC	Yes	No					
Gagetown, NB	Yes						
Cold Lake, AB	Yes			No		Yes	
	(As built drawings on most recent repairs to roads, generally based on site utility drawings. Layer properties were based on cores taken in 1978).						
Edmonton, AB	None						
Shilo, MB	Not specified						
Winnipeg, MB	Yes				No		Yes
	(Geotechnical Surveys are also recorded)						
Valcartier, QC	Not specified						
Kingston, ON	Yes	Yes	No				

Table 3.1: Pavement History of Various CFB's (Cont'd)

Pavement History of Various Canadian Forces Bases (cont'd)

CFB	Mean Ann (Monthly) Rainfall (mm)	Mean Ann (Monthly) Evaporation (mm)	Mean Ann (Monthly) Snow Fall (cm)	Mean Ann (Monthly) Precipitation (mm)	Mean Max. Air Temp. (*C)	Mean Min. Air Temp. (*C)	AADT	ESAL (Kips)
Suffield, AB	238	-	332 (83)	321	26.9 (Jul)	-16.9 (Jan)	<10,000 for arterial, & collector. <5,000 for local	<10,000 for arterial, & collector. <5,000 for local
Borden, ON	Not provided						<10,000 for arterial, & collector. <5,000 for local	Not provided
Alouette, QC	642 (53.5)	511.8 (42.6)	343 (28.6)	947 (77)	7.8	-3.3	<10,000 for arterial, & collector. <5,000 for local	<10,000 for arterial, & collector. <5,000 for local
Gagetown, NB	(No difference is made b/w arterial, collector, local or others)							
	845 (99.4)	-	294.8 (70.8)	1131.1 (118.8)	29	-26	<10,000 for arterial, & collector. <5,000 for local	This data has never been measured.
Cold Lake, AB	Readings based on Average from 1961 to 1990							
	795 (85)	-	270 (22.5)	-	22.9 (July)	-22.4 (Jan)	<10,000 for arterial, & collector. <5,000 for local	<10,000 for arterial, & collector. <5,000 for local
Edmonton, AB	325.7	-	131.6	450.9	7.5	-2.8	< 5,000 for local roads.	< 5,000 for local roads.
Shilo, MB	468	-	105.8	453.8	31	-35	<10,000 for arterial, & collector. <5,000 for local	<10,000 for arterial, & collector. <5,000 for local
Winnipeg, MB	Not provided			504 (42)	30 (Dry) 23 (Wet)	-33	50,000 to 100,000 for collector, and > 30,000 for local roads.	20,000 to 50,000 for collector, and > 30,000 for local roads.
Valcartier, QC	Not provided						Not provided	Not provided
Kingston, ON	Not provided						<10,000 for collector & <5,000 for local roads.	Information not available

Table 3.1: Pavement History of Various CFB's (Cont'd.)

Planning and Design Considerations at Canadian Forces Bases

CFB	Accident Data	Data Storage	Pavement Design Procedure	Planning Range (years)	Basis of Implementing Projects	M & R Treatment	Common Referencing Method
Suffield, AB	No	P.C's	Own Design Manual	>10	Pavement Management Guidelines	Contract (100%)	Base Maps & Plans
Borden, ON	Yes (MP's have data)	Mainframe	RTAC Guide 1977 Asphalt Institute	< 5	Budgets	Contract (100%)	Not provided
Alouette, QC	Yes	Manual (Project Files)	Own Design Manual Standard Sections MTQ	< 5	Budgets	Contract (50%) Base (50%)	GIS
Gagetown, NB	Could be obtained through transport company.	Not mentioned	RTAC Guide 1977 AASHTO	5 - 10	Pavement Management Guidelines	Contract (100%)	GIS
Cold Lake, AB	MP & MSE collects all the stats on base roads.	Mainframe	Standard Sections	No long term planning (repaired as required)	Annual site inspection in order to plan maintenance.	Contract (20%) Base (80%)	Branch-Section.
Edmonton, AB	Not collected	None	Standard Sections Asphalt Institute	< 5	Surface conditions. Complaints.	Contract (90%) Base (10%)	None
Shilo, MB	Very Low (problem areas are identifiable)	PM Books (Manual)	City of Brandon Pavement Specifications for Local Roads.	< 5	Majority of road replacement are tied to underground utility replacement projects.	Contract (100%)	Node Link
Winnipeg, MB	Not Collected	Record drawings	Own design manual. Standard sections. Asphalt Institute.	< 5	Yearly inspections	Contract (90%) Base (10%)	None
Valcartier, QC	Not Collected	None	None	< 5	Preventive maintenance. Inspection (Annually)	Contract (100%)	None
Kingston, ON	Not Collected	1.Record Drawings 2.Personal Computers	Ministry of Ontario Design Manual Standard Sections	< 5	Yearly inspections	Contract (90%) Base (10%)	GIS

PM Books: Pavement Management Books

RTAC: Roads and Transportation Association of Canada

MTQ: Ministry Transportation Quebec

MP: Military Police

MSE: Mobile and Support Equipment

AASHTO: American Association of State Highway Officials

Table 3.2: Planning and Design Considerations at CFB's

Planning and Design Considerations at Canadian Forces Bases (cont'd)

CFB	Frequency of Data Collection for				Overlay Practices		Special Considerations in Planning			
	Deflection	Roughness	Surface Distress	Skid	Deflection	Others	Environment issues	Recycling	LTPP	SHRP
Suffield, AB	20 years for arterial, collector, and local.	None	5 years for arterial, collector, and local.	None	None		Yes		No	
Borden, ON	2 years for arterial, collector, and local.	2 years for arterial, collector, and local.	2 years for arterial, collector, and local.	None	-	Yes (Condition of pavement & base materials)	No	Yes	No	
Alouette, QC	None				None		None			
Gagetown, NB	5 years for local roads only.				Yes	-	Yes		No	
Cold Lake, AB	Not collected periodically, surface distress and deflection measurement were done in 1978 and 1977. (Base and married quarters in 1978, and base roads in 1997)				Yes	-	None			
					(Based on strength results from Benkelman Beam test)		(Roads in married quarters and part of main base is now the responsibility of the Town of Cold Lake to maintain)			
Edmonton, AB	None				None		Yes	No		
Shilo, MB	None		Annually for all the classifications	None	-	Repair of defects in pavement.	Yes	No		
Winnipeg, MB	None				-	Visual performance and availability of funds.	Yes	No		
Valcartier, QC	None				None	None	None	None		
Kingston, ON	None				None	When required	Yes	None		

Table 3.2: Planning and Design Considerations at CFB's (Cont'd.)

Planning and Design Considerations at Canadian Forces Bases (cont'd)

CFB	Priority Treatment			
	Cost Effectiveness	Ranking Based on Surface Defects	Engineering Judgement	Other
Suffield, AB	None			
Borden, ON	Yes		No	
Alouette, QC	No	Yes	No	
Gagetown, NB	Yes	No	Yes	No
Cold Lake, AB	No		Yes	No
	Also based on 1997 Base Road Evaluation Report			
Edmonton, AB	Yes			
	(Also as per directed by OC Works)			
Shilo, MB	No	Yes		No
Winnipeg, MB	No	Yes		No
Valcartier, QC	None			
Kingston, ON	None			

OC: Officer Commanding

Planning and Design Considerations at Canadian Forces Bases (cont'd)

CFB	Prediction Modelling				PMS Implementation		Level of PMS practiced		
	RCI	PQI	PCI	Other	Software Based	Manual	Network	Project	Both
Suffield, AB	None				None		None		
Borden, ON	None				-	Yes (Developed by MTO)	-	Yes	-
Alouette, QC	None				None		None		
Gagetown, NB	-		Yes using software	-	-	Yes	-		Yes
Cold Lake, AB	None				None		None		
Edmonton, AB	None								
Shilo, MB	None				-	Yes	Not mentioned		
Winnipeg, MB	None				None				
Valcartier, QC	None				A study was done using ROMSYS for implementing Pavement Management System		Not mentioned		
Kingston, ON	None				None				

RCI: Riding Comfort Index
PQI: Pavement Quality Index
PCI: Pavement Condition Index

Table 3.2: Planning and Design Considerations at CFB's (Cont'd.)

Pavement Evaluation for Canadian Forces Bases

CFB	Indices used for pavement condition surveys & evaluation					Methods & Equipments used for Structural Evaluation				
	RCI	SAI	SDI	PCI	PQI	Destructive Testing	Non-Destructive Testing	Roughness Measurements	Surface Distress	Skid
Suffield, AB	-	Yes			-	Test Hole/ CBR	Static Deflection (BB)	None	Visual	None
	(Only evaluated for specific projects)									
Borden, ON	None (Riding condition rating, severity of distress, and density of distress)					None	None (MTO Ride)		Visual	None
Alouette, QC	None									
Gagetown, NB	-		Yes	-	CBR Plate-Bearing Test	Static Deflection (BB) Impulse deflection (FWD) Steady-State Dynamic Deflection (Dynaflect)	Vehicular-Response Measuring System	Visual	Not mentioned.	
Cold Lake, AB	None (Asphalt Institute Rating Form was used in 1997 and 1 CEU Rating Form in 1978)					Not performed	Static Deflection (BB in 1978 and 1997)	Visual Inspection	Visual	None
Edmonton, AB	None					None			Visual	None
Shilo, MB	-	Yes	-		Not performed	Visual inspections (Annually based on subjective rating by inspector riding in a vehicle).	Not performed	Visual	None	
Winnipeg, MB	None					None			Visual	None
Valcartier, QC	None					None			Visual	None
Kingston, ON	None					None			Visual	None

MTO: Ministry of Transportation Ontario
CEU: Construction Engineering Unit
RCI: Riding Comfort Index
SAI: Structural Adequacy Index
CBR: California Bearing Ratio

SDI: Surface Distress Index
PCI: Pavement Condition Index
PQI: Pavement Quality Index
BB: Benkelman Beam

Table 3.3: Pavement Evaluation for CFB's

Pavement Evaluation for Canadian Forces Bases (cont'd)

CFB	M&R Practices				Drainage Maintenance Inspection Interval
	Flexible Pavements		Rigid Pavements		
	Operation	Interval	Operation	Interval	
Suffield, AB	Full-depth patching Crack Sealing AC Overlay	Annually Bi annually 20 years	Joint Sealing	Annually	>12 months for all classifications.
Borden, ON	Full-depth patching Crack Sealing Rejuvenators Cold Recycling AC Overlay	Not mentioned	AC Overlay	Not mentioned	6 to 12 months for all classifications.
Alouette, QC	Full-depth patching Crack Sealing	Annually Rarely	N/A		Not performed
Gagetown, NB	Full-depth patching Crack Sealing Rejuvenators Slurry Seal Cold Recycling Cold Milling Hot Recycling AC Overlay	5 years " " " " " "	Full-depth patching. Crack Sealing Joint Sealing Hot mix patching.	20 years 5 years " Annually	6 to 12 months for all classifications.
Cold Lake, AB	Full-depth patching Crack Sealing	Annually "	N/A		6 to 12 months for all classifications.
	(Based on site inspection)				
Edmonton, AB	Crack Sealing	As per requirement	None		Not performed
	AC Overlay	"			
Shilo, MB	Full-depth patching Crack Sealing Aggregate Surface Treatment AC Overlay	As per req. Annually 2 - 3 years As per req. (3 - 5 years)	N/A		No formal Inspection procedure.
Winnipeg, MB	Full-depth patching Crack Sealing Fog Seal Cold Milling AC Overlay	Annually " " As per req. "	Full-depth patching. Partial-depth patching. Crack Sealing Joint Sealing Cold Milling Hot Mix and Saw Cut patching. AC Overlay	Annually Annually As per req. As per req. As per req. As per req.	> 12 months for all classifications.
Valcartier, QC	Not mentioned				> 12 months for all classifications.
Kingston, ON	Crack Sealing Full-depth patching AC Overlay	As per req. As per req. As per req.	N/A		> 12 months for all classifications.

As per req: As per requirement

Table 3.3: Pavement Evaluation for CFB's (Cont'd.)

Overview of Budgeting Practices at Various Canadian Forces Bases

(All values in Canadian Dollars)

CFB	Unit Cost						Life Cycle Cost Analysis	Private Partnership Option	Cost Function for software-based PMS
	New Construction			M&R					
	Cost	Year	Classification	Cost	Year	Classification			
Suffield, AB	Not mentioned			30/sq.m. 55/m 80/m	- - -	Asphalt Curb & Gutter Side walks	1. All relevant cost components. 2. Annual payment to payback capital cost over design life of project plus annual maintenance costs.	Yes	N/A
Borden, ON	Not mentioned			Not mentioned			Not mentioned	No	N/A
Alouette, QC	Not mentioned			20/sq.m.	1997	Footpaths, & parking lots.	Not performed	No	N/A
Gagetown, NB	Not mentioned			300,000 a year			All relevant cost components Present value method.	Yes	Not mentioned
Cold Lake, AB	135/sqm 100/sqm	1997 1997	Arterial and collector. Local roads and Parking lots.	30/sqm	1997	Asphalt overlays for all the classifications	Not performed	Not mentioned	N/A
Edmonton, AB	750,000 250,000	1995-97 1995-97	Local roads Parking lots.	25,000 per year	-	Local roads only	Not performed	No	N/A
Shilo, MB	Not mentioned						Not performed	No	1500- 2000 (per year)
Winnipeg, MB	800,000 200,000 1,500,000	1996-97 1995 1995-97	Collector Local Parking lots and footpaths	40,000 100,000 300,000	1998 1998 1995-97	Collector Local Parking lots and footpaths	All relevant cost components	No	N/A
Valcartier, QC	Not mentioned								
Kingston, ON	Not mentioned								

CFB	Current year's Budget (fiscal year 1998-99)				Last year's Budget (fiscal year 1997-98)			
	New Construction		M&R		New Construction		M&R	
	Budget	Classification	Budget	Classification	Budget	Classification	Budget	Classification
Suffield, AB	1,000,000 (20 year rebuild project)	Arterial, Collector, local, parking lots and footpaths	50,000	Arterial, Collector, local, parking lots and footpaths	600,000 (20 year rebuild project)	Arterial, Collector, local, parking lots and footpaths	50,000	Arterial, Collector, local, parking lots and footpaths
Borden, ON	Not mentioned		Not mentioned		Not mentioned		Not mentioned	
Alouette, QC	0	Arterial, Collector, local, parking lots and footpaths	35,000	Arterial, Collector, local, parking lots and footpaths	150,000	Arterial, Collector, local, parking lots and footpaths	35,000	Arterial, Collector, local, parking lots and footpaths
Gagetown, NB	Not mentioned		200,000 400,000 200,000	Road stabilization in place. RCC Replacement of concrete slabs	Not mentioned			
Cold Lake, AB	Nil		20,000	Only for Local roads.	59,000	Only for Local roads.	18,000	Only for Local roads.
Edmonton, AB	Nil		Nil		Nil		25,000	Only for Local roads.
Shilo, MB	600,000	Local roads plus underground replacements	100,000	For local roads.	700,000	Local roads plus underground replacements.	50,000	For local roads.
Winnipeg, MB	0	For collector, local roads, parking lots and footpaths.	70,000 40,000 0	Collector Local roads Parking lots and footpaths.	250,000 250,000 0	Collector Local roads Parking lots and footpaths.	0	For collector, local roads, parking lots and footpaths.
Valcartier, QC	Not mentioned							
Kingston, ON	Not mentioned							

Table 3.4: Overview of Budgeting Practices at Various CFB's

Summary of Pavement Practices throughout DND Bases

Construction History		Planning and Design Consideration		Pavement Evaluation		Budgeting Practices	
Total Length of Pavements:		Accident Data Collection:		Use of Various Indices:		Basis of Life Cycle Cost Analysis:	
Flexible pavement range	5 to 62 km	Collected	30.0%	Structural Adequacy Index	10.0%	Present value method	10.0%
Rigid pavement range	1 to 20 km	Not collected	70.0%	Surface Distress Index	20.0%	All relevant cost component	30.0%
Gravel pavement	5 to 125 km	Data Storage Sources:		Pavement Condition Index	20.0%	Not performed	40.0%
Composite pavement	1 km	Personal computer's	20.0%	None	70.0%	Private Partnerships	
Number of Pavement Layers:		Mainframe	20.0%	Drainage Inspection:		Option Consideration:	
1-layer pavements	28.5%	Manual (files and cabinets)	20.0%	More than one year interval	40.0%	Considered	20.0%
2-layer pavements	65.5%	Record drawings	20.0%	Between 6 to 12 months	30.0%	Not considered	30.0%
3-layer pavements	6%	None	20.0%	Not performed	30.0%		
Type of Flexible Pavements:		Pavement Design and Maintenance Procedure:		Most Frequently Used Maintenance & Rehabilitation:			
Partial depth	56.0%	Roads and Transportation Association of Canada Guide, 1977	20.0%	Operations and Period of Interval:			
Full depth	33.0%	Own design manual	30.0%	Full depth patching (flexible pav.)			
Thick lift	1.0%	Standard sections	50.0%	Annually	40.0%		
Type of Rigid Pavements:		Asphalt Institute	30.0%	As per requirement	20.0%		
Jointed reinforced	58.3%	AASHTO	10.0%	Every 5 years	10.0%		
Jointed plain	34.2%	Local Ministry of Transportation Man	20.0%	Crack sealing (flexible pav.)			
Continuously reinforced	7.5%	Planning Horizon:		Annually	30.0%		
Average Age of Pavements:		5 to		Biannually	10.0%		
Range	> 20 years	Repaired as required	10.0%	As per requirement	20.0%		
Construction History Records:		Less than 5 years	70.0%	Every 5 years	10.0%		
Width of roads	60.0%	Between 5 to 10 years	10.0%	Asphalt concrete overlay (flexible pav.)			
Number of lanes	40.0%	More than 10 years	10.0%	Every 5 years	20.0%		
Shoulder type and width	30.0%	Basis of Implementing Projects:		Every 20 years	10.0%		
Grade information	40.0%	Budget	20.0%	As per requirement	30.0%		
Curvature	20.0%	Pavement management guidelines	20.0%	Cold Recycling (flexible pav.)			
Curb dimensions	10.0%	Site inspection/surface condition	50.0%	Every 5 years	10.0%		
Layer properties	20.0%	Others	10.0%	Cold milling (flexible pav.)			
Meteorological Information:		Work / Construction Done By:		Every 5 years	10.0%		
Mean annual rainfall range	25.7 to 845 mm	Contractors	84.0%	As per requirement	10.0%		
Mean annual snowfall range	105.8 to 343 cm	Base Personnel	16.0%	Joint sealing (rigid pav.)			
Mean annual precipitation range	321 to 947 mm	Data Collection:		Annually	16.7%		
Maximum dry temperature range (Degree Celsius)	7.5 to 31	Deflection (data collected)	40.0%	Every 5 years	16.7%		
Minimum dry temperature range (Degree Celsius)	-35 to -2.8	Roughness (data collected)	30.0%	As per requirement	16.7%		
Traffic & Load Characteristics:		Surface defects (data collected)	50.0%	Method and Equipment Used for Structural Evaluation:			
Annual average daily traffic of <10,000 for arterial & collector, and <5,000 for local roads.	80.0%	Skid (data collected)	10.0%	Deflection			
Equivalent standard axle load (ESAL) of <10,000 kips for arterial, collector, and <5,000 kips for local roads.	50.0%	Common Referencing Method Used:		CBR using plate bearing test	20.0%		
ESAL information not collected	20.0%	Geographic Information System (GIS)	30.0%	Benkelman beam	30.0%		
		Maps and plans	10.0%	Falling weight deflection	10.0%		
		Branch section method	10.0%	Steady state dynamic def.	10.0%		
		Node link method	10.0%	Roughness			
		None	40.0%	Vehicle response measuring system	10.0%		
		Basis of Overlay Practices:		Not performed	90.0%		
		Deflection	20.0%	Skid	0%		
		Visual performance of pavements	30.0%	Surface distress			
		Done-when-required approach	10.0%	Visual inspection	100%		
		None	40.0%				
		Special Consideration Adopted:					
		Environment	60.0%				
		Recycling	30.0%				
		None	20.0%				
		Basis of Priority Treatment:					
		Cost effectiveness	30.0%				
		Ranking based on surface defects	50.0%				
		Engineering judgement	50.0%				
		None	30.0%				
		Pavement Management Implementation:					
		Manual based	40.0%				
		None	60.0%				
		Level of Pavement Management System Practiced:					
		Both of network and project level	10.0%				
		Project level only	10.0%				
		Network level only	10.0%				
		Bases initiated PMS Studies	30.0%				
		None	50.0%				

Table 3.5: Summary of Pavement Practices within DND Bases

Figure 3.2: Construction History of Various CFB's

Figure 3.3: Planning and Design Considerations at CFB's

Figure 3.3: Planning and Design Considerations at CFB's (Cont'd)

Figure 3.3: Planning and Design Considerations at CFB's(Cont'd)

Figure 3.3: Planning and Design Considerations (Cont'd)

Figure 3.4: Pavement Evaluation for CFB's

Figure 3.5: Budgeting Practices at CFB's

CHAPTER 4: PMS PROTOCOL FOR DND

4.1 INTRODUCTION

The research objectives as described in Chapter 1, were to develop a generic protocol for typical Canadian Forces Base's road network, and to develop a methodology based on the protocol for recommending maintenance and rehabilitation treatments suited to local conditions. This chapter describes the recommended procedures for initiating and implementing a PMS, including network inventories, assessing pavement conditions, maintenance and rehabilitation practices, cost analysis and prioritising the road network. CFB Kingston is used as an example of a typical Base and serves to illustrate the general procedures.

The protocol consists of four steps required for implementing a PMS for DND Bases. The first step describes the procedures for identifying pavement sections, collecting geometry and pavement structure related data such as pavement type, length and width of section, etc. The second step involves pavement surface condition, which identifies riding quality and distress manifestation of individual sections. Visual inspection for each pavement section is made based on methodologies explained further in the chapter. This step allows a BCEO to obtain pavement condition rating based on either subjective rating assigned to a road section or objective rating based on weighting values to both riding quality and various distresses present at the time of the survey. The third step consists of the selection of optimal alternative strategies based on sound economic analysis. The fourth and final step generates maintenance and rehabilitation needs with their respective priorities under a constrained budget.

4.2 STEP 1: NETWORK RECORD AND SECTIONING

The network record is the initial component of a PMS. The procedures focus on the identification of the pavement network and its systematic division into homogenous sections. A record can range from extensive to a limited collection of various pavement data. They are classified into two major categories, inventory and other pavement data. The former consists of a permanent inventory, while the latter comprises data that are periodically updated.

Typical information collected as part of the inventory include [Haas, 1994]:

- a) Section reference: Identification of pavement section used to reference all data collected for a specific area of pavement within the network.
- b) Geometry related: This refers to its classification and physical features of the pavement, for example, classification of road, length and width of section, shoulder type, etc.
- c) Pavement structure: This defines the thickness and material properties of the layers.
- d) Traffic: This refers to the traffic volumes and loads on a pavement. It may also be required for the prediction of pavement performance.
- e) Environment related: This identifies the local conditions such as annual precipitation and annual freeze thaw cycle that can influence pavement performance and serviceability.
- f) Cost related: Cost data include maintenance, rehabilitation and construction costs.

4.2.1 NETWORK IDENTIFICATION

The first step of pavement section identification involves creating a list of all pavements to be included in the network. This list should include all the paved roadways, parking lots, and specialized areas such as parade squares. The pavement network normally would not include airport runways, taxiways and aprons.

4.2.2 NETWORK SECTIONING

4.2.2.1 SECTIONING CRITERIA

The total network, once defined, must be subdivided into homogeneous pavement sections. Typical criteria considered in the sectioning process are shown in Table 4.1. Initially, the criteria defined in Table 4.1, when available, can be used to assign the area limits to the candidate pavement sections so as to provide a gross breakdown. Actual field visits are normally required to verify the initial pavement section assignments. During this field inspection the overall pavement surface condition, traffic types, patterns, and pavement surface condition can be assessed for uniformity.

Primary Criteria	Secondary Criteria
Pavement Function (Age, Subgrade Strength)	Construction History
Traffic Characteristics	Drainage Conditions
Maximum Area Constraint	Soil Types and Conditions
Pavement Condition Rating (Present surface condition)	
Pavement Structure	

Table 4.1: Criteria Used to Define Pavement Network Sections

4.2.2.2 SECTIONING METHOD

There are number of techniques that can be used to section pavement networks. These include, intersection method, block by block method, fixed length method, subdivision approach and dynamic sectioning. Each has its own advantages and disadvantages, which will be discussed in the following paragraphs.

The intersection method is a common sectioning technique. The pavement sections are defined between intersections along a pavement network with similar characteristics [Stewart, 2000]. The length of these sections might cover several blocks as warranted by the criteria shown in Table 4.1. The intersections provide fixed reference points that accurately define the limits of pavement sections. The network sectioning at CFB Kingston was performed using this method. An example of this method is shown in Figure 4.1.

Figure 4.1: Intersection Method: Red Patch Ave. to Moro Street

Sections can be defined to have a fixed length. The advantage of fixed length approach is the simplicity of maintaining the database and the data collection. On other hand, the disadvantage of this approach is that criteria identified in Table 4.1 can change within the length of the section.

The block by block method is another approach, which can be adopted for sectioning the network. It is a further refinement of the intersection method. The technique is used when pavement conditions change rapidly [Stewart, 2000]. The advantage of this method is that the resulting smaller sections are more likely to be homogenous in accordance with the criteria defined in Table 4.1 as compared to the intersection method. The disadvantage of this approach is that it may not lead to practical maintenance and rehabilitation projects from an economic point of view.

Another method is the subdivision approach, which considers numerous streets grouped as one pavement section. This approach is valid only if the criteria presented in Table 4.1 are constant over the area of the proposed section. The advantage of this approach is the

ease of managing the database. The disadvantage of this approach is that it may result in an overly large maintenance or rehabilitation project.

Another method, dynamic sectioning or segmentation is relatively recent but it is considered by a number of agencies as offering the most flexibility. With dynamic segmentation variable or attribute changes can be selected to define section boundaries. For example, section boundaries may be defined by changes in pavement type, subgrade strength, age, etc. Data can then be selected from sections with specified combinations of these attributes or variables [Haas, 1994]. This approach, which would more likely be used in rural than urban areas, provides substantial flexibility in that very detailed data can be referenced to specific locations and averaged data can be used to define sections for network analysis [TAC, 1997].

Some specialised areas such as parade squares or parking lots are easily defined by their existing limits or boundaries. However, others, such as specialised storage, or limited access areas require careful consideration. These areas require field inspection to determine the correct location of section limits. There is often no need to further divide the area into subsections if the criteria identified are consistent.

The balance between larger (few) pavement sections of non-uniform conditions and excessively small (numerous) pavement sections of completely uniform conditions will often require a trade-off between the effort required to collect, process, and report the data and the benefits associated with the maintenance and rehabilitation improvements.

4.2.2.3 SECTION NUMBERING

The next step is to assign each section a unique identifier or labelling codes. The pavement section identifier will be used to reference all data collected for a specific area of pavement within the network. Examples of various approaches are shown in Table 4.2.

Type	Possible Section Identifiers	Pavement Section Description
Numeric	00010	Red Patch Ave. from Apprentice Street to Moro Street.
Alphabetic	RPAVE	Red Patch Ave. from Apprentice Street to Moro Street.
Alphanumeric	RP00010	Red Patch Ave. from Apprentice Street to Moro Street.

Table 4.2: Section Identifiers

The numeric procedure for assigning sections is recommended, since the pavement sections are typically described by street name accompanied by additional descriptors such as the “from and to street name”. This method also conveniently facilitated identification of adjacent pavement sections by a sequential number and the incorporation into computer database.

4.3 STEP 2: PAVEMENT SURFACE CONDITION EVALUATION

4.3.1 INTRODUCTION

Pavement surface condition evaluation provides two major pavement performance descriptors, riding quality and distress manifestations. Riding quality is the degree of riding comfort, which the pavement section provides to the user. It is a subjective measure, depending on the personal opinion of the observer. It is also important that the rater should try not to be influenced by the appearance of the pavement surface and the pavement’s class when rating riding comfort. Those factors should be considered irrelevant [MTO (b), 1989].

4.3.2 FIELD DATA COLLECTION PROCEDURE

The evaluation of the surface condition is accomplished in six steps:

- a) STEP I: Identification of section
- b) STEP II: Condition assessment
- c) STEP III: Riding Comfort Rating (RCR)
- d) STEP IV: Pavement distress manifestation
- e) STEP V: Pavement Condition Rating (PCR) and Annual Average Daily Traffic (AADT)
- f) STEP VI: Other characteristics

Distress manifestations are signs of pavement structural condition. They are caused by vehicle loads or by environment such as freeze and thaw cycle, precipitation, etc. The distress manifestations are categorised and listed by the extent and severity of the occurrence.

Sample Pavement Surface Evaluation worksheets for flexible and rigid pavements are illustrated in Figure 4.2 and 4.3. These were created by the use of MS Excel.

STEP I: Identification of Section

The CFB name, reference location and name of person evaluating pavement condition are used to complete the top portion of the Pavement Condition Evaluation Worksheet. The survey date, section number, AADT (Annual Average Daily Traffic), ESAL (Equivalent Single Axle Load) and traffic direction are also completed. The section length, pavement and shoulder widths are measured accurately and these dimensions are transferred to the worksheet (see Figure 4.4).

CPS	<div style="border: 1px solid black; height: 15px;"></div>	Survey Date	<div style="border: 1px solid black; height: 15px;"></div>
Reference Location:	<div style="border: 1px solid black; height: 15px;"></div>	Section #	<div style="border: 1px solid black; height: 15px;"></div>
Street Name	<div style="border: 1px solid black; height: 15px;"></div>	AADT	<div style="border: 1px solid black; height: 15px;"></div>
From	<div style="border: 1px solid black; height: 15px;"></div>	ESAL	<div style="border: 1px solid black; height: 15px;"></div>
Evaluated/Surveyed By	<div style="border: 1px solid black; height: 15px;"></div>	Traffic Direction	<div style="border: 1px solid black; height: 15px;"></div>

Rating Quality (Rating Comfort Rating-BCR)									
Direction A:					Direction B:				
0.5		5.5			0.5		5.5		
1.0		6.0			1.0		6.0		
1.5		6.5			1.5		6.5		
2.0		7.0			2.0		7.0		
2.5		7.5			2.5		7.5		
3.0		8.0			3.0		8.0		
3.5		8.5			3.5		8.5		
4.0		9.0			4.0		9.0		
4.5		9.5			4.5		9.5		
5.0		10.0			5.0		10.0		

E Both Directions	<div style="border: 1px solid black; height: 15px;"></div>	Shoulder Type	<div style="border: 1px solid black; height: 15px;"></div>
N North Bound	<div style="border: 1px solid black; height: 15px;"></div>	Asphalt Treated	<div style="border: 1px solid black; height: 15px;"></div>
S South Bound	<div style="border: 1px solid black; height: 15px;"></div>	Gravel/Granular	<div style="border: 1px solid black; height: 15px;"></div>
E East Bound	<div style="border: 1px solid black; height: 15px;"></div>	Grass/Turf	<div style="border: 1px solid black; height: 15px;"></div>
W West Bound	<div style="border: 1px solid black; height: 15px;"></div>	Other	<div style="border: 1px solid black; height: 15px;"></div>
Section Length (m)	<div style="border: 1px solid black; height: 15px;"></div>	None	<div style="border: 1px solid black; height: 15px;"></div>
Pavement Width (m)	<div style="border: 1px solid black; height: 15px;"></div>	Drainage Type	<div style="border: 1px solid black; height: 15px;"></div>
Shoulder Width (m)	<div style="border: 1px solid black; height: 15px;"></div>	Ditches	<div style="border: 1px solid black; height: 15px;"></div>
		Catch Basins	<div style="border: 1px solid black; height: 15px;"></div>
		None	<div style="border: 1px solid black; height: 15px;"></div>
		Curb Type	<div style="border: 1px solid black; height: 15px;"></div>
Per Cond Rating (PCR)	<div style="border: 1px solid black; height: 15px;"></div>	Asphalt Concrete Cement	<div style="border: 1px solid black; height: 15px;"></div>
Average BCR	<div style="border: 1px solid black; height: 15px;"></div>	Portland Concrete Cement	<div style="border: 1px solid black; height: 15px;"></div>
(Direction A + B/2)		Other	<div style="border: 1px solid black; height: 15px;"></div>
		None	<div style="border: 1px solid black; height: 15px;"></div>

Pavement Distress Manifestation		Severity					Extent					Shoulder Condition	
		Negligible	Minor	Moderate	Major	Extreme	<10%	10-20%	21-50%	51-80%	81.2-100%		
Surface Defects	Coarse Aggregate Loss												Good
	Ravelling/Stripping												Fair
	Flaking												Inadequate
	Potholes												Drainage Condition
	Utility Trenches												Excellent
Pavement Distortion	Rippling/Shoving												Good
	Wheel Track Rutting												Fair
	Distortion												Inadequate
Cracking	Manholes and Catchbasins												Curb Condition
	Longitudinal Wheel Track Crack	Single											Good
		Multiple											Fair
		Alligator											Inadequate
	Longitudinal Mid-Lane Crack	Single											Traffic Condition
		Multiple											High
		Alligator											Moderate
	Centre Lane Crack	Single											Low
		Multiple											
		Alligator											
	Mandering Crack	Single											
		Multiple											
		Alligator											
	Pavement Edge Crack	Single											
		Multiple											
	Alligator												
Transverse Crack		Single											
		Multiple											
		Alligator											
	Alligator Crack												
	Map Crack												
Remarks													

Figure 4.2: Pavement Surface Evaluation Worksheet for Flexible Pavement (Adapted from MTO (a), 1982)

Figure 4.3: Pavement Surface Evaluation Worksheet for Rigid Pavement (Adapted from MTO (b), 1982)

CFB	CFB Kingston
Reference Location:	
Street Name	Red Patch Avenue
From	Apprentice Street to Moro Street
Evaluated/Surveyed By	Mr. Ali Asghar & Mr. L.F. Harvey

Survey Date	06/06/99
Section #	00010
AADT	
ESAL	
Traffic Direction	
B: Both Directions	B
N: North Bound	
S: South Bound	
E: East Bound	
W: West Bound	
Section Length (m)	975.00
Pavement Width (m)	6.30
Shoulder Width (m)	

Figure 4.4: Identification of Section

STEP II: Condition Assessment

On the initial visual inspection of the section, pavement, shoulder, drainage and curb types are highlighted (see Figure 4.5). Then the subjective rating to the shoulder, drainage, curbs and traffic conditions are given (see Appendix B).

Pavement Type	
Asphalt Concrete Cement	☐
Portland Concrete Cement	☐
Gravel	☐
Shoulder Type	
Asphalt Treated	☐
Gravel/Granular	☐
Grass/Turf	☐
Other	☐
None	☐
Drainage Type	
Ditches	☐
Catch Basins	☐
None	☐
Curb Type	
Asphalt Concrete Cement	☐
Portland Concrete Cement	☐
Other	☐
None	☐
Shoulder Condition	
Good	☐
Fair	☐
Inadequate	☐
Drainage Condition	
Excellent	☐
Good	☐
Fair	☐
Inadequate	☐
Curb Condition	
Good	☐
Fair	☐
Inadequate	☐
Traffic Condition	
High	☐
Moderate	☐
Low	☐

Figure 4.5: Condition Assessment of Pavement Section

STEP III: Riding Comfort Rating (RCR)

There are number of means for describing the ride quality of a pavement. The most common of these is a Riding Comfort Rating. This rating can be arrived at in a variety of ways including precise levelling, automated roughness measurements and subjective assessment. The cheapest and most direct method is based on the opinion of knowledgeable personnel and is accomplished by driving over the subject sections of road. The vehicle type has a large impact on the evaluation. As such, normally, a late model mid size sedan is used in the evaluation.

The rater drives the pavement section at the posted speed in both directions and assesses the Riding Comfort Rating (RCR) by averaging the ride quality. The RCR is based on

riding quality and smoothness of road section at posted speed [MTO (a), 1989]. The guide for ride condition rating is shown in Table 4.3 [TAC, 1997].

<i>RCR</i>	<i>Uniform Description</i>	<i>Guidelines</i>
10 to 08	Excellent	Smooth and pleasant ride
08 to 06	Good	Comfortable
06 to 04	Fair	Uncomfortable
04 to 02	Poor	Very rough and bumpy
02 to 00	Very poor	Dangerous at posted speed

Table 4.3: RCR Guidelines (TAC, 1997)

The rater should highlight the appropriate area and record the value on the RCR column on a zero to ten scale up to one decimal place (see Figure 4.6).

Riding Quality (Riding Comfort Rating-RCR)							
Direction A:				Direction B:			
0.5		5.5		0.5		5.5	
1.0		6.0		1.0		6.0	
1.5		6.5		1.5		6.5	
2.0		7.0		2.0		7.0	
2.5		7.5		2.5		7.5	
3.0		8.0		3.0		8.0	
3.5		8.5		3.5		8.5	
4.0		9.0		4.0		9.0	
4.5		9.5		4.5		9.5	
5.0		10.0		5.0		10.0	

Average RCR 4.5
 (Direction A+B/2)

Figure 4.6: Riding Comfort Rating (RCR) Input

STEP IV: Pavement Distress Manifestation

This step involves an assessment of the surface condition of the pavement section based on the severity and extent of the existing pavement distress [MTO (a), 1989]. The Ministry of Transportation of Ontario (MTO) procedures were adopted because they are very similar to the Canadian guidelines given in Transportation Association of Canada (TAC) [TAC, 1997], Roads and Transportation Association of Canada [RTAC, 1987] and the US guidelines given in the Strategic Highway Research Program [SHRP, 1990]. However, they are more detailed and offer a higher level of sophistication than either of these national publications. The review must be based on the procedures and tables documented in Appendix C. The survey may be conducted in a number of ways. These vary from fully automated and computerized vehicle mounting video-imaging devices to manual pencil and paper recording of visually obtained data. This last method is typically called a “windshield survey” as it is accomplished by driving the network and recording severity and extent of distresses. Based on the limited road mileage and small budgets of typical bases, the windshield method is recommended. Details on how these values should be assigned are given below. The example shown in Figure 4.7 indicates the type, prevalent severity and extent of the following eight distress types for flexible pavements:

1. Potholes
2. Longitudinal Wheel Track Crack (Alligator)
3. Centre Lane Crack (Multiple)
4. Meandering Crack (Multiple)
5. Pavement Edge Crack (Multiple)
6. Pavement Edge Crack (Alligator)
7. Transverse Crack (Multiple)
8. Alligator Crack

A rough sketch for each section to be evaluated should be drawn, describing approximately where pavement surface area is affected. Each distress should be assigned a code (see STEP V, Table 4.8 for details). This approach is also helpful for assigning the percentage of surface area affected. An example sketch is demonstrated in this section that shows section number 00003 with three surface distresses (see Figure 4.8):

Pavement Distress Manifestation			Severity					Extent				
			Negligible	Minor	Moderate	Major	Extreme	<10%	10-20%	21-50%	51-80%	81-100%
Surface Defects	Coarse Aggregate Loss											
	Raveling/Streaking											
	Flushing											
	Potholes									30		
	Utility Trenches											
Pavement Distortion	Rippling/Shoving											
	Wheel Track Rutting											
	Distortion											
	Manholes and Catchbasins											
Cracking	Longitudinal Wheel Track Crack	Single										
		Multiple										
		Alligator							15			
	Longitudinal Mid-Lane Crack	Single										
		Multiple										
		Alligator										
	Centre Lane Crack	Single										
		Multiple							20			
		Alligator										
	Meandering Crack	Single										
		Multiple							15			
		Alligator										
	Pavement Edge Crack	Single										
		Multiple								40		
		Alligator								30		
	Transverse Crack	Single										
		Multiple									65	
		Alligator								45		
	Map Crack											

Figure 4.7: Distress Type, Severity and Extent (Adapted from MTO (a),1989)

Figure 4.8: Sketching of Pavement Distresses

4.3.2.1 PAVEMENT DISTRESS MANIFESTATION

Pavement distress manifestation is the structural condition visible during pavement evaluation. The distresses point to various problems such as deficiency in material properties, failing to meet construction quality, environmental conditions and traffic loading. The severity and extent of these distresses are good indicators of the problem involved [MTO (a), 1989]. The severity explains the seriousness of the problem. The severity scale, based on past findings and engineering experience, has been divided into five levels: Negligible, Minor, Moderate, Major and Extreme. The extent shows the degree of the problem. The extent level has been divided into five levels: <10%, 10-20%, 21-50%, 51-80% and 81-100%.

4.3.2.1.1 DISTRESS MANIFESTATION FOR FLEXIBLE PAVEMENT

The distress manifestation in flexible pavements are subdivided into three categories [MTO (a), 1982 and TAC, 1987]:

- a) Surface Defects: These involve the disintegration of a pavement into small particles or loose fragments. There are five surface type defects identified within flexible pavements. These are, the loss of coarse aggregate, ravelling/streaking, flushing, potholes, manholes and catchbasins.
- b) Permanent Deformation: Permanent deformation is the result of sub-grade weakness where compaction or movement of the subgrade soil has taken place, or where base compaction has occurred. It may or may not be accompanied by cracking, but in either instance creates hazard to traffic and permits water to accumulate. The four types identified within flexible pavements are rippling/shoving, wheel track rutting, distortion and utility trenches.
- c) Cracking: Cracking takes many forms, a number of which have been identified for monitoring. These include longitudinal, longitudinal mid lane, centre line, meandering, pavement edge, transverse, alligator and map.

4.3.2.1.2 DISTRESS MANIFESTATION FOR RIGID PAVEMENT

The distress manifestation in rigid pavements are subdivided into five categories [MTO (b), 1982 and Shahin, 1994]:

- a) Surface Defects: These involve the disintegration of a pavement into small particles or loose fragments. There are five surface type defects identified within rigid pavements. These are, polishing, loss of coarse aggregate, potholes, scaling and ravelling.
- b) Surface Deformation /Distortion: Any change of the pavement surface from its original shape is of this type. The two types identified within rigid pavements are faulting/stepping and settlement/sagging.
- c) Joint Deficiencies: Rigid pavements have joints at frequent intervals. Joint deficiencies identified for rigid pavements are joint creeping, joint sealant loss and joint failures.
- d) Cracking: Cracking takes many forms, a number of which have been identified for monitoring. The cracks identified are longitudinal, meandering, corner, “D”, transverse, diagonal, edge crescent and reflection.
- e) Spalling: The breaking or chipping of the pavement at the joints, cracks or edges is classified as spalling. The spillings identified are joint spalling and crack spalling.

The pavement distress manifestations for both flexible and rigid pavements are provided in Appendix C in order to enhance better understanding of Pavement Distress Manifestation.

STEP V: Pavement Condition Rating (PCR) and Annual Average Daily Traffic (AADT)

A pavement condition rating is a means of assigning a numerical value that summarizes the results of the RCR survey and the Windshield survey. It provides an indication of the overall condition of the pavement in terms of roughness and distress.

There are two methods of assigning Pavement Condition Rating, the subjective and objective. In the subjective rating the rater, after visualising the pavement surface condition, records a PCR value for each section based on riding condition, severity and

extent of different pavement distresses on the zero to hundred scale. The description for PCR value range is shown in Table 4.4.

Pav. Cond. Rating (PCR)

50

(Subjective Rating)

PCR Value Range	Description
100 to 90	Excellent
89 to 80	Good
79 to 70	Fairly Good
69 to 60	Fair
59 to 40	Poor
39 to 30	Very Poor
29 to 00	Failure

Table 4.4: PCR Range and the Description (Adapted from MTO (a), 1989 and MTO (b), 1989)

The objective rating estimates PCR by assigning weights to both riding quality and to the various distresses.

The PCR identifies:

- Streets which need no immediate maintenance and therefore no immediate expenditures.
- Streets which require minor or routine maintenance.
- Streets which require preventive maintenance activities.
- Streets which need major rehabilitation or reconstruction (maintenance is not a cost-effective option as the level of deterioration requires major work to raise the condition to an acceptable level of service).

It is recommended to use the objective method for calculating the PCR values. The objective method provides a more reliable measure of pavement performance.

4.3.2.2 CALCULATION OF PAVEMENT CONDITION RATING (PCR)

Experience of various Transportation Departments (e.g. MTO) has shown that the PCR value is governed by riding quality and pavement distresses. In turn, the pavement distresses, significantly affect ride quality. The PCR may be a purely subjective rating assigned to a road section by one or more experienced pavement engineering staff members or may be based on objective observations. The PCR values trigger certain actions, and help in making long or short term plans in order to manage the pavement infrastructure to an acceptable quality of service [MTO (a), 1989 and MTO (b), 1989].

In 1982, Ministry of Transportation of Ontario, Geotechnical Office produced an objective method of estimating PCR by evaluating over 6000 kilometres of highway in five Ontario regions [MTO (a), 1982]. These regions encompass the majority of climatic conditions that are experienced at Canadian Forces Bases. The methodology used, correlates PCR against a calculated PCI (Pavement Condition Index) by assigning appropriate weights to both riding quality (RCR) and to the various distresses, which comprise the sum of distress manifestation (DM) (see Equations 4.1 and 4.2). Table 4.5 shows distress weighting factors and description codes whereas Table 4.6 outlines severity and density weights and description codes.

$$DM = \sum_{i=1}^{27} C_i (S_i + D_i) \quad \text{Equation 4.1 (MTO (a), 1982)}$$

$$PCR = PCI = \{100 \times \sqrt{0.1RCR \times (320 - DM)/320}\} \quad \text{Equation 4.2 (MTO (a), 1982)}$$

Where:

PCR = Pavement Condition Rating

PCI = Pavement Condition Index

RCR = Riding Comfort Rating

DM = Distress Manifestation

C_i = Weighting value for a particular type of distress

S_i = Weighting value for severity of a particular type of distress

D_i = Weighting value for Density of occurrence of a particular type of distress

In 1990, MTO updated the 1982 objective pavement condition rating by including new constants, which could be used if a mechanical device is used to obtain the RCR. The new methodology is also flexible, in case an agency is not using mechanical means to obtain RCR. The distress manifestation has been replaced by distress manifestation index (DMI). The updated equation (Equation 4.3) is shown below [MTO (a), 1990]:

$$DMI = \sum_{i=1}^{15} W_i (S_i + D_i)$$

Equation 4.3 (MTO (a), 1990)

Pavement Distress Manifestations			Code	Weight (C)
Description				
Surface Defects	1 Coarse Aggregate Loss		CA	3.0
	2 Ravelling		RA	3.0
	3 Flushing		FL	0.5
Surface Deformation	4 Rippling		RI	0.5
	5 Shoving		SH	0.5
	6 Wheel-Track Rutting		WR	3.0
	7 Distortion		DT	3.0
Cracking	8 Longitudinal Wheel Track	single	S/L/WT	1.0
	9	multiple	M/L/WT	1.5
	10	alligator	A/L/WT	3.0
	11 Mid-Lane	single	S/ML	0.5
	12	multiple	M/ML	1.0
	13 Centre-Lane	Single	S/CL	0.5
	14	multiple	M/CL	1.0
	15	alligator	A/CL	2.0
	16 Meander	single	S/ME	0.5
	17	multiple	M/ME	1.0
	18 Pavement Edge	single	S/PE	0.5
	19	multiple	M/PE	1.0
	20	alligator	A/PE	1.5
	21 Transverse	partial	P/TRV	0.5
	22	half	H/TRV	0.5
	23	full	F/TRV	0.5
	24	multiple	M/TRV	2.0
	25	alligator	A/TRV	3.0
	26 Random		RD	0.5
	27 Slippage		SL	0.5

Table 4.5: Distress Weighting Factors and Description Codes (MTO (a), 1982)

Weight		Severity			Density		
D or S	Description	Code	Rut Depth cm	Crack Width* cm	Description	Code	% Length or Area
0	Very slight	0	< 0.5	< 0.7	Few	5	< 10
1	Slight	1	0.5 - 1.0	0.7 - 1.0	Intermittent	6	10 - 20
2	Moderate	2	1.0 - 2.0	1.0 - 2.0	Frequent	7	20 - 50
3	Severe	3	2.0 - 5.0	2.0 - 3.0	Extensive	8	50 - 80
4	Very severe	4	> 5.0	> 3.0	Throughout	9	80 - 100

* For cement - treated base, use 0.3 instead of 0.7

Table 4.6: Severity, Density Weights and Description Codes (MTO (a), 1982)

The updated PCR or PCI equation (Equation 4.4) is:

$$PCR = PCI = \{100 \times \sqrt{0.1 RCR \times (205 - DMI) / 205 \times c + s}\} \quad \text{Equation 4.4 (MTO (a), 1990)}$$

Where:

$$PCR = PCI \leq 100$$

$$c = 1.077$$

$$s = 0.000 \text{ for Portable Universal Roughness Device (PURD) RCR}$$

OR

$$c = 0.924$$

$$s = 8.856 \text{ for subjective RCR}$$

The distress weighting factors as well as severity and density weights are also revised for flexible pavement (see Table 4.7).

Weighting of Distress (Wi)		Density of Distress (Di)		Severity of Distress (Si)	
Ravelling and Coarse Aggregate Loss	3.0	Few	0.5	Very Slight	0.5
Flushing	0.5	Intermittent	1.0	Slight	1.0
Rippling and Shoving	1.0	Frequent	2.0	Moderate	2.0
Wheel Track Rutting	3.0	Extensive	3.0	Severe	3.0
Distortion	3.0	Throughout	4.0	Very Severe	4.0
Long Wheel Track - single/multiple	1.0				
Long Wheel Track - alligator	3.0				
Centreline - single/multiple	0.5				
Centreline - alligator	2.0				
Pavement Edge - single/multiple	0.5				
Pavement Edge - alligator	1.5				
Transverse - single/multiple	1.0				
Transverse - alligator	3.0				
Long Meander or Midlane	1.0				
Map	0.5				

Table 4.7: Revised Weighting Factors (MTO (a), 1990)

The revised approach does not consider alligator cracks and potholes. A modification of this approach was adopted which covers all the possible distress manifestations used in both the 1982 and the 1990 methods. The PCR calculated for the entire road network at CFB Kingston (see Chapter 5 for details) was computed using Equations 4.5 and 4.6 respectively. Tables 4.8 and 4.9 illustrate the weighting factors used for calculating PCR based on a combination of the first two approaches.

$$\text{PCR} = \text{PCI} = \{100 \times \sqrt{0.1\text{RCR} \times (328 - \text{DMI})/328}\} \quad \text{Equation 4.5 (Adapted from MTO (a), 1982)}$$

Where:

PCR = Pavement Condition Rating ($\text{PCR} \leq 100$)

PCI = Pavement Condition Index ($\text{PCI} \leq 100$)

RCR = Riding Comfort Rating obtained as a subjective rating

DMI = Distress Manifestation Index, is the sum of defects obtained by summing the products of the sum of the extent and severity weights multiplied by the weight assigned for each distress. The equation is:

$$DMI = \sum_{i=1}^{29} W_i (S_i + E_i)$$

Equation 4.6 (Adapted from MTO (a), 1982)

Where:

i = One of 29 distresses defined in Table 4.8.

W_i = Weighting value of pavement distress i (see Table 4.8).

S_i = Weighting severity value of pavement distress i (see Table 4.9).

E_i = Weighting extent value of pavement distress i (see Table 4.9).

Pavement Distress Manifestations		Code	Weight (W_i)
Description			
Surface Defects	1 Coarse Aggregate Loss	CA	3.0
	2 Ravelling	RA	3.0
	3 Flushing	FL	0.5
	4 Potholes	PH	2.0
	5 Manholes & Catchbasins	MH/CB	0.0
Surface Deformation	6 Rippling/Shoving	RIP/SH	1.0
	7 Wheel-Track Rutting	WTR	3.0
	8 Distortion	DI	3.0
	9 Utility Trenches	UT	0.0
Cracking	10 Longitudinal Wheel Track Single	LWTCS	1.0
	11 Multiple	LWTCM	1.0
	12 Alligator	LWTCA	3.0
	13 Longitudinal Mid Lane Single	LMLCS	0.5
	14 Multiple	LMLCM	1.0
	15 Alligator	LMLCA	2.0
	16 Centre Lane Single	CLCS	0.5
	17 Multiple	CLCM	0.5
	18 Alligator	CLCA	2.0
	19 Meander Single	MCS	0.5
	20 Multiple	MCM	1.0
	21 Alligator	MCA	2.0
	22 Pavement Edge Single	PECS	0.5
	23 Multiple	PECM	0.5
	24 Alligator	PECA	1.5
	25 Transverse Single	TCS	0.5
	26 Multiple	TCM	1.0
	27 Alligator	TCA	3.0
	28 Alligator Crack	AC	3.0
	29 Map Crack	MC	0.5

Table 4.8: Pavement Distress Manifestation, Code and Weighting Factors (Adapted from MTO (a), 1982 and MTO (a), 1990)

Severity of Distress (Si)		Extent of Distress (Di)	
Negligible	0.5	Few (< 10 %)	0.5
Minor	1.0	Intermittent (10 - 20 %)	1.0
Moderate	2.0	Frequent (21- 50 %)	2.0
Major	3.0	Extensive (51- 80 %)	3.0
Extreme	4.0	Throughout (81 - 100 %)	4.0

Table 4.9: Severity and Extent Distress Factors
(Adapted from MTO (a), 1982 and MTO (a), 1990)

The PCR is used as a measure in determining pavement deficiencies, remedial measures and fiscal needs. The objective PCR, based on weighing system, used for treatment selection and their use in DND Base-Roads are subject to revision.

4.3.2.2.1 WORKING EXAMPLE

This section describes the calculation of the Pavement Condition Rating (PCR) which is based on surface distress and ride quality data collected during a windshield survey. The PCR score is a rating on a scale ranging from 0 to 100 where a high value is indicative of a pavement in good condition whereas low number indicates pavement section in a poor condition.

The following steps are involved in the calculation of the PCR.

- a) The pavement distresses are recorded by distress type, severity and extent combination.
- b) A distress manifestation index (DMI) is calculated for each distress type observed on the section.
- c) The cumulative DMI is computed by summing all of the individual DMI scores.
- d) The average Riding Comfort Rating (RCR) is determined.
- e) The PCR is calculated using the cumulative DMI and average RCR value in the formulation described above in Section 4.3.2.2.

An example PCR calculation is demonstrated in this section (See Figure 4.9). The distresses captured during the windshield survey of this section are noted next.

Pavement Distress Manifestation			Severity					Extent				
			Negligible	Minor	Moderate	Major	Extreme	<10%	10-20%	21-50%	51-80%	81-100%
Surface Defects	Coarse Aggregate Loss											
	Ravelling/Stracking											
	Flushing											
	Potholes									30		
	Utility Trenches											
Pavement Distortion	Ripping/Shoving											
	Wheel Track Rutting											
	Distortion											
	Manholes and Catchbasins											
Cracking	Longitudinal Wheel Track Crack	Single										
		Multiple										
		Alligator										
	Longitudinal Mid-Lane Crack	Single								15		
		Multiple										
		Alligator										
	Centre Lane Crack	Single										
		Multiple								20		
		Alligator										
	Meandering Crack	Single										
		Multiple								15		
		Alligator										
	Pavement Edge Crack	Single										
		Multiple								40		
		Alligator								30		
	Transverse Crack	Single										
		Multiple									65	
		Alligator										
	Alligator Crack									45		
	Map Crack											

Figure 4.9: PCR Example Calculation

In this example, potholes exist at a moderate severity level over 21 – 50 percent of the area of the section. Other distresses present are longitudinal wheel track cracks, centre line cracks, meandering cracks, pavement edge cracks, transverse cracks and alligator cracks with severity and extent levels highlighted in the figure shown above.

Each of the eight possible severity levels is assigned a severity-weighting factor (S_i) (see Table 4.9). Similarly, each of the eight possible extent levels is assigned an extent-weighting factor (E_i) (see Table 4.9). These factors represent the influence of a particular combination of severity and extent level on the condition of a pavement section. In addition, each distress also has a weighting factor (W_i) assigned based on its relative impact on overall pavement performance.

In this example, the distress weighting factor for potholes, W_i is 2.0 (see Figure 4.10) obtained from Table 4.8. The severity factor for potholes, S_i is 2.0 and the extent factor, E_i is 2.0 (see Figure 4.11) obtained from Table 4.9. The DMI for pothole is then calculated using Equation 4.6:

$$DMI = W_i (S_i + E_i) = 2.0 (2.0 + 2.0) = 8.0$$

Pavement Distress Manifestation Description		Code	Weight (W)	
SURFACE DEFECTS	Coarse Aggregate Loss	CA	3.0	
	Ravelling	RA	3.0	
	Potholes	PH	2.0	→ Weighting Factor (W_i)
	Flushing	FL	0.5	
SURFACE DEFORMATION	Rippling	RI	1.0	
	Shoving	SH	1.0	
	Wheel-Track Rutting	WTR	3.0	

Figure 4.10: Example for Obtaining Weighting Factors for Any Distress Type

WEIGHT		SEVERITY		EXTENT		
Ei OR Si		Description	Ruth Depth (cm)	*Crack Width (cm)	Description	% Length or Area
	0.5	Negligible	<0.5	<0.7	Few	<10
	1.0	Minor	0.5-0.99	0.7-0.99	Intermittent	10-20
	2.0	Moderate	1.0-1.99	1.0-1.99	Frequent	21-50
	3.0	Major	2.0-5.0	2.0-3.0	Extensive	51-80
	4.0	Extreme	>5.0	>3.0	Throughout	81-100

<

Figure 4.11: Example for Obtaining Severity and Extent Weighting Factors

This procedure is repeated for each distress type. The cumulative DMI is then computed by summing all of the individual DMI scores. The scores for the various distresses are summarised in Table 4.10:

Distress Type	Si	Ei	Wi	DMI
Potholes	2.0	2.0	2.0	8.00
Longitudinal Wheel Track Crack (Alligator)	2.0	1.0	3.0	9.00
Centreline Crack (Multiple)	1.0	1.0	0.5	1.00
Meandering Crack (Multiple)	1.0	1.0	1.0	2.00
Pavement Edge Crack (Multiple)	2.0	2.0	0.5	2.00
Pavement Edge Crack (Alligator)	2.0	2.0	1.5	6.00
Transverse Crack (Multiple)	3.0	3.0	1.0	6.00
Alligator Crack	3.0	2.0	3.0	15.00
Cumulative DMI				49.00

Table 4.10: The DMI Scores for Various Distresses

The Riding Comfort Rating (RCR) value interpreted to the nearest 0.5 of a unit for this section is found to be 4.5.

The Pavement Condition Rating (PCR) is calculated by inserting the Distress Manifestation Index (DMI) for the section and the Riding Comfort Rating (RCR) in the Equation 4.5:

$$PCR = \{ 100 \times (0.1RCR)^{1/2} \times (328 - DMI) / 328 \}$$

In this example the PCR for this pavement section is found as follows:

$$PCR = \{ 100 \times (0.1 \times 4.5)^{0.5} \times (328 - 49.0) / 328 \}$$

$$PCR = 57.06$$

The pavement performance is an indicator of [MTO(a), 1990]:

- a) The present serviceability of the pavement.

- b) Whether the pavement is in need of repair or improvement.
- c) The extent of repair needed to correct or prevent any problem.

STEP VI: Other Characteristics

The condition of depressed or protruding manholes and catch basins along with utility trenches should be noted in the remarks column. Also, the pavement marking condition can be added to the remark columns (see Table 4.11).

The rater/inspector repeats each of the previous six steps for all other sections.

Remarks	Manhole: Severe bump noted due to protruding manhole
	Utility Trenches: Moderate rise with visible crack

Table 4.11: Other Characteristics of Pavement Network

4.4 STEP 3: SELECTION OF ALTERNATIVES AND COST ANALYSIS

Pavement maintenance is defined as well timed and executed activities employed to prolong the pavement life at an acceptable service quality. Figure 4.12 demonstrates the critical aspect of timing. Pavement maintenance can significantly influence pavement performance, as well as the durability, until major rehabilitation is required [Hicks, 1998]. The amount of maintenance required to keep a pavement at an adequate service quality is a function of the effectiveness of priority programming, treatment selection and quality control. Priority programming is dependant on traffic loading characteristics, PCR values obtained from pavement condition survey, and pavement structural evaluation. Priority programming is the process in which priorities are established when a limited budget is available. Only the prioritised sections can receive maintenance and reconstruction treatments and rest of the pavement sections have to be deferred. Priority programming is also affected by cost-effectiveness, availability of materials, and feasibility of treatment to a particular problem. Quality control ensures enhancement of expected life of a selected treatment.

Figure 4.12: Critical Aspects of Timing (Hicks, 1998)

Maintenance largely depends on budgetary identification employed by each base. It can be further sub classified into three main strategic categories. These are, routine maintenance, preventive maintenance and rehabilitation.

Table 4.12 outlines pavement maintenance and rehabilitation alternatives with expected service lives and relative cost.

4.4.1 ROUTINE MAINTENANCE

For roads in reasonably good condition, routine maintenance is generally the most cost-effective use of funds. If at all possible, routine maintenance needs should be funded each year. Routine maintenance includes local patching, minor crack sealing, and other relatively low-cost activities.

There are two facets of routine maintenance. First, every pavement section is inspected at least once a year and maintenance work is performed, if warranted. In the PMS context, line painting and a grass cutting do not qualify as yearly maintenance items. The second

facet is a treatment option with one year of life. This type of maintenance is in essence one of the alternatives for preventive maintenance that should be assessed against other alternatives with lives longer than one year.

Maintenance & Rehabilitation Alternatives	Expected Service Life (Years*)	Relative Cost
Routine Maintenance:		
Flexible Pavement		
1. Crack sealing	5 to 7	Low
2. Pothole repair	1 to 2	Low
3. Spray patching	2 to 3	Low
4. Shallow patching	3 to 5	Low
5. Drainage improvements	7 to 10	Moderate
6. Sand seal	3 to 6	Low
Rigid Pavement		
1. Crack and joint sealant	7 to 10	Low
2. Spall repairs	3 to 5	Moderate
3. Partial slab repairs	7 to 10	Moderate
4. Drainage improvements	7 to 10	Moderate
Preventive Maintenance:		
Flexible Pavement		
1. Full depth patching	7 to 10	Moderate
2. Texturization	5 to 7	Moderate
3. Heater scarification	6 to 8	High
4. Slurry sealing	3 to 5	Moderate
5. Micro surfacing	7 to 9	High
6. Chip sealing	5 to 7	Moderate
Rigid Pavement		
1. Full depth slab repair	12 to 15	High
2. Texturization	5 to 7	Moderate
3. Load transfer retrofit	10 to 15	Moderate
Rehabilitation:		
Flexible Pavement		
1. Resurfacing	N/A	N/A
2. Reconstruction	N/A	N/A
3. Hot in-place recycling	N/A	N/A
4. Cold in-place recycling	N/A	N/A
5. Full depth reclamation	N/A	N/A
Rigid Pavement		
1. Asphalt concrete surfacing	N/A	N/A
2. Diamond grinding	N/A	N/A
3. Sub sealing (joint stabilization)	N/A	N/A
4. Crack seal and resurfacing	N/A	N/A
5. Rubblizing and resurfacing	N/A	N/A
6. Bonded concrete overlay	N/A	N/A
7. Unbonded concrete overlay	N/A	N/A

* It should be noted that actual service lives could vary widely, depending on local conditions, traffic volumes, climatic conditions, etc.
 ^ High cost values are associated with rehabilitation activities of flexible and rigid pavements with life expectancy varies from 15 to 25 years depending upon considerations discussed above plus materials used, construction practices and maintenance activities employed during the service life.

Table 4.12: Pavement Maintenance and Rehabilitation Alternatives (Adapted from TAC, 1997)

4.4.2 PREVENTIVE MAINTENANCE

This strategy is a more expensive than yearly maintenance. It is designed to arrest deterioration before it becomes a serious problem. Surface seal and hot patching are excellent examples of preventive maintenance.

4.4.3 REHABILITATION

Rehabilitation usually includes overlays or extensive recycling. Funding for completion of these major projects may depend on federal sources. Priorities should be established and the projects should be spanned over a certain period of time for completion. The Base Construction Engineering Officer (BCEO) should realise, however, that priorities may change for a variety of reasons. For example, estimates for a particular job may exceed available funds, and therefore should be considered as Deferred Action Strategy. That is, road sections, which cannot be improved due to minimum funds for the current budget year have to be included in the following year's plan. Pavement rehabilitation is necessary when the condition of pavement is such that maintenance techniques are no longer able to cost-effectively keep the pavement in a minimum serviceable condition.

4.4.4 MAINTENANCE AND REHABILITATION TREATMENTS

Table 4.12 shows a number of maintenance treatments for flexible and rigid pavements. Typical treatments for various distresses as a function of severity and extent are shown in Appendix D (Flexible Pavements) and Appendix E (Rigid Pavements). Each can be effective if used under the proper conditions and to address pavement distress for which they were intended.

The process of assigning maintenance treatment alternatives for a candidate section is based on the PCR score for the section, but can be influenced by the pavement roughness and the types of distresses present on the section. In general, as the PCR decreases, the suggested treatments change from localised repair to light surface repairs to total reconstruction. In other words, treatments range from routine maintenance to preventive maintenance to rehabilitation. PCR ranges and the type of strategy for particular PCR ranges are shown in Table 4.13.

PCR RANGES	FACTORS	TYPE OF STRATEGY	PROGRAM TIMING (Years)
100 - 91	Very slight distress present.	Do nothing	0
90 - 86	Slight and less than frequent distress.	Routine Maintenance	3 to 5
85 - 61	Load associated distress is not present.	Routine Maintenance	3 to 5
	Load associated distress is present.	Preventive Maintenance	3 to 5
60 - 46	Large amount of distress is present with low RCR.	Preventive Maintenance	1 to 2
45 - 26	Frequent distress conditions.	Rehabilitation	Now
25 - 00	Very frequent distress conditions (failure).	Rehabilitation	Now

Table 4.13: PCR Ranges, Factors and Type of Strategy used with Suggested Program Years

4.4.5 COST ANALYSIS

Economic analysis is concerned with comparing treatment alternatives on the basis of sound economic effectiveness. The economic performance of any treatment alternative considers initial investment requirements, yearly maintenance expenditures, and time value of money (i.e. interest rate). A number of approaches for determining cost effectiveness exist and some can be very complex in computing the cost effectiveness. A list of the more common ones is indicated in Table 4.14.

METHOD	REQUIREMENTS	OUTPUT
Life-Cycle Costing	<ul style="list-style-type: none"> ❑ Interest rates ❑ Inflation ❑ Analysis period ❑ Unit cost of treatment ❑ Estimated life of treatment 	Computation of the Equivalent Uniform Annual Cost (EUAC) for each proposed treatment and selection of lowest cost.
Cost-Effectiveness Analysis	<ul style="list-style-type: none"> ❑ Pavement performance curve 	Area under the pavement performance curve is equivalent to effectiveness.
Equivalent Annual Cost	<ul style="list-style-type: none"> ❑ Cost of equipment, man power, and materials per day 	Unit cost per expected life of treatment
Longevity Cost Index	<ul style="list-style-type: none"> ❑ Treatment unit cost ❑ Present value of unit cost over life of treatment ❑ Traffic loading ❑ Life of the treatment 	Relates present value of cost of treatment to life and traffic.

Table 4.14: Existing Cost-Effective Analysis Methods (Geoffroy, 1996)

The Equivalent Annual Cost (EAC) method is recommended for CFB's, since it bypasses the need to define a fixed period for analysis and the need to estimate salvage values before end of life of some alternatives. It is relatively straightforward and can easily be computed using spreadsheet software such as Microsoft Excel. The PMS for jurisdictions with large networks and heavy traffic volumes (e.g. Ministry of Transportation of Ontario) tends to include at least one major rehabilitation within the analysis period. This leads to long analysis periods. Also due to high traffic volumes, these may not favour frequent preventive or corrective solutions with relatively short lives (range may be from 1 to 10 years). The roads in Canadian Forces Bases generally carry very low traffic volumes. Therefore the strategy of frequent cost-effective pavement improvements will

not cause undue hardships for road users. Given the diversity of lives of pavement improvement alternatives, the EAC method is adopted.

Equations 4.7, 4.8 and 4.9 are used for calculating EAC for each feasible treatment alternative. These are shown below.

$$\text{Equivalent Annual Cost} = P(A/P, i, N) - S\{(A/P, i, N) - i\} \quad \text{Equation 4.7 (Riggs, 1997)}$$

$$\text{Equivalent Annual Cost} = (P - S) (A/P, i, N) + S \times i \quad \text{Equation 4.8 (Riggs, 1997)}$$

$$\text{Equivalent Annual Cost} = (P - S) \{i (1 + i)^N / (1 + i)^N - 1\} + S \times i \quad \text{Equation 4.9 (Riggs, 1997)}$$

Where,

A	=	Annuity Amounts
P	=	Present Amount
A/P	=	Capital Recovery Factor
i	=	Interest Rate per Period
N	=	Expected Life in years
S	=	Salvage Amount

According to the EAC model, there is no fixed analysis period. All costs are converted to Equivalent Annual Costs. The analysis is repeated frequently on yearly basis and for pavement sections that require action, new strategies are analyzed. For those sections that do not require action, do-nothing is expected to be the optimal answer.

In performing the cost analysis the following costs were included:

- a) Capital Cost: This is the total initial cost of a pavement improvement alternative.
- b) Yearly Maintenance Cost: This is the cost necessary to operate and maintain road network during its useful life.

Based on the discussion presented in Section 2.5, it was decided not to include user and social costs. Specifically, they were not included in the analysis for the following reasons:

- a) Most roads on CFB's serve very low traffic volumes. So the amount of incremental user and social costs can be very small.
- b) The relative differences between user and social costs for various treatment alternatives are negligible. Therefore, as compared to do-nothing, these provide equal benefits for users.
- c) The comprehensive data on user and social costs for various pavement improvement types is not readily available and could not be obtained for the case study.

4.5 STEP 4: PRIORITIZATION OF STRATEGIES

Priority programming can vary from simple subjective ranking to sophisticated mathematical programming. The basic idea is to answer the following questions [Haas, 1994]:

- a) What projects (or sections) should be rehabilitated or maintained (selection of candidates)?
- b) How can they be built or maintained (selection of within-project alternatives or maintenance treatment alternatives)?
- c) When should they be built or maintained (selection of timings)?

Table 4.15 summarises the various classes of methods with advantages and disadvantages of each class of method.

<i>CLASS OF METHOD</i>	<i>ADVANTAGES AND DISADVANTAGES</i>
Simple subjective ranking of projects based on judgement.	Quick, simple; subject to bias and inconsistency; may be far from optimal.
Ranking based on parameters, such as serviceability, deflection, etc.	Simple and easy to use; may be far from optimal.
Ranking based on parameters with economic analysis	Reasonably simple; should be closer to optimal.
Optimisation by mathematical programming model for year-by-year basis.	Less simple; may be close to optimal effects of timing not considered.
Near optimisation using heuristics and marginal cost-effectiveness.	Reasonably simple; can be used in microcomputer environment; close to optimal results.
Comprehensive optimisation by mathematical programming model taking into account the effects.	Most complex; can give optimal program (maximum of benefits).

Table 4.15: Different Methodologies for Priority Programming (Haas, 1994)

The priority programming currently used for DND bases are subjective in nature and it is recommended that this method be continued on an interim basis. Further development of one of the other methods should, however, be considered within five years when all or most of the bases have enough data to build a site-specific model. This initial protocol is based on one-year analysis with emphasis on collecting data frequently. Once this is done, multiyear planning can also be analysed.

4.5.1 PRIORITY SCORING

The priority is assigned on the basis of pavement condition, drainage, traffic volume, and functional classification of pavement sections. The formula for the priority score is given in Equation 4.10 as:

$$PS = NI \times (TI + DC + FC)$$

Equation 4.10

Where:

PS	=	Priority Score
NI	=	Need's Index
TI	=	Traffic Index
DC	=	Drainage Condition
FC	=	Functional Classification

The above formulation requires that descriptive information from the pavement evaluation survey, traffic counts and functional classification be translated into numeric values.

For a decision involving multiple objectives, the method adopted requires two major assumptions [Szonyi, 1982]. They are:

- a) It must be possible for the decision-maker to think about and judge the value of any combination of objectives. That is, it must be possible to consider not only the importance or weight value for, say, G_1 but also the weighting value for sums of objectives.
- b) Values are assumed to be additive. Given the individual weighting values for, say, G_1 and G_2 , it is assumed that the weighting value for both objectives is the sum of their individual weighting values.

The general procedure for the method is as follows [Szonyi, 1982]:

- a) Rank the objectives in order of importance, where G_1 indicates the most important and G_n the least important.
- b) Assign the weighting value of 1.00 to G_1 (that is, $w_1 = 1.00$) and weighting values to the other objectives to reflect their importance relative to G_1 . These two steps actually complete the judgement process and the next step serves to refine the initial judgements and to keep consistency.
- c) Compare G_1 to the linear combination of all other objectives. That is, compare G_1 versus $(G_2 + G_3 + \dots + G_n)$.

c1) If $G_1 > (G_2 + G_3 + \dots + G_n)$, adjust (if necessary) the value of w_1 such that $w_1 > (w_2 + w_3 + \dots + w_n)$. Attempt, in all adjustments of the procedural steps, to keep the relative values within the objective group in variant. Proceed to step d (The symbol “>” represents “preferred to” and the symbol “<” represents “not preferred to”).

c2) If $G_1 = (G_2 + G_3 + \dots + G_n)$, adjust w_1 so that

$w_1 = (w_2 + w_3 + \dots + w_n)$ and proceed to step d.

c3) If $G_1 < (G_2 + G_3 + \dots + G_n)$, adjust (if necessary) the value of

w_1 so that $w_1 < (w_2 + w_3 + \dots + w_n)$.

Now compare G_1 with $(G_2 + G_3 + \dots + G_{n-1})$.

c3.1 If $G_1 > (G_2 + G_3 + \dots + G_{n-1})$, adjust (if necessary) the values so that $w_1 > (w_2 + w_3 + \dots + w_{n-1})$ and proceed to step d.

c3.2 If $G_1 = (G_2 + G_3 + \dots + G_{n-1})$, adjust (if necessary) the values so that $w_1 = (w_2 + w_3 + \dots + w_{n-1})$ and proceed to step d.

c3.3 If $G_1 < (G_2 + G_3 + \dots + G_{n-1})$, adjust (if necessary) the values so that $w_1 < (w_2 + w_3 + \dots + w_{n-1})$. Then compare G_1 with $(G_2 + G_3 + \dots + G_{n-2})$ and so forth, either until G_1 is preferred or equal to the rest, then proceed to step d.

d) Compare G_2 with $(G_3 + G_4 + \dots + G_n)$ and proceed as in step c.

e) Continue until the comparison of G_{n-2} with $(G_{n-1} + G_n)$ is completed.

f) If desired, convert each w_k into a normalised value by dividing w_k by the sum $\sum_{k=1}^n w_k$.

Following the same procedure, numeric values for needs index (NI) is determined, which is subdivided into seven objectives depending on the PCR range. PCR value range from 0 to 29 produced NI_1 , 30 to 39 produced NI_2 , 40 to 59 produced NI_3 , 60 to 69 produced NI_4 , 70 to 79 produced NI_5 , 80 to 89 produced NI_6 and 90 to 100 generated NI_7 . The steps for generating needs index value is as follows:

a) The objectives were ranked in order of importance, where NI_1 was most important and NI_7 was the least important.

- b) The weighting value to each objective was assigned, $w_1 = 1.00$, $w_2 = 0.75$, $w_3 = 0.50$, $w_4 = 0.40$, $w_5 = 0.25$, $w_6 = 0.20$ and $w_7 = 0.10$
- c) As NI_1 was preferred to the linear combination of the other objectives. That is, $NI_1 > (NI_2 + NI_3 + NI_4 + NI_5 + NI_6 + NI_7)$, since, $w_1 = 1.00 < (w_2 + w_3 + w_4 + w_5 + w_6 + w_7 = 2.20)$, it is necessary to adjust “ w_1 ” to be greater than the sum of 2.20 – say $w_1 = 2.25$
- d) NI_2 versus $(NI_3 + NI_4 + NI_5 + NI_6 + NI_7)$ was compared, assuming $NI_2 < (NI_3 + NI_4 + NI_5 + NI_6 + NI_7)$ procedure in step c was repeated. Since the weighting value reflected this ($w_2 = 0.75 < (w_3 + w_4 + w_5 + w_6 + w_7 = 1.45)$), w_2 was not adjusted.
- e) The same procedure was repeated for NI_3 , NI_4 , NI_5 , NI_6 and NI_7 respectively.
- f) The adjusted weighting values were $w_1 = 2.25$, $w_2 = 0.75$, $w_3 = 0.50$, $w_4 = 0.40$, $w_5 = 0.25$, $w_6 = 0.20$ and $w_7 = 0.10$.
- g) The normalised weighting values were $w_1 = 0.5056$, $w_2 = 0.1685$, $w_3 = 0.1124$, $w_4 = 0.0899$, $w_5 = 0.0562$, $w_6 = 0.0449$ and $w_7 = 0.0225$.

The same approach was followed for traffic index (TI), drainage condition (DC) and functional classification (FC). The weighting values are summarised in Table 4.16.

Pavement Condition Rating (PCR)			Traffic (Annual Avg. Daily Traffic)			Road Type		Drainage	
Needs Index (NI)			Traffic Index (TI)			Road Classification (RC)		Drainage Condition (DC)	
0	Failure	0.5056	> 5000	High	0.5714	Rural Local	0.1429	Excellent	0.0678
30	Very Poor	0.1685	< 500	Low	0.1429	Urban Collector	0.5714	Fair	0.2542
40	Poor	0.1124	≤ 5000	Moderate	0.2857	Urban Local	0.2857	Good	0.1695
60	Fair	0.0899						Inadequate	0.5085
70	Fairly Good	0.0562						n/a	0.0000
80	Good	0.0449							
90	Excellent	0.0225							

Table 4.16: Numeric Values for Various Factors Used in Priority Scoring

Having listed maintenance needs and their respective priorities, it should be decided where to spend the limited funds available and whether additional funds should be appropriated. Summary of budget allocations, total repair cost, total number of sections improved and average PCR for the entire network is prepared.

4.6 FREQUENCY OF DATA COLLECTION

Managing pavement network is not a one-time event. It involves planning the maintenance and construction program, implementing it in a timely fashion and monitoring the serviceability of the network sections. It is therefore, important to update pavement surface evaluation on a yearly basis. To be consistent, a pavement surface condition evaluation should be carried out at the same time every year. Generally, the windshield survey is to be carried out in the late spring and summer months to allow for the effects of frost heaving to dissipate, and for crack widening due to low temperature shrinkage to reclose. [RTAC, 1987].

CHAPTER 5: EXAMPLE OF APPLICATION OF PROTOCOL: CASE STUDY CFB KINGSTON

5.1 INTRODUCTION

This chapter illustrates the use of the Protocol for initiating a Pavement Management System for CFB Kingston. The complete details of this example can be found in Appendix F.

The CFB Kingston is situated east of the city of Kingston, Ontario hereafter referred to as the 'Study Area', lies in the southeastern part of the province of Ontario. It has a population of 5,000 military personnel according to the 1998 Base Census. The Base covers a total area of 227,939.76 m² of paved roads. It also has 4,470.14 m² of gravel pavement, which is not considered in this study. CFB Kingston is divided into four distinct sectors namely McNaughton Barracks; Vimy Barracks; Fort Henry Heights and Royal Military College (shown in Appendix G).

The following steps of the protocol were performed for the road network of CFB Kingston and Royal Military College of Canada:

- a) Network sectioning and inventory
- b) Windshield survey i.e. visual pavement distress survey
- c) Cost analysis using Equivalent Annual Cost model
- d) Prioritizing road sections using Prioritization method
- e) Summary of maintenance and rehabilitation strategies for the entire road section

5.2 NETWORK SECTIONING AND INVENTORY

The road network at CFB Kingston was divided into 65 sections based on the Intersection Method (see Section 4.2.2 for details). The road section inventory included section number, street name, location, road classification, drainage condition, traffic, section length, pavement type, average section width and shoulder type as shown in Appendix F. The roads were categorised into rural local, urban local and urban collector based on traffic volume. Drainage conditions were subjectively defined as good, fair and

inadequate based on visual inspection of the road sections. Traffic counts were made using portable mechanical counters (Golden River MK3 Counters). Ideally, the counts should be recorded on the entire road network, however, due to budget constraints 11 strategic locations were recorded for a period of 24 hours a day for a week. This was done from 31st of August to 15th of September 1999. The sections that were not counted had very low traffic volumes. These sections were identified by the Base Construction Engineering Officer (BCEO). It was assumed that the traffic levels for these sections were in the low category.

A manual 2-hour count was also taken on Craftsman Boulevard and Highway 15, classifying vehicle categories. The counts were converted into passenger car unit equivalent (pcu/vehicle) based on Canadian Capacity Guide for Signalized Intersections methodology [Teply, 1995].

Annual Average Daily Traffic (AADT) was calculated multiplying the adjusted 7-day count by a seasonal variation factor. The value was taken from Traffic Volumes 1990, Ministry of Transportation of Ontario [MTO (b), 1990]. Table 5.1 summarizes AADT on 11 locations, where as Table 5.2 shows the 2-hour manual classified count (see Appendix H for the collected traffic data). Traffic levels were classified as high, moderate and low based on the collected AADT as described in Section 4.5.1 and illustrated in Table 4.16.

Location	Adjusted 7-Day Average Volume (pcu/day)	Annual Average Daily Traffic (pcu/day)
At the intersection of Apprentice St. and Artisan Rd. on Highway 2	2694	2828
Craftsman Blvd. on Highway 15	1932	2029
Craftsman Blvd. on Highway 2	2146	2253
At the intersection of Crerar Cr. and Precision Dr.	1950	2048
Duty Dr. on Highway 2	681	715
Estafetein St. on Highway 15	1217	1278
At the intersection of Lundy's Lane and Canal Du Nord Dr.	863	906
At the intersection of Lundy's Lane and Niagara Park	2592	2721
Niagara Park and Highway 2	3879	4073
Precision Dr. and Highway 2	3586	3765
Princess Marry Ave. and Highway 2	3901	4096

Table 5.1: Summary of Traffic Data Recorded on Strategic Locations

Location: Craftsman Blvd and Highway 15
Date: September 29th, 1999
Start Time: 7:00 a.m.
End Time: 9:00 a.m.

Vehicle Category	Passenger Car Unit Equivalent (pcu/vehicle)	Count	pcu
Passenger cars, vans, pick-up trucks	1.00	87	87
Single unit trucks	1.50	5	7.5
Multi unit trucks	2.50	15	37.5
Buses	1.75	3	5.25

Table 5.2: 2-Hour Manual Classified Count

5.3 PAVEMENT SURFACE CONDITION EVALUATION

Pavement surface condition evaluation (windshield survey) was carried out in the summer of 1999 to identify the maintenance and rehabilitation needs of the road network. Appendix F summarises observed and calculated PCR for the entire road network at CFB Kingston.

5.4 COST ANALYSIS USING EQUIVALENT ANNUAL COST METHOD

Economic analysis for the entire road network at CFB Kingston was performed using the EAC method. Equivalent Annual Costs for different treatment alternatives were computed using the following formulations (Equations 5.1 and 5.2):

$$EAC_{TA} = [(Unit\ Cost_{TA} \times P.A.A_{Section} \times Area_{Section})(i(1+i)^N / (1+i)^N - 1)] \quad \text{Equation 5.1}$$

$$EAC_{\text{Overlay/Reconstruction}} = [(Unit\ Cost_{\text{Overlay/Reconstruction}} \times Area_{\text{Section}})(i(1+i)^N / (1+i)^N - 1)]$$

Equation 5.2

Where as,

EAC_{TA} = Equivalent Annual Cost of Treatment Alternatives

$P.A.A_{\text{Section}}$ = Percent Affected Area of the Section

$Area_{\text{Section}}$ = Total Area in m^2 of the Section

i = Interest Rate

N = Expected Life of Treatment Alternatives in Year(s)

$EAC_{\text{Overlay/Reconstruction}}$ = Equivalent Annual Cost of Overlay/Reconstruction

Salvage value is not considered in the analysis as explained in Chapter 2, Section 2.5.

Yearly maintenance cost (YMC) for various Treatment Alternatives was calculated using Table 5.3. These values are typical of costs in the Kingston area and were obtained from local pavement maintenance contractors.

Treatment Alternatives	Type	Yearly Maintenance Cost
Cold mix patching	Routine	5 % of its calculated EAC
Hot mix patching	Preventive	15 % of its calculated EAC
Chip seal (fine)	Preventive	10 % of its calculated EAC
Chip seal (course)	Preventive	15 % of its calculated EAC
Rout & crack seal	Routine	20 % of its calculated EAC
Spray patching	Routine	5 % of its calculated EAC
Cold mill + hot mix patching	Preventive	5 % of its calculated EAC
Improve drainage + hot mix patching	Preventive	5 % of its calculated EAC
AC overlay + milling	Preventive	10 % of its calculated EAC
Reconstruction	Rehabilitation	5 % of its calculated EAC

Table 5.3: Yearly Maintenance Cost

The yearly maintenance cost for areas of a section that do not require any specific treatment are calculated by using a weighted average of the yearly maintenance costs for areas of the same section that do require specific treatments. In this case Equation 5.3 is used.

$$YMC_{\text{do-nothing area}} = \sum [YMC_{\text{other TA}} / (P.A.A_{\text{other TA}} \times \text{Area}_{\text{Section}})] (P.A.A_{\text{do-nothing area}})(\text{Area}_{\text{Section}})$$

Equation 5.3

Where:

$YMC_{\text{do-nothing area}}$	= Yearly Maintenance Cost for do-nothing area that require no specific treatment
$YMC_{\text{other TA}}$	= Yearly Maintenance Cost for Treatment Alternatives in other areas
$P.A.A_{\text{other TA}}$	= Percent Affected Area for Treatment Alternatives in other areas
$P.A.A_{\text{do-nothing area}}$	= Percent Affected Area for do-nothing area
$\text{Area}_{\text{Section}}$	= Total Area in m ² of the Section

In the case where an entire section requires no specific treatment the YMC is calculated using the YMC of a similar section that has the same distress and does require a specific treatment. Ideally, the two sections should also have the same or similar severity levels. Equation 5.4 is then used to calculate the YMC.

$$YMC_{\text{do-nothing section}} = (\text{Area}_{\text{do-nothing section}} / \text{Area}_{\text{compared section}})(P.A.A_{\text{do-nothing}} / P.A.A_{\text{compared section}})(YMC_{\text{compared section}})$$

Equation 5.4

Where as,

$YMC_{\text{do-nothing section}}$	= Yearly Maintenance Cost when no treatment is required
$\text{Area}_{\text{do-nothing section}}$	= Section Area in m ² when no treatment is required
$\text{Area}_{\text{compared section}}$	= Section Area in m ² for compared section with similar Severity
$P.A.A_{\text{do-nothing section}}$	= Percent Affected Area when no treatment is required

YMC_{compared section} = Yearly Maintenance Cost for compared section with similar Severity

An example case using Section 00010 is shown below explaining the calculation of Equivalent Annual Cost and Yearly Maintenance Cost:

Area Section (m²) = 6142.00; Interest Rate (I) = 10.0 %; Salvage = \$0.0

Table 5.4 gives the distresses, the percent affected area of the section, severity, suggested treatment alternatives, unit cost in \$/m², and expected life.

Distresses Present	P.A.A	Severity	Suggested Treatment Alternatives	Unit Cost (\$/m2)	Expected Life (Years)
Potholes	30.0 %	Moderate	Cold mix patching	2.35	1.0
			Hot mix patching	2.85	4.0
			AC overlay + milling	9.00	10.0
Longitudinal Wheel Track Crack (Alligator)	15.0 %	Moderate	Rout & crack seal	2.50	2.0
Centre Lane Crack (Multiple)	20.0 %	Minor	Do nothing	0.00	0.0
Meandering Crack (Multiple)	15.0 %	Minor	Do nothing	0.00	0.0
Pavement Edge Crack (Multiple)	40.0 %	Moderate	Spray patching	2.20	1.0
Pavement Edge Crack (Alligator)	30.0 %	Moderate	Spray patching	2.20	1.0
Transverse Crack (Multiple)	65.0 %	Major	AC overlay + milling	9.00	10.0
			Reconstruction	12.75	20.0
Alligator Crack	45.0 %	Major	Hot mix patching	2.85	4.0
			Improve drainage +	4.25	5.0
			Hot mix patching		

Table 5.4: Example Section 00010

The unit costs were provided by Criuckshank Construction, Kingston and the expected life of various treatment alternatives was provided by the Ministry of Transportation of Ontario (MTO).

For cold mix patching, EAC and YMC are as follows:

$$\begin{aligned} \text{EAC}_{\text{cold mix patching}} &= [(2.35)(0.3)(6142.50)(0.1(1+0.1)^1/(1+0.1)^1-1)] = \$4,763.51 \\ \text{YMC}_{\text{cold mix patching}} &= (\$4,763.51)(0.05) = \$238.18 \end{aligned}$$

Similarly, for AC overlay and milling, EAC and YMC are:

$$\begin{aligned} \text{EAC}_{\text{AC overlay + milling}} &= [(9.00)(6142.50)(0.1(1+0.1)^{10}/(1+0.1)^{10}-1)] = \$8,996.97 \\ \text{YMC}_{\text{AC overlay + milling}} &= (\$8,996.97)(0.10) = \$899.70 \end{aligned}$$

The EAC and YMC for all treatment alternatives are summarised in Table 5.5

Distresses Present	Selected Treatment Alternatives	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)
Potholes	Hot mix patching	\$1,656.80	\$248.52
Longitudinal Wheel Track Crack (Alligator)	Rout & crack seal	\$1,327.22	\$265.44
Centre Lane Crack (Multiple)	Do-nothing	\$0.00	\$1,074.57
Meandering Crack (Multiple)	Do-nothing	\$0.00	\$805.93
Pavement Edge Crack (Multiple)	Spray patching	\$5,945.94	\$297.30
Pavement Edge Crack (Alligator)	Spray patching	\$4,459.46	\$222.97
Transverse Crack (Multiple)	Reconstruction	\$9,199.07	\$459.95
Alligator Crack	Hot mix patching	\$2,485.20	\$372.78

Table 5.5: Equivalent Annual Cost and Yearly Maintenance Cost with Selected Treatment Alternatives for Section 00010

The YMC for Centre Lane Cracks and Meandering Cracks for the do-nothing scenario was calculated using the first approach as shown below:

$$\begin{aligned} \text{YMC}_{\text{Centre Lane Crack (Multiple)}} = & [(248.52/(0.30)(6142.50)+(265.44)/(0.15)(6142.50)+(297.30)/(0.40) \\ & (6142.50)+(222.97)/(0.30)(6142.50)+(459.95)/(6142.50)+(372.78)/(0.45) \\ & (6142.50)](0.15)(6142.50) \\ \text{YMC}_{\text{Centre Lane Crack (Multiple)}} = & \$1,074.57 \end{aligned}$$

Similarly,

$$\text{YMC}_{\text{Meandering Crack (Multiple)}} = \$805.93$$

The EAC was then added to the YMC to get the Total Equivalent Annual Cost for the entire section. The optimal treatment was selected based on the lowest EAC value. Table 5.6 summarizes the minimum EAC and the optimal treatment alternative for each distress for Section 00010.

Distresses Present	Total Minimum EAC	Optimal Treatment Alternative
Potholes	\$1,905.32	Hot mix patching
Longitudinal Wheel Track Crack (Alligator)	\$1,592.66	Rout & crack seal
Centre Lane Crack (Multiple)	\$1,074.57	Do nothing
Meandering Crack (Multiple)	\$805.93	Do nothing
Pavement Edge Crack (Multiple & Alligator)	\$10,925.67	Spray patching
Transverse Crack (Multiple)	\$9,659.02	Reconstruction
Alligator Crack	\$2,857.98	Hot mix patching

Table 5.6: Minimum EAC with Optimal Treatment Alternatives for Section 00010

Excessive Transverse Crack (Multiple) indicated that a total rehabilitation of Section 00010 would be required. The total EAC for reconstruction was \$9,659.02. Thus rather than apply individual treatments to the various distresses, this section should be reconstructed.

A further example explains the second approach adopted to calculate YMC for a do-nothing scenario. Section 00002 has Pavement Edge Crack (Single) and Transverse Crack (Multiple) of minor severity with 5 percent of the area affected. The severity for both distresses does not warrant any action to be taken at this time. The distress type and severity for both distresses are similar to Section 00006. Therefore, the YMC calculations for Pavement Edge Crack (Single) and Transverse Crack (Multiple) are shown below:

$$YMC_{\text{do-nothing 00002}} = (\text{Area}_{00002} / \text{Area}_{00006}) (P.A.A_{00002} / P.A.A_{00006}) (YMC_{00006})$$

$$YMC_{\text{Pavement Edge Crack (Single)}} = (12,078.50 / 5,670.00) (0.05 / 0.15) (102.91)$$

$$YMC_{\text{Pavement Edge Crack (Single)}} = \$73.07$$

Similarly,

$$YMC_{\text{Transverse Crack (Multiple)}} = (12,078.50 / 5,670.00) (0.05 / 0.15) (243.03)$$

$$YMC_{\text{Transverse Crack (Multiple)}} = \$172.23$$

$$\text{Total YMC}_{\text{do-nothing 00002}} = \$275.14$$

5.5 PRIORITIZATION AND SUMMARY OF ADOPTED STRATEGIES

Once the EAC for each section was calculated, they were ranked by the priority score. The procedures for performing this prioritization were discussed in Chapter 4, Section 4.5. The results of this ranking are shown in Table 5.7.

Threshold PCR/PCI

Maximum 70.00

Minimum 30.00

**Budget for the
year 2000-2001**

\$140,000.00

Section Number	Priority Score (PS)	PCR/PCI (before improvement)	Total EAC	Budget Remaining	Improvements
00007	0.1249	59.20	\$3,582.52	\$136,417.48	Spray patching, rout & crack seal and hot mix patching
00045	0.1249	50.50	\$7,252.38	\$129,165.11	Rout & crack seal, hot mix patching and chip seal (course)
00010	0.1214	57.06	\$9,659.02	\$119,506.08	Reconstruction
00040	0.0999	66.76	\$7,089.74	\$112,416.35	Spray patching and rout & crack seal
00017	0.0999	63.43	\$5,550.60	\$106,865.75	Spray patching, rout & crack seal hot mix patching and chip seal (course)
00006	0.0999	63.40	\$5,096.90	\$101,768.85	Spray patching, rout & crack seal and hot mix patching
00034	0.0893	58.62	\$1,454.65	\$100,314.20	Spray patching, rout & crack seal and hot mix patching
00036	0.0893	55.68	\$7,166.53	\$93,147.67	AC overlay + milling
00052	0.0893	52.58	\$1,587.49	\$91,560.19	Spray patching and hot mix patching
00012	0.0893	50.56	\$6,534.90	\$85,025.29	Rout & crack seal and hot mix patching
00016	0.0893	49.60	\$2,851.79	\$82,173.50	Spray patching, rout & crack seal and hot mix patching
00011	0.0842	61.71	\$2,425.35	\$79,748.15	Spray patching, rout & crack seal and hot mix patching
00039	0.0742	67.77	\$8,310.15	\$71,438.00	Spray patching, rout & crack seal and hot mix patching
00035	0.0742	63.81	\$4,065.15	\$67,372.85	Spray patching, rout & crack seal and hot mix patching
00019	0.0742	60.69	\$1,277.55	\$66,095.30	Rout & crack and hot mix patching
00009	0.0714	69.85	\$879.00	\$65,216.30	Spray patching and rout & crack seal
00023	0.0714	68.40	\$1,030.82	\$64,185.48	Spray patching, rout & crack seal and hot mix patching
00018	0.0714	67.64	\$1,358.63	\$62,826.85	Spray patching, rout & crack seal and hot mix patching
00038	0.0714	64.83	\$363.59	\$62,463.25	Spray patching, rout & crack seal and hot mix patching

Table 5.7: Summary of Maintenance and Rehabilitation Strategies for CFB Kingston

Section Number	Priority Score (PS)	PCR/PCI (before improvement)	Total EAC (\$)	Budget Remaining	Improvements
00030	0.0714	64.58	\$2,973.04	\$59,490.21	Spray patching, rout & crack seal and hot mix patching
00014	0.0714	61.00	\$9,667.08	\$49,823.13	AC overlay + milling
00031	0.0714	60.69	\$551.04	\$49,272.09	Spray patching, rout & crack seal and hot mix patching
00004	0.0614	60.45	\$2,116.92	\$47,155.17	Spray patching, rout & crack seal and hot mix patching
00062	0.0607	59.20	\$718.05	\$46,437.12	Spray patching, rout & crack seal and hot mix patching
00047	0.0607	58.95	\$1,325.97	\$45,111.16	Spray patching, rout & crack seal and hot mix patching
00049	0.0607	55.63	\$1,777.09	\$43,334.07	Spray patching, rout & crack seal and hot mix patching
00048	0.0607	53.51	\$11,396.31	\$31,937.76	Spray patching, rout & crack seal, hot mix patching and chip seal (course)
00050	0.0607	53.48	\$1,273.35	\$30,664.41	Spray patching, rout & crack seal and hot mix patching
00015	0.0607	50.51	\$5,635.44	\$25,028.97	Spray patching, rout & crack seal and hot mix patching
00027	0.0577	76.87	\$8,569.97	\$16,459.00	Spray patching and rout & crack seal
00041	0.0499	82.33	\$2,037.70	\$14,421.30	Rout & crack seal
00033	0.0485	68.12	\$607.17	\$13,814.14	Spray patching and rout & crack seal
00057	0.0485	64.78	\$936.21	\$12,877.92	Spray patching and hot mix patching
00013	0.0485	63.45	\$5,818.54	\$7,059.39	Spray patching, rout & crack seal and hot mix patching
00032	0.0485	61.00	\$6,702.51	\$356.88	AC overlay + milling

Table 5.7: Summary of Maintenance and Rehabilitation Strategies for CFB Kingston (Cont'd.)

The allotted budget for the year 2000/2001 was assumed to be \$140,000, which is typical for CFB Kingston. A total of 35 sections are scheduled for improvement at an estimated total expenditure of approximately \$140,000. Appendix F contains the details for all the sections including those that are not scheduled for treatment as the costs of the required treatments exceeded budget limits.

CHAPTER 6: BAYESIAN APPROACH TO THE MANAGEMENT PROBLEM

6.1 INTRODUCTION

This chapter presents an alternative method of determining the most cost-effective maintenance strategy when there are a range of possible strategies. The method described in Chapter 5 bases the selection of the optimal strategy for a particular distress purely on the equivalent annual cost of each possible treatment. This approach does not account for any error or uncertainty in the predicted performance of a particular treatment. Nor does it account for any uncertainty in the data collected. Finally, the method previously described gives the analyst no information about whether or not the collection of additional data that would reduce this uncertainty is economically justifiable. Bayesian Statistical Analysis can be used to address all of these issues.

Bayesian Statistical Decision Theory is based on making statistical inferences by treating uncertain “states of nature” and by using Bayes Theorem to update probabilities. In essence, Bayesian analysis enables the development of a mechanism for incorporating new information in the form of empirical observations (example, field data) with prior information about uncertain future states.

The prior information is presented in the form of a prior probability distribution. The priors are linked with the empirical data by the conditional probabilities. This results in a posterior distribution that reflects both the empirical (field) data and the prior information. The posterior distribution is presented as a conditional probability distribution, where the empirical (field) data provide the conditioning. The calculation is done by the use of Bayes Theorem [Zellner, 1971]. The Bayes Theorem provides a mechanism for changing, or updating, the degree of belief about a parameter in the light of more recent information [Press, 1989]. Bayesian methodology is especially useful in the following two contexts:

- a) A limited amount of data is available, a thin database, or a small sample size.

b) Premature database; only near term data in the life of the system to be modelled are available or performance has to be predicted on the basis of a model of limited capability. Here, field experiments may be undertaken to supplement the knowledge base.

The pavement management problem falls in to the second context where performance predictions can be made on the basis of models and the experience of engineers. However, before making decisions on the maintenance and rehabilitation work, some field data can be acquired in order to enhance the pavement performance knowledge [Smith, 1979].

6.2 COMPONENTS OF THE MODEL

The problem of maintenance and rehabilitation analysis and evaluation can be described in terms of its elements. These are shown below:

- a) $a_1, a_2, \dots$ = Maintenance and rehabilitation alternatives.
- b) $Q_1, Q_2, \dots$ = Possible states of RCI (or PCR) loss defined by the engineer on the basis of a model. The RCI or PCR loss reflects the effect of traffic and environment. Since traffic and environmental conditions cannot be forecasted with certainty and also the models of their effect on pavement condition are very rough, it is realistic to assume that $Q_1, Q_2, \dots$ are random variables.
- c) $e_0, e_1, \dots$ = Possible field studies in order to acquire additional information; e_0 means no field experiment.
- d) $z_1, z_2, \dots$ = Possible outcomes of the field experiment. z_1 corresponds to Q_1 , z_2 corresponds to Q_2 , etc. If e_0 is chosen, z_0 implies no field experimental outcome.
- e) $P'(Q)$ = Probability of occurrence of uncertain state Q prior to acquiring additional information. Probabilities could be expressed in the form of probability density function or the judgement of the experienced engineers could be expressed in the form of discrete subjective judgement.
- f) $P(z|Q, e)$ = A conditional probability measure on the space of all possible z for given e and Q . For example, in the case of e_1, z_1 and Q_1 , the $P(z_1|Q_1, e_1)$ means the probability that the field study (experiment) e_1 will result in z_1 result, given

that Q_I is the true state of pavement performance. This probability function is a measure of reliability of experiment e in forecasting the true state of Q .

g) $P(z|e) = \sum_Q P'(Q) \cdot P(z|Q, e)$ This is a marginal measure on the space Q of all possible z for all Q and a specified e . It should be read as "given a specified e , the probability of observing an outcome z ".

h) $P''(Q|z, e) = P'(Q) \cdot P(z|Q, e) / \sum_Q P'(Q) \cdot P(z|Q, e)$

(Bayes Theorem) It is a conditional measure on the space of all the Q for a given z . This posterior probability distribution is a measure that would be assigned to the uncertain state (of pavement condition) space posterior to knowing the outcome z of e .

i) $EAC(e, z, \alpha, Q)$ = Equivalent Annual Cost of undertaking field study e , observing outcome z , selecting maintenance or rehabilitation alternative α and Q is the state of pavement RCI (or PCR) loss.

In case of e_0, z_0 , the $EAC(\alpha, Q)$ becomes applicable.

The Bayesian approach can be represented in the form of a decision tree as shown in Figure 6.1:

Figure 6.1: Decision-Tree for Bayesian Analysis (Adapted from Khan, 1986)

6.3 VALUE OF INFORMATION

In the pre-posterior analysis, if the “null experiment” e_0 turns out to be the optimal one, then there is no value of acquiring information.

On the other hand, if the optimal experiment turns out to be any experiment other than e_0 , it could be of interest to know the value of information acquired from sampling.

One can find the decrease in EAC , which would result for each z , if the decision-maker's decision is altered after learning about it.

Let a' be an alternative optimal under prior distribution of Q shown in Equation 6.1:

$$\sum_{Q} P'(Q) [EAC(a', Q)] \leq \sum_{Q} P'(Q) [EAC(a, Q)] \quad \text{Equation 6.1}$$

Next, let a_z be defined as the act optimal under the posterior distribution of Q determined by outcome z of an experiment (Equation 6.2).

$$\sum_{Q} P''(Q|z, e) [EAC(a_z, Q)] = \min_a \sum_{Q} P''(Q|z, e) [EAC(a, Q)] \quad \text{Equation 6.2}$$

If instead of choosing the act a directly, the decision-maker performs an experiment e , observes z , and then chooses a_z , the terminal EAC can be decreased by (Equation 6.3):

$$V_t(e, z) = \sum_{Q} P'(Q) [EAC(a', Q)] - \sum_{Q} P''(Q|z, e) [EAC_t(a_z, Q)] \quad \text{Equation 6.3}$$

From this, we can find (Equation 6.4):

$$V_t^*(e) = \sum_z P(z|e) [V_t(e, z)] \quad \text{Equation 6.4}$$

The expected terminal EAC of a particular experiment is the expected terminal EAC of an immediate terminal action reduced by the expected value of sample information. That is (Equation 6.5):

$$EAC_t^*(e) = EAC_t(e_0) - V_t^*(e) \quad \text{Equation 6.5}$$

Starting from the right hand side and folding back to the left solves the decision-making problem.

6.4 OUTPUTS OF BAYESIAN ANALYSIS AND EVALUATION METHOD

The outputs of Bayesian Analysis are:

- a) The optimal alternative a is identified.
- b) The value of information obtainable from a field experiment (study) can be calculated. This can be used as a measure of the amount of money that can be spent on the field experiment.

6.5 METHODOLOGICAL FRAMEWORK

The Bayesian methodology can be implemented in a systematic fashion as shown in Figure 6.2.

Figure 6.2: Methodological Framework

6.6 EXAMPLE ANALYSIS

1. Suggested alternatives, $a1, a2, a3, \dots a_n$ of pavement maintenance/rehabilitation for eleven sections (Section 00010, Section 00012, Section 00014, Section 00016, Section

00017, Section 00023, Section 00032, Section 00036, Section 00045, Section 00048 and Section 00055) are to be evaluated.

2. Three states of pavement performance loss are defined as high (Q_1), moderate (Q_2) and low (Q_3) respectively.

3. A field study is under consideration, provided that its expected value of information exceeds cost of study. In this case the study proposed is a Benkelman Beam Test.

4. High deflection (z_1), moderate deflection (z_2) and low deflection (z_3) are defined. These correspond with Q_1 , Q_2 , and Q_3 .

5. The prior probabilities assigned for each section are shown in Table 6.1:

Section Number	Pavement Performance Loss			
	P' (Q1)	P' (Q2)	P' (Q3)	Sum P' (Q)
00010	0.600	0.300	0.100	1.000
00012	0.500	0.300	0.200	1.000
00014	0.400	0.400	0.200	1.000
00016	0.400	0.400	0.200	1.000
00017	0.600	0.300	0.100	1.000
00028	0.400	0.400	0.200	1.000
00032	0.400	0.400	0.200	1.000
00036	0.500	0.300	0.200	1.000
00045	0.600	0.300	0.100	1.000
00048	0.500	0.300	0.200	1.000
00055	0.400	0.400	0.200	1.000

Table 6.1: Prior Probabilities for Each Section

6. On the basis of judgement and past experience, the reliability of experimental outcome for each section is defined as shown in Table 6.2.

Section Number	Conditional Probabilities P(z Q,e)								
	P(z1 Q1)	P(z2 Q1)	P(z3 Q1)	P(z1 Q2)	P(z2 Q2)	P(z3 Q2)	P(z1 Q3)	P(z2 Q3)	P(z3 Q3)
00010	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00012	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00014	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00016	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00017	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00023	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00032	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00036	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00045	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00048	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700
00055	0.800	0.150	0.050	0.150	0.600	0.250	0.050	0.250	0.700

Table 6.2: Conditional Probabilities for Each Section

7. Marginal measure $P(z|e)$ for each section is computed using:

$$P(z|e) = \sum_Q P'(Q) P(z|Q,e)$$

Note: $P(z_0|e_0) = 1.0$

The calculation for Section 00010 is shown below:

$$\begin{aligned} P_{00010}(z_1|e_1) &= P'_{00010}(Q_1)P_{00010}(z_1|Q_1) + P'_{00010}(Q_2)P_{00010}(z_1|Q_2) + P'_{00010}(Q_3)P_{00010}(z_1|Q_3) \\ &= (0.600)(0.800) + (0.300)(0.150) + (0.100)(0.050) = 0.5300 \end{aligned}$$

$$\begin{aligned} P_{00010}(z_2|e_1) &= P'_{00010}(Q_1)P_{00010}(z_2|Q_1) + P'_{00010}(Q_2)P_{00010}(z_2|Q_2) + P'_{00010}(Q_3)P_{00010}(z_2|Q_3) \\ &= (0.600)(0.150) + (0.300)(0.600) + (0.100)(0.250) = 0.2950 \end{aligned}$$

$$\begin{aligned} P_{00010}(z_3|e_1) &= P'_{00010}(Q_1)P_{00010}(z_3|Q_1) + P'_{00010}(Q_2)P_{00010}(z_3|Q_2) + P'_{00010}(Q_3)P_{00010}(z_3|Q_3) \\ &= (0.600)(0.050) + (0.300)(0.250) + (0.100)(0.700) = 0.1750 \end{aligned}$$

$$\sum P_{00010}(\text{Marginal Measure}) = 0.5300 + 0.2950 + 0.1750 = 1.0000$$

The Marginal Measure for each section is summarised in Table 6.3.

Section Number	Marginal Measure P(z e)			
	P(z1 e1)	P(z2 e1)	P(z3 e1)	Sum P(z e)
00010	0.5300	0.2950	0.1750	1.000
00012	0.4550	0.3050	0.2400	1.000
00014	0.3900	0.3500	0.2600	1.000
00016	0.3900	0.3500	0.2600	1.000
00017	0.5300	0.2950	0.1750	1.000
00023	0.3900	0.3500	0.2600	1.000
00032	0.3900	0.3500	0.2600	1.000
00036	0.4550	0.3050	0.2400	1.000
00045	0.5300	0.2950	0.1750	1.000
00048	0.4650	0.3400	0.1950	1.000
00055	0.3900	0.3500	0.2600	1.000

Table 6.3: Marginal Measure for Each Section

8. Conditional measure (Posterior Distribution) $P''(Q|z,e)$ for each section is computed

using: $P''(Q|z,e) = P'(Q) P(z|Q,e) / \sum_Q P'(Q) P(z|Q,e)$

The calculation for Section 00010 is shown below:

$$P''_{00010}(Q_1|z_1,e_1) = P'_{00010}(Q_1)P_{00010}(z_1|Q_1,e_1)/P_{00010}(z_1|e_1) = (0.60)(0.80)/(0.530)=0.9057$$

$$P''_{00010}(Q_1|z_2,e_1) = P'_{00010}(Q_1)P_{00010}(z_2|Q_1,e_1)/P_{00010}(z_2|e_1) = (0.60)(0.15)/(0.295)=0.3051$$

$$P''_{00010}(Q_1|z_3,e_1) = P'_{00010}(Q_1)P_{00010}(z_3|Q_1,e_1)/P_{00010}(z_3|e_1) = (0.60)(0.05)/(0.175)=0.1714$$

$$P''_{00010}(Q_2|z_1,e_1) = P'_{00010}(Q_2)P_{00010}(z_1|Q_2,e_1)/P_{00010}(z_1|e_1) = (0.30)(0.15)/(0.530)=0.0849$$

$$P''_{00010}(Q_2|z_2,e_1) = P'_{00010}(Q_2)P_{00010}(z_2|Q_2,e_1)/P_{00010}(z_2|e_1) = (0.30)(0.60)/(0.295)=0.6102$$

$$P''_{00010}(Q_2|z_3,e_1) = P'_{00010}(Q_2)P_{00010}(z_3|Q_2,e_1)/P_{00010}(z_3|e_1) = (0.30)(0.25)/(0.175)=0.4286$$

$$P''_{00010}(Q_3|z_1,e_1) = P'_{00010}(Q_3)P_{00010}(z_1|Q_3,e_1)/P_{00010}(z_1|e_1) = (0.10)(0.05)/(0.530)=0.0094$$

$$P''_{00010}(Q_3|z_2,e_1) = P'_{00010}(Q_3)P_{00010}(z_2|Q_3,e_1)/P_{00010}(z_2|e_1) = (0.10)(0.25)/(0.295)=0.0847$$

$$P''_{00010}(Q_3|z_3,e_1) = P'_{00010}(Q_3)P_{00010}(z_3|Q_3,e_1)/P_{00010}(z_3|e_1) = (0.10)(0.70)/(0.175)=0.4000$$

For (e_0, z_0) combination, $P''(Q|z,e)=P'(Q)$. The conditional measure (Bayes Theorem) for each section is summarised in Table 6.4

Section Number	Bayes Theorem $P'(Q z,e) = P'(Q) \times P(z Q,e) / P(z e)$ (Conditional Measure)								
	$P'(Q1 z1,e1)$	$P'(Q2 z1,e1)$	$P'(Q3 z1,e1)$	$P'(Q1 z2,e1)$	$P'(Q2 z2,e1)$	$P'(Q3 z2,e1)$	$P'(Q1 z3,e1)$	$P'(Q2 z3,e1)$	$P'(Q3 z3,e1)$
00010	0.9057	0.0849	0.0094	0.3051	0.6102	0.0847	0.1714	0.4286	0.4000
00012	0.8791	0.0989	0.0220	0.2459	0.5902	0.1639	0.1042	0.3125	0.5833
00014	0.8205	0.1538	0.0256	0.1714	0.6857	0.1429	0.0769	0.3846	0.5385
00016	0.8205	0.1538	0.0256	0.1714	0.6857	0.1429	0.0769	0.3846	0.5385
00017	0.9057	0.0849	0.0094	0.3051	0.6102	0.0847	0.1714	0.4286	0.4000
00023	0.8205	0.1538	0.0256	0.1714	0.6857	0.1429	0.0769	0.3846	0.5385
00032	0.8205	0.1538	0.0256	0.1714	0.6857	0.1429	0.0769	0.3846	0.5385
00036	0.8791	0.0989	0.0220	0.2459	0.5902	0.1639	0.1042	0.3125	0.5833
00045	0.9057	0.0849	0.0094	0.3051	0.6102	0.0847	0.1714	0.4286	0.4000
00048	0.8791	0.0989	0.0220	0.2459	0.5902	0.1639	0.1042	0.3125	0.5833
00055	0.8205	0.1538	0.0256	0.1714	0.6857	0.1429	0.0769	0.3846	0.5385

Table 6.4: Conditional Measure for Each Section

- The yearly maintenance costs (YMC) calculated in Chapter 5 are applied to the Moderate Pavement Performance Loss (Q2). The percent increase in YMC assumed for High Pavement Performance Loss (Q1) for various treatment alternatives are shown in Table 6.5. Similarly, percent decrease in YMC assumed for Low Pavement Performance Loss (Q3) for various treatment alternatives are shown in Table 6.6. Equivalent Annual Cost Matrix for high, moderate and low pavement performance losses are shown in Table 6.7 and summarised in Table 6.8.

Treatment Alternatives	% Increase in YMC for Q1 w.r.t YMC under Q2
AC overlay with milling	25 %
Reconstruction	25 %
Chip seal (fine)	50 %
Chip seal (course)	70 %
Hot mix patching with improved drainage	50 %
Hot mix patching	75 %
Cold mix patching	75 %
Rout & crack seal	75 %
Spray patching	75 %

Table 6.5: Percent Increase in Yearly Maintenance Cost (YMC) for High Pavement Performance Loss (Q1) w.r.t YMC under Moderate Pavement Performance Loss (Q2)

Treatment Alternatives	% Decrease in YMC for Q3 w.r.t YMC under Q2
AC overlay with milling	50 %
Reconstruction	50 %
Chip seal (fine)	40 %
Chip seal (course)	30 %
Hot mix patching with improved drainage	30 %
Hot mix patching	25 %
Cold mix patching	25 %
Rout & crack seal	25 %
Spray patching	25 %

Table 6.6: Percent Decrease in Yearly Maintenance Cost (YMC) for Low Pavement Performance Loss (Q3) w.r.t YMC under Moderate Pavement Performance Loss (Q2)

Equivalent Annual Cost (EAC) Matrix Under High Pavement Performance Loss (Q1)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00010	6142.50	Potholes, Longitudinal Wheel Track Crack (Alligator), Centre Lane Crack (Multiple), Meandering Crack (Multiple), Pavement Edge Crack (Multiple & Alligator) and Alligator Crack	Hot mix patching, rout & crack seal, spray patching and do nothing	\$15,874.62	\$5,753.14	\$21,627.76
		Transverse Crack (Multiple)	AC overlay + milling	\$8,996.97	\$1,124.63	\$10,121.60
			Reconstruction	\$9,199.07	\$574.94	\$9,774.01
00012	4278.00	Potholes, Centre Lane Crack (Alligator), Meandering Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple), and Alligator Crack	Hot mix patching, rout & crack seal and do nothing	\$5,120.14	\$2,475.85	\$7,595.99
		Potholes	AC overlay + milling	\$6,266.02	\$783.25	\$7,049.27
00014	6000.00	Coarse Aggregate Loss, Potholes, Centre Lane Crack (Single), Meandering Crack (Multiple), Pavement Edge Crack (Multiple & Alligator) and Transverse Crack	Spray patching, hot mix patching, rout & crack seal and do nothing	\$16,048.69	\$4,738.00	\$20,786.69
		Potholes	AC overlay + milling	\$8,788.25	\$1,098.54	\$9,886.79

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q)

Equivalent Annual Cost (EAC) Matrix Under High Pavement Performance Loss (Q1)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00016	1770.00	Potholes, Longitudinal Mid Lane Crack (Multiple), Meandering Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple) and Alligator Crack	Spray patching hot mix patching, rout & crack seal and do nothing	\$3,512.66	\$899.45	\$4,412.11
		Potholes	AC overlay + milling	\$2,592.53	\$324.06	\$2,916.59
00017	5464.00	Potholes, Wheel Track Rutting, Distortion, Meandering Crack (Multiple), Pavement Edge Crack (Multiple) and Transverse Crack (Multiple)	Spray patching, Chip seal (course), hot mix patching, rout & crack seal and do nothing	\$4,410.93	\$1,994.41	\$6,405.34
		Wheel Track Rutting	AC overlay + milling	\$8,003.17	\$1,000.40	\$9,003.57
00023	962.50	Potholes, Meandering Crack (Multiple), Pavement Edge Crack (Single), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal and hot mix patching	\$920.72	\$192.66	\$1,113.38
		Potholes	AC overlay + milling	\$1,409.78	\$176.23	\$1,586.01
00032	4160.00	Potholes, Centre Lane Crack (Multiple), Pavement Edge Crack (Multiple & Alligator), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal and hot mix patching	\$7,174.61	\$1,538.30	\$8,712.91
		Potholes	AC overlay + milling	\$6,093.19	\$761.65	\$6,854.84

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Equivalent Annual Cost (EAC) Matrix Under High Pavement Performance Loss (Q1)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00036	4448.00	Potholes, Distortion, Centre Lane Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal, hot mix patching and do nothing	\$8,112.86	\$2,153.66	\$10,266.52
		Potholes	AC overlay + milling	\$6,515.02	\$814.38	\$7,329.40
00045	4480.00	Wheel Track Rutting	Chip seal (fine)	\$1,034.09	\$155.12	\$1,189.21
			Chip seal (course)	\$960.22	\$244.85	\$1,205.07
			Hot mix patching	\$1,006.98	\$264.34	\$1,271.32
00048	4860.00	Pavement Edge Crack (Alligator)	Chip seal (fine)	\$2,019.24	\$302.88	\$2,322.12
			Chip seal (course)	\$1,875.01	\$478.13	\$2,353.14
		Alligator Crack	Hot mix patching	\$1,092.40	\$286.76	\$1,379.16
			Improve drainage + hot mix patching	\$1,362.18	\$102.17	\$1,464.35
00055	1080.00	Potholes, Centre Lane Crack (Alligator), Pavement Edge Crack (Multiple), and Alligator Crack	Spray patching, hot mix patching and do nothing	\$1,221.03	\$280.00	\$1,501.03
		Potholes	AC overlay + milling	\$1,581.89	\$197.74	\$1,779.63

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Equivalent Annual Cost (EAC) Matrix Under Moderate Pavement Performance Loss (Q2)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00010	6142.50	Potholes, Longitudinal Wheel Track Crack (Alligator), Centre Lane Crack (Multiple), Meandering Crack (Multiple), Pavement Edge Crack (Multiple & Alligator) and Alligator Crack	Hot mix patching, rout & crack seal, spray patching and do nothing	\$15,874.62	\$3,287.51	\$19,162.13
		Transverse Crack (Multiple)	AC overlay + milling	\$8,996.97	\$899.70	\$9,896.67
			Reconstruction	\$9,199.07	\$459.95	\$9,659.02
00012	4278.00	Potholes, Centre Lane Crack (Alligator), Meandering Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple), and Alligator Crack	Hot mix patching, rout & crack seal and do nothing	\$5,120.14	\$1,414.77	\$6,534.91
		Potholes	AC overlay + milling	\$6,266.02	\$626.60	\$6,892.62
00014	6000.00	Coarse Aggregate Loss, Potholes, Centre Lane Crack (Single), Meandering Crack (Multiple), Pavement Edge Crack (Multiple & Alligator) and Transverse Crack	Spray patching, hot mix patching, rout & crack seal and do nothing	\$16,048.69	\$2,707.43	\$18,756.12
		Potholes	AC overlay + milling	\$8,788.25	\$878.83	\$9,667.08

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Equivalent Annual Cost (EAC) Matrix Under Moderate Pavement Performance Loss (Q2)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00016	1770.00	Potholes, Longitudinal Mid Lane Crack (Multiple), Meandering Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple) and Alligator Crack	Spray patching hot mix patching, rout & crack seal and do nothing	\$3,512.66	\$513.97	\$4,026.63
		Potholes	AC overlay + milling	\$2,592.53	\$259.25	\$2,851.78
00017	5464.00	Potholes, Wheel Track Rutting, Distortion, Meandering Crack (Multiple), Pavement Edge Crack (Multiple) and Transverse Crack (Multiple)	Spray patching, Chip seal (course), hot mix patching, rout & crack seal and do nothing	\$4,410.93	\$1,139.66	\$5,550.59
		Wheel Track Rutting	AC overlay + milling	\$8,003.17	\$800.32	\$8,803.49
00023	962.50	Potholes, Meandering Crack (Multiple), Pavement Edge Crack (Single), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal and hot mix patching	\$920.72	\$110.09	\$1,030.81
		Potholes	AC overlay + milling	\$1,409.78	\$140.98	\$1,550.76
00032	4160.00	Potholes, Centre Lane Crack (Multiple), Pavement Edge Crack (Multiple & Alligator), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal and hot mix patching	\$7,174.61	\$879.03	\$8,053.64
		Potholes	AC overlay + milling	\$6,093.19	\$609.32	\$6,702.51

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Equivalent Annual Cost (EAC) Matrix Under Moderate Pavement Performance Loss (Q2)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00036	4448.00	Potholes, Distortion, Centre Lane Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal, hot mix patching and do nothing	\$8,112.86	\$1,230.66	\$9,343.52
		Potholes	AC overlay + milling	\$6,515.02	\$651.50	\$7,166.52
00045	4480.00	Wheel Track Rutting	Chip seal (fine)	\$1,034.09	\$103.41	\$1,137.50
			Chip seal (course)	\$960.22	\$144.03	\$1,104.25
			Hot mix patching	\$1,006.98	\$151.05	\$1,158.03
00048	4860.00	Pavement Edge Crack (Alligator)	Chip seal (fine)	\$2,019.24	\$201.92	\$2,221.16
			Chip seal (course)	\$1,875.01	\$281.25	\$2,156.26
		Alligator Crack	Hot mix patching	\$1,092.40	\$163.86	\$1,256.26
			Improve drainage + hot mix patching	\$1,362.18	\$68.11	\$1,430.29
00055	1080.00	Potholes, Centre Lane Crack (Alligator), Pavement Edge Crack (Multiple), and Alligator Crack	Spray patching, hot mix patching and do nothing	\$1,221.03	\$160.00	\$1,381.03
		Potholes	AC overlay + milling	\$1,581.89	\$158.19	\$1,740.08

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Equivalent Annual Cost (EAC) Matrix Under Low Pavement Performance Loss (Q3)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00010	6142.50	Potholes, Longitudinal Wheel Track Crack (Alligator), Centre Lane Crack (Multiple), Meandering Crack (Multiple), Pavement Edge Crack (Multiple & Alligator) and Alligator Crack	Hot mix patching, rout & crack seal, spray patching and do nothing	\$15,874.62	\$2,465.63	\$18,340.25
		Transverse Crack (Multiple)	AC overlay + milling	\$8,996.97	\$449.85	\$9,446.82
			Reconstruction	\$9,199.07	\$229.98	\$9,429.05
00012	4278.00	Potholes, Centre Lane Crack (Alligator), Meandering Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple), and Alligator Crack	Hot mix patching, rout & crack seal and do nothing	\$5,120.14	\$1,061.08	\$6,181.22
		Potholes	AC overlay + milling	\$6,266.02	\$313.30	\$6,579.32
00014	6000.00	Coarse Aggregate Loss, Potholes, Centre Lane Crack (Single), Meandering Crack (Multiple), Pavement Edge Crack (Multiple & Alligator) and Transverse Crack	Spray patching, hot mix patching, rout & crack seal and do nothing	\$16,048.69	\$2,030.57	\$18,079.26
		Potholes	AC overlay + milling	\$8,788.25	\$439.42	\$9,227.67

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Equivalent Annual Cost (EAC) Matrix Under Low Pavement Performance Loss (Q3)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00016	1770.00	Potholes, Longitudinal Mid Lane Crack (Multiple), Meandering Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple) and Alligator Crack	Spray patching hot mix patching, rout & crack seal and do nothing	\$3,512.66	\$385.48	\$3,898.14
		Potholes	AC overlay + milling	\$2,592.53	\$129.63	\$2,722.16
00017	5464.00	Potholes, Wheel Track Rutting, Distortion, Meandering Crack (Multiple), Pavement Edge Crack (Multiple) and Transverse Crack (Multiple)	Spray patching, Chip seal (course), hot mix patching, rout & crack seal and do nothing	\$4,410.93	\$854.75	\$5,265.68
		Wheel Track Rutting	AC overlay + milling	\$8,003.17	\$400.16	\$8,403.33
00023	962.50	Potholes, Meandering Crack (Multiple), Pavement Edge Crack (Single), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal and hot mix patching	\$920.72	\$82.57	\$1,003.29
		Potholes	AC overlay + milling	\$1,409.78	\$70.49	\$1,480.27
00032	4160.00	Potholes, Centre Lane Crack (Multiple), Pavement Edge Crack (Multiple & Alligator), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal and hot mix patching	\$7,174.61	\$659.27	\$7,833.88
		Potholes	AC overlay + milling	\$6,093.19	\$304.66	\$6,397.85

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Equivalent Annual Cost (EAC) Matrix Under Low Pavement Performance Loss (Q3)						
Section Number	Section Area (sq.m.)	Distresses Present	Suggested Treatment Alternatives	EAC	Yearly Maintenance Cost (YMC)	Total EAC (Excluding Benkelman Beam Cost)
00036	4448.00	Potholes, Distortion, Centre Lane Crack (Multiple), Pavement Edge Crack (Multiple), Transverse Crack (Multiple) and Alligator Crack	Spray patching, rout & crack seal, hot mix patching and do nothing	\$8,112.86	\$923.00	\$9,035.86
		Potholes	AC overlay + milling	\$6,515.02	\$325.75	\$6,840.77
00045	4480.00	Wheel Track Rutting	Chip seal (fine)	\$1,034.09	\$62.05	\$1,096.14
			Chip seal (course)	\$960.22	\$100.82	\$1,061.04
			Hot mix patching	\$1,006.98	\$113.29	\$1,120.27
00048	4860.00	Pavement Edge Crack (Alligator)	Chip seal (fine)	\$2,019.24	\$121.15	\$2,140.39
			Chip seal (course)	\$1,875.01	\$196.88	\$2,071.89
		Alligator Crack	Hot mix patching	\$1,092.40	\$122.90	\$1,215.30
			Improve drainage + hot mix patching	\$1,362.18	\$40.87	\$1,403.05
00055	1080.00	Potholes, Centre Lane Crack (Alligator), Pavement Edge Crack (Multiple), and Alligator Crack	Spray patching, hot mix patching and do nothing	\$1,221.03	\$120.00	\$1,341.03
		Potholes	AC overlay + milling	\$1,581.89	\$79.10	\$1,660.99

Table 6.7: Equivalent Annual Cost (EAC) Matrix under Pavement Performance Loss (Q) (Cont'd.)

Section Number	Suggested Treatment Alternatives	Equivalent Annual Cost (EAC) Excluding Benkelman Beam Cost Per Section Under Pavement Performance Loss		
		High (Q1)	Moderate (Q2)	Low (Q3)
00010	Hot mix patching, rout & crack seal, spray patching and do nothing	\$21,627.76	\$19,162.13	\$18,340.25
	AC overlay + milling	\$10,121.60	\$9,896.67	\$9,446.82
	Reconstruction	\$9,774.01	\$9,659.02	\$9,429.05
00012	Hot mix patching, rout & crack seal and do nothing	\$7,595.99	\$6,534.91	\$6,181.22
	AC overlay + milling	\$7,049.27	\$6,892.62	\$6,579.32
00014	Spray patching, hot mix patching, rout & crack seal and do nothing	\$20,786.69	\$18,756.12	\$18,079.26
	AC overlay + milling	\$9,886.79	\$9,667.08	\$9,227.67
00016	Spray patching, hot mix patching, rout & crack seal and do nothing	\$4,412.11	\$4,026.63	\$3,898.14
	AC overlay + milling	\$2,916.59	\$2,851.78	\$2,722.16
00017	Spray patching, chip seal (course), hot mix patching, rout & crack seal and do nothing	\$6,405.34	\$5,550.59	\$5,265.68
	AC overlay + milling	\$9,003.57	\$8,803.49	\$8,403.33
00023	Spray patching, rout & crack seal and hot mix patching	\$1,113.38	\$1,030.81	\$1,003.29
	AC overlay + milling	\$1,586.01	\$1,550.76	\$1,480.27

Table 6.8: Summary of Equivalent Annual Cost (EAC) under Pavement Performance Loss (Q)

Section Number	Suggested Treatment Alternatives	Equivalent Annual Cost (EAC) Excluding Benkelman Beam Cost Per Section Under Pavement Performance Loss		
		High (Q1)	Moderate (Q2)	Low (Q3)
00032	Spray patching, rout & crack seal and hot mix patching	\$8,712.91	\$8,053.64	\$7,833.88
	AC overlay + milling	\$6,854.84	\$6,702.51	\$6,397.85
00036	Spray patching, rout & crack seal hot mix patching and do nothing	\$10,266.52	\$9,343.52	\$9,035.86
	AC overlay + milling	\$7,329.40	\$7,166.52	\$6,840.77
00045	Chip seal (fine)	\$1,189.21	\$1,137.50	\$1,096.14
	Chip seal (course)	\$1,205.07	\$1,104.25	\$1,061.04
	Hot mix patching	\$1,271.32	\$1,158.03	\$1,120.27
00048	Chip seal (fine)	\$2,322.12	\$2,221.16	\$2,140.39
	Chip seal (course)	\$2,353.14	\$2,156.26	\$2,071.89
00048	Hot mix patching	\$1,379.16	\$1,256.26	\$1,215.30
	Improve drainage + hot mix patching	\$1,464.35	\$1,430.29	\$1,403.05
00055	Spray patching, hot mix patching and do nothing	\$1,501.03	\$1,381.03	\$1,341.03
	AC overlay + milling	\$1,779.63	\$1,740.08	\$1,660.99

Table 6.8: Summary of Equivalent Annual Cost (EAC) under Pavement Performance Loss (Q) (Cont'd.)

Table 6.8 indicates that under each state of nature, that is, pavement performance loss (Q) (except for Sections 00012, 00045 and 00048), one of the alternatives is dominating others and does not warrant Bayesian analysis.

10. For each experiment and outcome combination, the treatment alternative and its associated expected EAC are determined using:

$$EAC^*(z,e) = \text{Min}_a EAC^*(a,z,e).$$

In this case, one experiment is planned, i.e., Benkelman Beam Test (*eI*).

EAC for Benkelman Beam test was computed using the following information:

Capital Cost of Benkelman Beam	= \$3,340.00
Salvage value of Benkelman Beam (after 20 years)	= \$501.00
Interest Rate (i)	= 10.0 %
Expected Life of Benkelman Beam (N)	= 20 years

$$EAC \text{ of Benkelman Beam} = [\text{Capital Cost} \times (A|P, i, N)] - [\text{Salvage Value} \times (A|F, i, N)]$$

$$A|P, i, N = [(i)(1+i)^N / (1+i)^N - 1]$$

$$A|P, i, N = [(0.10)(1+0.10)^{20} / (1+0.10)^{20} - 1]$$

$$A|P, i, N = 0.11746$$

Similarly,

$$A|F, i, N = [(i) / (1+i)^N - 1]$$

$$A|F, i, N = [(0.10) / (1+0.10)^{20} - 1]$$

$$A|F, i, N = 0.01746$$

$$EAC \text{ of Benkelman Beam} = [(3,340.00)(0.11746)] - [(501)(0.01746)] = \$383.57$$

$$\text{Number of Test Performed} = 12$$

$$EAC \text{ of Benkelman Beam per test} = \$31.96$$

$$\text{Truck and labour cost per test} = \$41.50$$

$$\text{Total EAC per test} = \$73.46$$

The calculation for Section 00012 is shown below (Table 6.9 summarises $EAC^*(a,z,e)$):

$$EAC^*_{00012}(a_1, z_1, e_1) = (7,669.45)(0.8791) + (6,608.37)(0.0989) + (6,254.68)(0.0220)$$

$$EAC^*_{00012}(a_1, z_1, e_1) = \$7,533.42$$

$$EAC^*_{00012}(a_2, z_1, e_1) = (7,122.73)(0.8791) + (6,966.08)(0.0989) + (6,652.78)(0.0220)$$

$$EAC^*_{00012}(a_2, z_1, e_1) = \$7,096.91$$

$$EAC^*_{00012}(a_1, z_2, e_1) = (7,669.45)(0.2459) + (6,608.37)(0.5902) + (6,254.68)(0.1639)$$

$$EAC^*_{00012}(a_1, z_2, e_1) = \$6,811.31$$

$$EAC^*_{00012}(a_2, z_2, e_1) = (7,122.73)(0.2459) + (6,966.08)(0.5902) + (6,652.78)(0.1639)$$

$$EAC^*_{00012}(a_2, z_2, e_1) = \$6,953.24$$

$$EAC^*_{00012}(a_1, z_3, e_1) = (7,669.45)(0.1042) + (6,608.37)(0.3125) + (6,254.68)(0.5833)$$

$$EAC^*_{00012}(a_1, z_3, e_1) = \$6,512.58$$

$$EAC^*_{00012}(a_2, z_3, e_1) = (7,122.73)(0.1042) + (6,966.08)(0.3125) + (6,652.78)(0.5833)$$

$$EAC^*_{00012}(a_2, z_3, e_1) = \$6,799.64$$

Section Number	Suggested Treatment Alternatives	Equivalent Annual Cost (EAC) (incl. Benkelman Beam Cost) Under Pavement Performance Loss			EAC (z1,e1)	EAC (z2,e1)	EAC (z3,e1)
		Q1 (High)	Q2 (Moderate)	Q3 (Low)			
00012	Hot mix patching, rout & crack seal and do nothing	\$7,669.45	\$6,608.37	\$6,254.68	\$7,533.42	\$6,811.31	\$6,512.58
	AC overlay + milling	\$7,122.73	\$6,966.08	\$6,652.78	\$7,096.91	\$6,953.24	\$6,799.64
00045	Chip seal (fine)	\$1,262.67	\$1,210.96	\$1,169.60	\$1,257.40	\$1,223.23	\$1,203.28
	Chip seal (course)	\$1,278.53	\$1,177.71	\$1,134.50	\$1,268.62	\$1,204.81	\$1,177.71
	Hot mix patching	\$1,344.78	\$1,231.49	\$1,193.73	\$1,333.74	\$1,262.86	\$1,235.81
00048	Chip seal (fine)	\$2,395.58	\$2,294.62	\$2,213.86	\$2,381.60	\$2,306.21	\$2,258.03
	Chip seal (course)	\$2,426.60	\$2,229.72	\$2,145.35	\$2,400.95	\$2,264.30	\$2,201.01

Table 6.9: Suggested Treatment Alternatives and its Associated Equivalent Annual Cost (EAC)

For each (e,z) combination, the optimal EAC is determined using:

$$EAC(z,e) = \text{Min}_a EAC^*(a,z,e)$$

$$EAC_{00012}(z_1,e_1) = \$7,096.91$$

$$EAC_{00012}(z_2,e_1) = \$6,811.31$$

$$EAC_{00012}(z_3,e_1) = \$6,512.58$$

Now for each e , the expected EAC of the optimal treatment alternative is calculated using:

$$EAC^*(e^*) = \sum_z P(z|e) EAC^*(z,e)$$

The calculation for Section 00012 is shown below:

$$EAC^*_{00012}(e^*) = (0.455)(7,096.91) + (0.305)(6,811.31) + (0.240)(6,512.58) = \$6,869.57$$

The optimal study (e^*) is that e for which $EAC^*(a)$ is minimum (i.e. that results in the lowest expected EAC of the maintenance).

$$EAC^*(e^*) = \text{Min}_e[EAC(e)]$$

Here, here there is only e_1 (Benkelman Beam Test), therefore, it is the optimal one.

Table 6.10 summarises optimal treatment alternative with it's associated EAC (z,e) and $EAC^*(e^*)$.

Section Number	Min EAC (z1,e1)	Optimal Treatment Alternative	Min EAC (z2,e1)	Optimal Treatment Alternative	Min EAC (z3,e1)	Optimal Treatment Alternative	EAC* (e*)
00012	\$7,096.91	AC overlay + milling	\$6,811.31	Hot mix patching, rout & crack seal and do nothing	\$6,512.58	Hot mix patching, rout & crack seal and do nothing	\$6,869.57
00045	\$1,257.40	Chip seal (fine)	\$1,204.81	Chip seal (course)	\$1,177.71	Chip seal (course)	\$1,227.94
00048	\$2,381.60	Chip seal (fine)	\$2,264.30	Chip seal (course)	\$2,201.01	Chip seal (course)	\$2,302.49

Table 6.10: Optimal Treatment Alternative and Expected Equivalent Annual Cost (EAC) for Each Section [EAC*(e*)]

11. Expected Value of Information: Equivalent Annual Costs of the optimal treatment alternative α' for e_0 (i.e. no new information acquisition and therefore, under prior probabilities) is determined using:

$$EAC(\alpha', Q) = \min_a P'(Q) [EAC(a, Q)]$$

The minimum $EAC(\alpha', Q)$ for e_0 and their respective optimal treatment alternatives are summarised in Table 6.11.

Section Number	Suggested Treatment Alternatives	Optimal Treatment Alternative Under Prior Probabilities		
		$EAC(\alpha', Q) = P'(Q) \times EAC(a, Q)$ [EAC(a, Q) does not include cost of BB Test]	Min EAC(α', Q)	Optimal Treatment Alternative
00012	Hot mix patching, rout & crack seal and do nothing	\$6,994.71	\$6,908.29	AC overlay + milling
	AC overlay + milling	\$6,908.29		
00045	Chip seal (fine)	\$1,164.39	\$1,160.42	Chip seal (course)
	Chip seal (course)	\$1,160.42		
	Hot mix patching	\$1,222.23		
00048	Chip seal (fine)	\$2,255.49	\$2,237.82	Chip seal (course)
	Chip seal (course)	\$2,237.82		

Table 6.11: Optimal Treatment Alternative and Equivalent Annual Cost (EAC) under Prior Probabilities for Each Section

The optimal treatment alternative for each z is determined and identified as α_z . These have been summarised earlier in Table 6.10 for each section. The expected value of information $[V_t^*(e)]$ for each section is obtained using marginal measure probabilities (see Table 6.3). Calculation for Section 00012 is shown below in Table 6.12:

	EAC Under High Deflection (z ₁)	EAC Under Moderate Deflection (z ₂)	EAC Under Low Deflection (z ₃)
A _z [Optimal Treatment Alternative Under Posterior Probabilities]	\$7,096.91	\$6,811.31	\$6,512.58
A' [Optimal Treatment Alternative Under Prior Probabilities]	\$6,908.29	\$6,908.29	\$6,908.29
A'-a _z [Difference]	-\$188.63	\$96.97	\$395.70
P(z e) [Marginal Measure]	0.4550	0.3050	0.2400

Table 6.12: Example Section 00012 for Calculating Expected Value of Information

$$V_{00012}^*(e) = (0.4550)(-188.63) + (0.3050)(96.97) + (0.2400)(395.70) = \$38.72$$

The net value of acquiring Benkelman Beam test information is \$38.72, therefore, it is feasible for Section 00012 to acquire additional information by using the Benkelman Beam test method. Table 6.13 summarises the expected value of information for each section under consideration.

Section Number	Min EAC(a',Q) (A)	Min EAC Under Bayes Theorem			Marginal Measure P(z e)			Expected Value of Information			
		a _{z1} = min EAC(z ₁ e) (B)	a _{z2} = min EAC(z ₂ e) (C)	a _{z3} = min EAC(z ₃ e) (D)	P(z ₁ e)	P(z ₂ e)	P(z ₃ e)	A-B	A-C	A-D	V _i * (e)
00012	\$6,908.29	\$7,096.91	\$6,811.31	\$6,512.58	0.4550	0.3050	0.2400	-\$188.63	\$96.97	\$395.70	\$38.72
00045	\$1,160.42	\$1,257.40	\$1,204.81	\$1,177.71	0.5300	0.2950	0.1750	-\$96.98	-\$44.39	-\$17.29	-\$67.52
00048	\$2,237.82	\$2,381.60	\$2,264.30	\$2,201.01	0.4650	0.3400	0.1950	-\$143.78	-\$26.48	\$36.81	-\$64.66

Table 6.13: Expected Value of Information [V_i* (e)] for Sections under Consideration

The negative value indicates that Benkelman Beam test is not warranted for acquiring additional information. However, in the case of Section 00012, a positive value indicates that the Benkelman Beam test is warranted.

6.7 COMPARISON OF EAC METHOD WITH BAYESIAN METHODOLOGY

Selection of treatment alternatives for individual sections using Equivalent Annual Cost (EAC) method is based on lowest EAC values.

Bayesian methodology incorporates the uncertain state of nature, such as, pavement performance loss. The optimal treatment and its associated EAC are selected using prior and posterior probabilities of the occurrence of uncertain states. The methodology can also be used to assess the merit of acquiring additional information, such as traffic prediction studies, severity of climatic effects, deflection studies, etc. The expected value of this information can be estimated from the pre-posterior analysis.

CHAPTER 7: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY

The overall objective of this thesis research was to develop a methodological framework to initiate and implement general Pavement Management System for maintaining a pavement network for a Canadian Forces Base. This section details the summary from the research undertaken.

- a) The information on how Canadian Forces Bases manage their road infrastructure was collected through a questionnaire. The survey showed that most, if not all Bases may provide no systematic maintenance for their pavement infrastructure, have no standards for prioritising roadwork projects and in the past projects were initiated on a when-needed approach. Implementing a PMS tailored for DND Base-Roads was deemed beneficial.
- b) A set of procedures for collecting data, assessing and analyzing pavement maintenance and rehabilitation needs and prioritizing appropriated treatments given budget constraints were developed.
- c) The implementation of these procedures and the expected outcomes were illustrated using CFB Kingston as a test bed.
- d) The application of Bayesian Statistical Analysis techniques to a pavement management system was described and demonstrated.

7.2 CONCLUSIONS

The conclusions that arise from this work are as follows:

- a) The developed Protocol will enable Base Construction Engineers to more efficiently and rationally assign pavement maintenance and repair dollars.
- b) The pavement management system tailored for use by DND can be effectively implemented at a typical Canadian Forces Base with limited human and financial resources.
- c) The pavement management system provides information regarding the magnitude of existing pavement deficiencies, estimates the current condition of pavement network

and generates cost-effective strategies to repair the deficiencies, offering the potential for improved road condition with relatively reduced maintenance and rehabilitation costs.

- d) The Bayesian Statistical method is a fairly simple tool that can aid in the selection of the most appropriate treatment strategy in light of the limited data that is currently available at a typical Canadian Forces Base.
- e) The Bayesian Statistical method can be used to assess the economic feasibility of conducting field tests to acquire additional knowledge, thereby optimizing scarce financial resources.

7.3 RECOMMENDATIONS

This section details the recommendations for future research work.

- a) This protocol should be widely distributed to all Canadian Forces Bases.
- b) A comprehensive training program should be implemented to familiarise Base Construction Engineers and Base Maintenance Staff with the PMS Protocol. The objective of this activity would be to ensure all personnel are comfortable with the PMS working systems and have the skills required for collecting and updating road inventory. In addition the program should illustrate how to systematically divide pavement network into homogenous sections, to conduct pavement condition surveys and prepare one year or multiyear maintenance and rehabilitation plans. This approach would be beneficial, as the maintenance personnel should be knowledgeable about the types of pavement problems that exist at various road links in their area and will have a higher confidence level in preparing maintenance and rehabilitation plans.
- c) Bases should be encouraged to implement this protocol, or if not possible to at least begin collecting data that would enable the implementation of a PMS at a later date and provide data for future performance prediction modelling.
- d) The Bayesian approach should be fully incorporated into the protocol and utilized until such time as sufficient long term data can be accumulated that would permit the development of simpler site specific deterministic pavement performance models.
- e) User friendly software should be developed that incorporates this protocol to facilitate its adoption and use.

- f) The protocol should be further developed to incorporate long term performance prediction modelling that would permit multiyear optimization and scheduling of maintenance and repair treatments.

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APPENDIX A: QUESTIONNAIRE

QUESTIONNAIRE

Page 1 of 10

Please answer the following questions:

1/ The total length of the existing road infrastructure (in kilometers):

- Flexible Pavement
- Rigid Pavement
- Composite Pavement

2/ Pavement consists of:

- Two Layers %
- Three Layers %
- Four Layers %
- Other (please specify)
.....
.....

If this level of detail is not available, please tick the appropriate box(es)
Most of the pavement consists of:

- Two Layers ()
- Three Layers ()
- Four Layers ()
- Other (please specify)
.....
.....

3/ % Rigid Pavements that are:

- Jointed Plain Concrete Pavements
- Jointed Reinforced Concrete Pavements
- Continuous Reinforced Concrete Pavements

4/ % Flexible Pavements that are:

- Partial-Depth Asphalt Pavements
- Full-Depth Asphalt Pavements
- Thick-Lift Asphalt Pavements
- Deep-Strength Asphalt Pavements

- 5/ Mean monthly rainfall is mm
Mean monthly evaporation is mm
Mean monthly snow fall is cm
Mean monthly precipitation is mm

(The values should be based on the longest period in years for which measurements are available).

6/ Mean monthly maximum air temperature ($^{\circ}\text{C}$) is

Mean monthly minimum air temperature ($^{\circ}\text{C}$) is

(The temperatures should be based on the longest period in years for which measurements are available).

7/ Annual Average Daily Traffic (AADT) ranges from: (check one for each class type)

For Arterials	For Collectors	For Locals
< 10,000 ()	< 10,000 ()	< 5,000 ()
10,000 to 20,000 ()	10,000 to 20,000 ()	5,000 to 10,000 ()
20,000 to 50,000 ()	20,000 to 50,000 ()	10,000 to 20,000 ()
50,000 to 100,000 ()	50,000 to 100,000 ()	20,000 to 30,000 ()
>100,000 ()	>100,000 ()	>30,000 ()

8/ Annual Equivalent Single Axle Load (ESAL) ranges from: (check one for each class type)

For Arterials	For Collectors	For Locals
< 10,000 ()	< 10,000 ()	< 5,000 ()
10,000 to 20,000 ()	10,000 to 20,000 ()	5,000 to 10,000 ()
20,000 to 50,000 ()	20,000 to 50,000 ()	10,000 to 20,000 ()
>50,000 ()	>50,000 ()	>30,000 ()

9/ Accident data is collected at: (Check all that apply)

- Major Intersections ()
- Arterial ()
- Collector ()
- Local ()
- Not collected ()
- Other (please specify)

.....

10/ Specify the average age of road infrastructure: (check one for each class type)

Arterial	Collector	Local	Others*
05 to 10 years ()	05 to 10 years ()	05 to 10 years ()	05 to 10 years ()
11 to 15 years ()	11 to 15 years ()	11 to 15 years ()	11 to 15 years ()
16 to 20 years ()	16 to 20 years ()	16 to 20 years ()	16 to 20 years ()
> 20 years ()	> 20 years ()	> 20 years ()	> 20 years ()

*Include footpaths, and parking lots

11/ Unit cost (in Canadian Dollars):

NEW CONSTRUCTION			MAINTENANCE & REHABILITATION		
<i>Classification</i>	<i>Cost</i>	<i>Year</i>	<i>Classification</i>	<i>Cost</i>	<i>Year</i>
Arterial			Arterial		
Collector			Collector		
Local			Local		
Others*			Others*		

*Include footpaths, and parking lots

12/ Current year's Budget (in Canadian Dollars):

NEW CONSTRUCTION		MAINTENANCE & REHABILITATION	
<i>Classification</i>	<i>Budget</i>	<i>Classification</i>	<i>Budget</i>
Arterials		Arterial	
Collectors		Collector	
Locals		Local	
Others*		Others*	

*Include footpaths, and parking lots

13/ Last year's Budget (in Canadian Dollars):

NEW CONSTRUCTION		MAINTENANCE & REHABILITATION	
<i>Classification</i>	<i>Budget</i>	<i>Classification</i>	<i>Budget</i>
Arterials		Arterials	
Collectors		Collectors	
Locals		Locals	
Others*		Others*	

*Include footpaths, and parking lots

14/ Data is stored and processed using: (check one)

- Computers
- Personal Computers ()
- Main Frame ()
- Others (please specify)

.....

.....

15/ Pavement Design is based on: (check all that apply)

- RTAC Guide 1977 ()
- Own Design Manual ()
- Standard Sections ()
- AASHTO ()
- Asphalt Institute ()

- Other (please specify)

.....

16/ Planning horizon ranges from: (check one)

- < 5 years ()
- 5 to 10 years ()
- > 10 years ()
- Other (please specify)

.....

17/ Implementation of projects, maintenance and repair work based on:

- Pavement Management Guidelines ()
- Other (please specify)

.....

18/ Maintenance and Rehabilitation treatment is carried by: (check all that apply)

- Agency/Base itself ()
- Contract ()
- Both ()
- % of work carried out by contractors
- % of work carried out by agency/base itself

19/ Life-cycle cost analysis is performed using: (check all that apply)

- All relevant cost components ()
- A subset of all relevant cost components ()

Please Specify

.....

- Present Value Method ()
- Equivalent Annual Cost Method ()
- Other Method (please specify)

.....

20/ Common referencing method used to identify pavement sections are: (check all that apply)

- Route-Mile Post ()
 - Node-Link ()
 - Branch-Section ()
 - Geographic Information Systems (GIS) ()
 - Other (please specify) ()
-
-

21/ Which indices are used for pavement condition surveys and evaluation: (check one)

- Riding Comfort Index (RCI) ()
- Structural Adequacy Index (SAI) ()
- Surface Distress Index (SDI) ()
- Pavement Condition Index (PCI) ()
- Pavement Quality Index (PQI) ()

22/ Following data are periodically collected: (check all that apply)

- Deflection Data ()
- Roughness Data ()
- Surface Distress Data ()
- Skid Data ()

23/ Frequency of data collected:

MEASUREMENT	FREQUENCY (YEARS)			
	<i>Arterials</i>	<i>Collectors</i>	<i>Locals</i>	<i>Others*</i>
Deflection				
Roughness				
Surface Distress				
Skid				

*Include footpaths, and parking lots

24/ Methods used for Structural Evaluation

a/ Destructive Testing: (if using more than one test procedure, please tick the appropriate boxes)

- Field California Bearing Ratio (CBR) ()
- Plate-Bearing Test ()
- Field Subgrade Modulus ()
- Other (please specify)

b/ Non-Destructive Testing: (if using more than one test procedure, please tick the appropriate boxes)

- Impulse Deflection (FWD) ()
- Steady-State Dynamic Deflection (Dynalect) ()
- Static Deflection (Benkelman Beam) ()
- Other (please specify)

.....

.....

25/ Methods used for Roughness Measurements are: (if using more than one method, please tick the appropriate boxes)

- Profile-Roughness Measuring System ()
- Vehicular-Response Measuring System ()
- Other (please specify)

.....

.....

26/ Main measurement devices for:

a/ Deflection: (if using more than one equipment, please tick the appropriate boxes)

- Dynaflect ()
- WES 16 Kip Vibrator ()
- Benkelman Beam ()
- Road Rater ()
- Falling Weight Deflectometer (FWD) ()
- Other (please specify)

.....

.....

b/ Roughness: (if using more than one equipment, please tick the appropriate boxes)

- Rod and Level ()
- TRRL Beam Static Profilometer ()
- K.J Law 690-DNC Profilometer ()
- South Dakota Profiler ()
- Siometer ()
- ARAN ()
- VTI Laser Road Surface Tester ()
- TRRL Laser Profilometer ()

- May's Ride Meter (MRM) ()
- Bureau of Public Roads Roughometer (BRR) ()
- TRRL Bump Integrator ()
- Other (please specify) ()

.....

.....

c/ Surface Distress

- Mechanical ()
- Visual ()

d/ Skid (if using more than one equipment, please tick the appropriate boxes)

- Trailer (ASTM E274) ()
- British Pendulum Device (ASTM E303) ()
- Mu-Meter (ASTM E670) ()
- SCRIM ()
- Other (please specify) ()

.....

.....

27/ Maintenance and Rehabilitation practices generally adopted for:

a/ Flexible Pavements (check all that apply)

Operation	Interval
Full-Depth Patching ()	
Crack Sealing ()	
Fog Seal ()	
Rejuvenators ()	
Slurry Seal ()	
Aggregate Surface Treatment ()	
Cold Milling ()	
Cold Recycling ()	
Hot Recycling ()	
Heater Scarifying ()	
AC Overlay ()	
PCC Overlay ()	

b/ Rigid Pavements (check all that apply)

Operation	Interval
Diamond Grinding ()	
Full-Depth Patching ()	
Partial-Depth Patching ()	
Crack Sealing ()	
Joint Sealing ()	
Slab Under-sealing Using Cement Grout ()	
Cold Milling ()	
Hot Mix and Saw Cut Patching ()	
AC Overlay ()	
PCC Overlay ()	

28/ Flexible overlays over flexible pavements are based on: (check one)

- Deflection ()
- Other (please specify)

.....

.....

29/ Drainage maintenance inspection interval is: (check one for each class type)

Arterial	Collector	Local	Others*
3 to 6 months ()	3 to 6 months ()	3 to 6 months ()	3 to 6 months ()
6 to 12 months ()	6 to 12 months ()	6 to 12 months ()	6 to 12 months ()
>12 months ()	>12 months ()	>12 months ()	>12 months ()
None ()	None ()	None ()	None ()

*Include footpaths, and parking lots

30/ What records do you keep relating to Pavement Construction History and Geometry: (check all that apply)

- Width of lanes ()
- Number of lanes ()
- Shoulder type and width ()
- Grade ()
- Curvature ()
- Curb dimensions (if any) ()
- Layer properties ()
- Others (please specify)

.....

.....

31/ Special issues considered while planning, designing, implementation or rehabilitation: (check all that apply)

- Strict environmental policies ()
- Use of waste products and recycling ()
- Implementation of Long Term Pavement Performance (LTPP), Canadian Strategic Highway Research Project (C-SHRP) ()
- Others (please specify)

.....

32/ Private partnership or privatization options considered:

- Yes ()
- No ()

33/ Pavement Management System (PMS) is practiced: (If 'yes', please answer Qs 34 to 36, if 'no', go to Qs 37)

- Yes ()
- No ()

34/ PMS is:

- Manual-Based ()
- Software-Based (if 'yes' please provide the name) ()

.....

- In-built ()
- Custom-made ()
- Others (please specify)

.....

35/ Please provide the cost functions (also mention in which year's \$ value) for the software-based PMS (if used):

- Software development/purchasing cost
- Actual operation of system including computer hardware, staff, and equipment
- Training cost
- Administration cost
- Indirect cost
- Miscellaneous cost

36/ Pavement Management System is practiced at: (check one)

- Network level only ()
- Project level only ()
- Both levels ()

37/ Priority treatment is practiced: (if 'yes', please answer Qs 38, if 'no', go to Qs 39)

- Yes ()
- No ()

38/ Priority treatment for road infrastructure is done by: (check all that apply)

- Cost-effectiveness ()
- Ranking ()
- Engineering judgement ()
- All of the above three factors ()
- Other (please specify)

.....

39/ Performance of pavement practiced using Prediction Models: (if 'yes', please answer Qs 40 to 41)

- Yes ()
- No ()

40/ Following indices used for Performance Prediction Models:

- RCI related ()
- PQI related ()
- PCI related ()
- Other (please specify)

41/ Procedures used for developing prediction models are:

- Regression ()
- Extrapolation ()
- Probability Distribution ()
- Computer software ()

Please indicate the name:

- Other (please specify)

.....

Thank you for your cooperation and assistance.

**APPENDIX B: SUBJECTIVE RATING TO SHOULDERS,
DRAINAGE AND CURBS [Stewart, 2000]**

TABLE B1: GUIDE FOR DESCRIBING SHOULDER TYPE AND CONDITION

Pavement and Treated

<i>Description</i>	<i>Condition</i>
☐ New or nearly new pavement or recently treated surface, very slight single cracks, solid bond at pavement edge and shoulder surface	Good
☐ Exhibiting some slight to moderate distresses or cracks, separation of bond at pavement edge and shoulder surface	Fair
☐ Alligatored surface, some break-off, any form of distortion distresses throughout.	Inadequate

Granular

<i>Description</i>	<i>Condition</i>
☐ Adequate slope and gravel cover from edge of pavement for one metre before vegetation begins, no drop-off.	Good
☐ Level granular cover of 0.6 metres from edge of pavement, isolated shoulder drop-off and some localised evidence of run-off erosion.	Fair
☐ Drop-off or excessive shoulder height, noticeable windrowing of granular, inverted shoulder crown or vegetation encroachment less than 0.6 metres from the edge.	Inadequate

Grass or Turf

<i>Description</i>	<i>Condition</i>
☐ Confirmed design indicates no shoulder, excellent grooming.	Good
☐ Less than perfect grooming, level crown.	Fair
☐ Tall vegetation, poor crown sloping towards pavement and vegetation growing in pavement edge cracks.	Inadequate

Table B2: GUIDE FOR DESCRIBING DRAINAGE SYSTEM

<i>Description</i>	<i>Condition</i>
<ul style="list-style-type: none"> ☐ Cross-section and drainage are in excellent condition ☐ Concealed storm drains in excellent repair ☐ Open ditching – no tall grass, weeds, free standing water, silt in the bottom layer, or obstructed culverts, etc. ☐ Urban – gutter is in excellent repair with sufficient catch basins; catch basin spacing < 90 metres with basins at intersecting streets ☐ Note: Gutters can be overlayed but they must still perform as drainage channels 	Excellent
<ul style="list-style-type: none"> ☐ Cross-section and drainage are adequate ☐ Concealed storm drains in good repair ☐ Open ditching – minor presence of weeds, and silt in the bottom layer, no free standing water ☐ Urban – gutter is in adequate repair with sufficient catch basins 	Good
<ul style="list-style-type: none"> ☐ If the height of gradeline, cross-section elements and/or culvert and/or ditch capacity is below the standard that would be provided if the road were rebuilt ☐ Roads with acceptable design characteristics, but poorly maintained ditching, requiring work to be brought up to an acceptable level. Work required should generally fall into a category that could be completed by gradual cleaning of ditches, grading of shoulder areas and minor culvert repair. ☐ Urban – minor gutter or catch basin repair required to bring up to standard such as leaf removal/sweeping gutter, cleaning manholes or catch basins. 	Fair
<ul style="list-style-type: none"> ☐ No or substandard ditching/gutters ☐ Free standing water in ditches, grass and other debris, requiring more than minor work to be brought up to an adequate standard ☐ Poor drainage condition that could block obstruct traffic movement ☐ Areas with lack of grade that could possibly flood ☐ Urban – gutters overlayed to a level where there is no defined drainage path ☐ Gutters in total state of deterioration ☐ Catch basins are in inadequate state of repair with obvious pavement deterioration and free standing water ☐ Water channels on driven portion of road ☐ Road or pavement surface drains onto adjacent occupied properties 	Inadequate

TABLE B3: GUIDE FOR DESCRIBING CURB TYPE AND CONDITION**Portland Cement Concrete (PCC)**

<i>Description</i>	<i>Condition</i>
☐ New or repaired curb, slightly spalled, cracked or distorted.	Good
☐ Cracking, spalling settling around catch basins, needs minor repairs.	Fair
☐ Badly cracked, spalled, and settled; disintegrating; pavement almost at top of curbs.	Inadequate

Asphalt Concrete Cement (ACC)

<i>Description</i>	<i>Condition</i>
☐ New asphalt, slight spalling or distortion.	Good
☐ Cracking, settling at catch basins; Loss of form shape, top portion of asphalt breaking off.	Fair
☐ A.C overlays at top of curb; badly distorted, broke.	Inadequate

APPENDIX C: PAVEMENT DISTRESS MANIFESTATIONS

(MTO, 1980; MTO (a), 1982; MTO (b), 1982; MTO (a), 1989; Shahin, 1994)

Table C1: Surface Defects: Description, Possible Causes, and Solution for Flexible Pavements
(Adapted from MTO (a), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Loss of Coarse Aggregate	Coarse aggregate particles (>6 mm) are removed from the surface.	Lack of bond b/w particles and mortar due to inadequate coating or to stripping under the action of water. Fracture of the particle through load or natural causes, allowing the loosened pieces to be picked out by traffic action. Disintegration of particles such as chert which are highly absorptive, fracture & disintegrate upon repeated freezing & thawing. Delamination of chert or shale particles.	Surface treatment or hotmix resurfacing for major to extreme conditions throughout. Spray patching for extreme but few or intermittent conditions.
Ravelling/Streaking	Progressive loss of pavement material from surface downward or edge inward. This is sometimes called Fretting.	Clay-coated aggregate particles. Insufficient asphalt content. Poor adhesion of asphalt binder to aggregate particles due to wet aggregate. Poor compaction. Asphalt hardening due to aging.	Spray patching of major to extreme localised condition. Hot-mix resurfacing of major to extreme extensive condition.
Flushing	The presence of free asphalt binder on the surface resulting from upward migration of the binder. Most likely to occur in the wheel tracks during hot weather.	High asphalt content relative to void content in mineral aggregate. On the hot days, asphalt binder expands into air voids; if air voids are too low, continued expansion results in lower stability of the mix with the consequence that traffic will force excess asphalt binder to the surface. Paving over flushed surfaces. The excess asphalt on the old surface may be pumped up through new paving over a period of time. Paving over excess primed surfaces.	
Potholes	Bowl-shaped holes of various sizes in the pavement resulting from localised disintegration.	Poor construction technique and quality control. Poor aggregates in pavements. Result of other defects (ravelling, cracking, etc.)	Spray patching of minor severity . Cold mix patching of major to extreme extensive condition with surface treatment.
Manholes and Catchbasins	Depressed or protruding manholes & catchbasins with or without cracks. Manholes represents more of a problem than catchbasins because in most cases they are on the travelled portion of the pavement surface.	Differential frost heave of the manholes or catchbasins. Differential settlement of the manholes or catchbasins. Traffic action.	When moderate severity with intermittent extent cold mill or excavate pavement around manhole or catchbasin and build up with bricks or concrete ring(s) if depressed or remove excess height if protruding.

Table C1: Guide for Surface Defects: Severity and Extent for Flexible Pavements
(Adapted from MTO, 1980)

(Cont'd)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines*	Class	Uniform Description	Guidelines**
Loss of Coarse Aggregate	1 Negligible		Barely noticeable.	1 Few		<10%
	2 Minor		Noticeable.	2 Intermittent		10-20%
	3 Moderate		Having pock-marked appearance; fairly well spaced b/w pock-marks.	3 Frequent		21-50%
				4 Extensive		51-80%
				5 Throughout		81-100%
	4 Major		Having pock-marked appearance; pock-marks are closed spaced.			
	5 Extreme		Surface has a ravelled appearance, and is disintegrated into small potholes.			
Ravelling/Streaking	1 Negligible		Barely noticeable.	1 Few		<10%
	2 Minor		Noticeable.	2 Intermittent		10-20%
	3 Moderate		Open texture.	3 Frequent		21-50%
	4 Major		Disintegration with small potholes.	4 Extensive		51-80%
	5 Extreme		Disintegration with large potholes.	5 Throughout		81-100%
Flushing	1 Negligible		Very faint colouring (veining)	1 Few		<10%
	2 Minor		Colouring visible (interconnected veining)	2 Intermittent		10-20%
	3 Moderate		Distinctive appearance (with excessive asphaltic material already free)	3 Frequent		21-50%
	4 Major		Free asphaltic materials giving the pavement surface area a wet look.	4 Extensive		51-80%
	5 Extreme		Free asphaltic materials giving the affected area a wet look and wheel noise comparable to that when driving over a water-wet surface.	5 Throughout		81-100%
Potholes	1 Negligible		<6 cm wide & shallow in depth.	1 Few		<10%
	2 Minor		6 to 8 cm wide	2 Intermittent		10-20%
	3 Moderate		9 to 30 cm wide & usually more than 5 cm deep.	3 Frequent		21-50%
	4 Major		31 to 40 cm wide & 10 to 12 cm deep	4 Extensive		51-80%
	5 Extreme		>40 cm wide & >12 cm deep.	5 Throughout		81-100%
Manholes & Catchbasins	1 Negligible		Bump or drop < 10 mm.	1 Few		<10%
	2 Minor		Noticeable bump or drop when vehicle in motion, bump or drop b/w 11 to 15mm; with or without cracks.	2 Intermittent		10-20%
				3 Frequent		21-50%
	3 Moderate		Bump or drop b/w 16 to 25 mm.	4 Extensive		51-80%
	4 Major		Harsh bump or drop, b/w 26 to 35mm; with or without cracks	5 Throughout		81-100%
	5 Extreme		Hard bump, >35mm.			

* Guidelines for severity is based on observation of appearance.

** Guidelines for extent is based on percent of surface area in the pavement section being affected by defect.

Table C2: Pavement Distortion (Permanent Deformation): Description, Possible Causes, and Solution for Flexible Pavements (Adapted from MTO (a), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Rippling/Shoving	Regular transverse undulations in the surface of the pavement consisting of closely-spaced, alternate valleys and crests. (plastic movement often termed as washboarding) The asphalt surfacing is very uneven as a result of traffic moving it away from the wheel tracks, or forward or backwards in the wheel track.	Faulty paver behaviour with some mixes/ Low. stability in asphalt mix. Heavy traffic on steep downgrade or up-grade, or pavement with too thick tack coat or too thick soft waterproofing membranes on bridge decks. Stopping at intersection stop lights or stop signs. Lack of bond between asphalt surface and underlying layer. Unstable granular base reflecting through the surface.	Cold planing of extreme condition with hot-mix resurfacing. Cold planing, heater planing or cold/hot-mix patching of major localised condition.
Wheel Track Rutting	These are channelised depressions which may develop in the wheel tracks of an asphalt pavement after repeated load repetitions.	Poorly compacted structural layers. Unstable granular bases or subbases created by positive pore water pressure under loads at times of near saturation. Unstable asphalt mixes (due to high temperature or low viscosity of binder). Unstable shoulder material; does not provide adequate lateral support. Overstressed subgrade will deform permanently.	Cold or hot-mix patching of major localised condition. Padding and hot-mix resurfacing for extreme condition.
Distortion	Any deviation of the pavement surface from its original shape other than described for rippling, shoving, and rutting. Distortion may take the form of dishing, bumps, dips, tenting or stepping at cracks, all of which give rise to pitch and roll in a moving vehicle.	Differential frost heave in poorly-drained cuts and transitions. Differential frost heave at pavement edges or road centre. Reverse differential frost heave at culverts. Differential settlement of subgrade or base materials. Lack of subgrade support. Embankment slope failure.	Cold or hot-mix patching of major localised condition. Excavation and removal of unsuitable materials and hot-mix patching for extreme localised condition. Hot-mix patching with hot-mix resurfacing for extreme condition.
Utility Trenches	Utility cuts are not a pavement distress manifestation but they are a very important factor in overall pavement performance. The deviations of pavement surface results from excavation of trenches for utilities. The deformation may take the form of bumps, dips, potholes and breakup, all of which give rise to pitch, roll and jarring drop in a moving vehicle.	Differential frost heave in poorly drained trenches. Poor compaction of backfill resulting in settlement of trenches. Differential settlement of subgrade or base materials in trenches. Excess backfill and patching materials for trenches resulting in bump. Lack of subgrade support. Poor patching material for trenches & improper work procedures for trench backfill & patch. Traffic action.	Patching under moderate severity and intermittent extent. Cold milling or hot planing with patching under major to extreme severity & extensive to throughout extent. Section should be considered for rehabilitation under extreme severity and distress present throughout the section length.

Table C2: Guide for Pavement Distortion (Permanent Deformation): Severity and Extent for Flexible Pavements (Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines	Class	Uniform Description	Guidelines
*Rippling/Shoving	1	Negligible	Barely noticeable.	1	Few	<10%
	2	Minor	Noticeable.	2	Intermittent	10-20%
	3	Moderate	Rough ride.	3	Frequent	21-50%
	4	Major	Very rough ride.	4	Extensive	51-80%
	5	Extreme	Vehicle may lose control because of its presence.	5	Throughout	81-100%
**Wheel Track Rutting	1	Negligible	Barely noticeable (<6 mm).	1	Few	<10%
	2	Minor	6 mm to 13 mm.	2	Intermittent	10-20%
	3	Moderate	14 mm to 19 mm (may include slight longitudinal cracks).	3	Frequent	21-50%
	4	Major	20 mm to 50 mm (may include multiple longitudinal cracks).	4	Extensive	51-80%
	5	Extreme	<50 mm (may include multiple longitudinal cracks or alligator cracks).	5	Throughout	81-100%
***Distortion	1	Negligible	Noticeable (swaying motion).	1	Few	<10%
	2	Minor	Good control of car still present for driver of vehicle.	2	Intermittent	10-20%
	3	Moderate	Fair control of car when driving over pavement.	3	Frequent	21-50%
	4	Major	Poor car control when driving over pavement with driver always having to anticipate distortion ahead.	4	Extensive	51-80%
	5	Extreme	Continuous distortion making it a dangerous situation if driving car at speed > 60kph.	5	Throughout	81-100%
Utility Trenches	1	Negligible	Rise or depression of <10 mm with or without cracking	1	Few	<10%
	2	Minor	Jarring drop or bump of vehicle in motion barely noticeable, rise or depression b/w 11 to 15 mm.	2	Intermittent	10-20%
	3	Moderate	Rise or depression b/w 16 to 25 mm with or without cracks.	3	Frequent	21-50%
	4	Major	Harsh jarring drop or bump of vehicle in motion, rise or depression b/w 26 to 35 mm with multiple or alligator cracks.	4	Extensive	51-80%
	5	Extreme	Hard jarring drop or bump of vehicle while in motion. Rise or depression >35 mm. Multiple & alligator cracks with potholes.	5	Throughout	81-100%

* Guidelines for describing severity and extent are based on observation of appearance

** Guidelines for describing severity are based on appearance and rut-depth measured with a standard 1.2 m gauge;
Guidelines for describing extent are based on percent of total wheel-track length in pavement section affected by defect.

*** Guidelines for describing severity are based on personal experience of the interaction between vehicle and pavement surface distortion; Guidelines for extent are based on percent of pavement length in section affected by defect.

Table C3: Cracking: Description, Possible Causes, and Solution for Flexible Pavements
(Adapted from MTO (a), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Longitudinal Wheel Track Crack	Cracks which follows a course approximately parallel to the centre line of the pavement and are situated at or near the centre of the wheel tracks.	Due to overloaded vehicles at the wettest pavement period in the early spring. Single: one continuous crack over a considerable length. Multiple: two or more cracks closely spaced and parallel to each other. Alligator: two or more cracks closely spaced and interwoven with each other giving the appearance of loosely-braided strands of rope or of alligator skin.	1. Rout and seal with approved sealant when single, minor, and major cracks appear. 2. Cold or hot-mix patching for alligator condition.
Longitudinal Mid Lane Crack	Crack which is usually straight and parallel to the centre line situated at or near the middle of lane. This is usually single crack, but secondary cracks do develop parallel to it.	Faulty construction equipment appears to result in weak plane which then fails due to thermal shrinkage.	1. Rout and seal with approved sealant when minor to extreme. 2. Hot or cold-mix patching if major and of localised condition.
Centre Lane Crack	Crack which runs along or in the immediately adjacent vicinity of the road centre line.	1. Poor longitudinal joint construction. 2. Variable granular depths due to constructing lanes separately; differential frost heave along centre line due to insulating value of snow along pavement edges. 3. Moisture changes (swelling / shrinkage)	<i>Same as for Longitudinal Mid-Lane Crack</i>
Meandering Crack	Crack which wanders from edge to edge of the pavement, usually of quite long lengths. Mostly single, but secondary cracks do develop.	1. Greater heave at pavement centre than at edges. More prevalent in mixes where asphalt stripping is extensive. 2. Poor construction practises	<i>Same as for Longitudinal Mid-Lane Crack</i>
Pavement Edge Crack	Crack which is parallel to and within 30 cm of the pavement edge and is either fairly straight or crescent shaped in a wave formation.	1. Insufficient bearing support and/or excessive traffic loading at the pavement edge. 2. Poor drainage at pavement edge & shoulder. 3. Inadequate pavement width forces traffic too close to pavement edge.	1. Improve shoulder drainage or seal shoulder from water. 2. Spray patching of minor to moderate condition. 3. Cold-mix patching of minor to major condition. 4. Hot-mix patching of major to extreme condition.

Table C3: Guide for Cracking: Severity and Extent for Flexible Pavements
(Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines	Class	Uniform Description	Guidelines
**Longitudinal Wheel Track Crack	1	Negligible	≤ 2 mm (≤ 1/16").	1	Few	<10%
	2	Minor	6 mm to 13 mm (1/4" to 1/2").	2	Intermittent	10-20%
	3	Moderate	14 mm to 19mm (1/2" to 3/4") (single or multiple longitudinal cracks).	3	Frequent	21-50%
	4	Major	20 mm to 25 mm (3/4" to 1") (with spalling beginning to develop).	4	Extensive	51-80%
	5	Extreme	Multiple parallel longitudinal cracks also begin to develop alongside the original crack in very slight (2 mm) to slight 6 mm crack width. >25 mm (> 1") (with spalling developed). Slight to moderate multiple parallel longitudinal cracks also developed alongside the original crack may even begin to alligator.	5	Throughout	81-100%
**Longitudinal Mid Lane Crack			Same as mentioned for Longitudinal Wheel-Track Crack			
**Centre Lane Crack			Same as mentioned for Longitudinal Wheel-Track Crack			
**Meandering Crack			Same as mentioned for Longitudinal Wheel-Track Crack			
*Pavement Edge Crack	1	Negligible	Single longitudinal formation or single wave formation.	1	Few	<10%
	2	Minor	Multiple parallel longitudinal formation or wave formation under 0.6 m from pavement edge.	2	Intermittent	10-20%
	3	Moderate	Progressive multiple cracks extended over 0.6m but under 1m from pavement edge. Cracks begin to braid (interweave).	3	Frequent	21-50%
	4	Major	Progressive multiple cracks extended over 1 m but under 2.5 m from pavement edge. Outermost area near edge begins to alligator.	4	Extensive	51-80%
	5	Extreme	Progressive multiple cracks extended over 1.5 m from pavement edge. Outermost area near edge is alligatored; mid portion and innermost portion show multiple cracking (or alligatoring).	5	Throughout	81-100%

Table C3: Cracking: Description, Possible Causes, and Solution for Flexible Pavements
(Adapted from MTO (a), 1982)

(Cont'd.)

Defect	Description	Possible Causes	Possible Remedial Solution
Transverse Crack	Cracks which follows a course approximately at right angles to the centre line. Full transverse cracks tend to be regularly spaced along the length of the road, while half transverse and part transverse occur at shorter intermediate distances.	<ol style="list-style-type: none"> 1. Natural shrinkage caused by very low temperatures. 2. High temperature susceptibility of asphalt cement binder in asphalt mixes. 3. Frost action. 4. Reflection cracks. 	<ol style="list-style-type: none"> 1. Rout and seal if minor to extreme. 2. Cold or hot-mix patching if alligator in localised condition.
Alligator Crack	Cracks which form a network of multi-sided (polygon) blocks resembling the skin of an alligator. The block size can range from a few millimeters to about a meter. The block size indicates the level (depth) at which failure is taking place.	<ol style="list-style-type: none"> 1. Insufficient bearing support. 2. Poor base drainage and stiff or brittle asphalt mixes at cold temperatures. 	<ol style="list-style-type: none"> 1. Cold or hot-mix patching of major and localised condition. 2. Excavation and recycled hot-mix patching of major and localised condition. 3. Excavate to granular grade and replaced with hot-mix resurfacing for major and localised condition. 4. Reconstruction, if major to extreme.
Map Crack	Interconnected cracks forming a series of large polygon blocks appears to combine transverse and longitudinal cracks together to form a "map". This is also referred to as "random cracking".	<ol style="list-style-type: none"> 1. Swelling or shrinkage. 2. Frost action 3. Hardening and shrinkage of the asphalt due to age. 	<ol style="list-style-type: none"> 1. Chip seal 2. Hot or cold mix patching 3. Reconstruction (extreme severity)

Table C3: Guide for Cracking: Severity and Extent for Flexible Pavements
(Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines	Class	Uniform Description	Guidelines
***Transverse Crack	1	Negligible	2 mm (partial and singular).	1	Few	<10%
	2	Minor	6 mm to 13 mm (full and singular).	2	Intermittent	10-20%
	3	Moderate	13 mm to 19 mm (multiple cracking begins to develop).	3	Frequent	21-50%
	4	Major	19 mm to 25 mm (with spalling, stepping or lipping beginning to develop in singular or multiple cracks).	4	Extensive	51-80%
	5	Extreme	>25 mm (with spalling, stepping or lipping in multiple cracks which are beginning to develop into alligator cracking).	5	Throughout	81-100%
(The characteristics of the transverse crack along with the severity must also be described in terms of of spacing between the cracks, for e.g., "minor transverse cracks spaced 3 m apart.")						
**** Alligator Crack	1	Negligible	Alligator pattern just formed; distortion < 12 mm.	1	Few	<10%
	2	Minor	Alligator pattern established with corners of polygon blocks fracturing; distortion $\geq$ 13 mm.	2	Intermittent	10-20%
	3	Moderate	Alligator pattern established with spalling of polygon blocks; distortion $\geq$ 13 mm	3	Frequent	21-50%
	4	Major	Polygon blocks begin to lift; distortion $\geq$ 25 mm. Patching required.	4	Extensive	51-80%
	5	Extreme	Complete disintegration of affected area; pot-holes from missing blocks; distortion $\geq$ 50 mm. Immediate repair required.	5	Throughout	81-100%
(The characteristics of the alligator crack must also be described in terms of blocksize, for e.g., "moderate alligator cracking with block size apporximately 150 mm overall.")						
**Map Crack			Same as mentioned for Longitudinal Wheel-Track Crack			

* The guide used for describing progressive edge cracking is based on multiplicity and stage of development. For pavement edge cracking which does not progress any further than 300 mm from the pavement edge, severity description should be the same as for Longitudinal Wheel-Track Crack.

** Guidelines for describing severity are based on crack width and its condition, for extent, guidelines are based on percent of total length in the pavement section affected by the defect.

*** Guidelines for describing severity are based on crack width, condition and multiplicity; Guidelines for describing extent are based on percent of total pavement surface area in the pavement section affected by defect.

**** Guidelines for describing severity are based on appearance and surface distortion; Guidelines for describing extent are based on percent of surface area of pavement section affected by defect.

Table C4: Surface Defects: Description, Possible Causes, and Solution for Rigid Pavements
(Adapted from MTO (b), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Polishing	Polished appearance of pavement surface due to glazing of coarse aggregate particles in mix.	Wear resistance of coarse aggregate particles greater than mortar, thus exposing them to glazing action of traffic. If highly polished, poor skid resistance may result.	Thin hot-mix resurfacing or transverse grooving in case of extreme polishing. Others which may perform equally well are surface treatment, and hot or cold planing.
Loss of Coarse Aggregate	Coarse aggregate particles (> 6 mm) are removed from the surface.	<ol style="list-style-type: none"> 1. Lack of bond between particles and mortar due to inadequate coating. 2. Too coarse a mix and/or improper proportioning due to poor construction design, and/or procedures. 3. Fracture of the particle through load or natural causes, allowing the loosened pieces to be picked out by traffic action. 4. Disintegration of particles such as chert or shale which are highly absorptive & fracture and disintegrate upon repeated freezing and thawing. 	Hot-mix resurfacing for extreme case, or linseed oil treatment, and cement wash method.
Potholes	Holes in pavement surface unrelated to cracking or other surface defects.	<ol style="list-style-type: none"> 1. Disintegration from action of traffic combined with environmental conditions and improper mix design and proportioning. 2. Oversize particles of soft aggregate or clay, or other soft foreign materials. 3. Reinforcing steel too close to the surface. 	Cold-mix maintenance patch; hot-mix patch.
Scaling	Peeling away of the concrete pavement surface; may occur anywhere over the pavement surface.	<ol style="list-style-type: none"> 1. Effect of freeze-thaw and/or de-icing chemicals on non-air-entrained concrete. 2. Laitance on surface due to excessively wet mixes. 3. Frost action on concrete not fully cured or weak. 4. Weakened surface caused by over-finishing. 	Thin hot-mix or cold-mix patching.
Ravelling	Loss of fine aggregate from matrix. Ravelling is continuous over the pavement surface affected whereas scaling is spotty.	<ol style="list-style-type: none"> 1. Poor quality fine of aggregates. 2. Lack of bond between mortar and coarse aggregates. 3. Effect of freeze-thaw and/or de-icing chemicals on non-air-entrained concrete. 4. Frost action on concrete not fully cured or weak. 5. Traffic action of special nature such as studded tires. 	Surface treatment or thin asphalt resurfacing or asphalt patching.

Table C4: Guide for Surface Defects: Severity and Extent for Rigid Pavements
(Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines*	Class	Uniform Description	Guidelines**
Polishing	1	Negligible	Barely noticeable.	1	Few	<10%
	2	Minor	Noticeable.	2	Intermittent	10-20%
	3	Moderate	Distinctive appearance. (dull finish)	3	Frequent	21-50%
	4	Major	Glossy mirror finished surface.	4	Extensive	51-80%
	5	Extreme	Surface has a highly polished appearance.	5	Throughout	81-100%
Loss of Coarse Aggregate	1	Negligible	Barely noticeable	1	Few	<10%
	2	Minor	Noticeable.	2	Intermittent	10-20%
	3	Moderate	Having pock-marked appearance; fairly well spaced between pock-marks.	3	Frequent	21-50%
	4	Major	Having pock-marked appearance; pock-marks are closely spaced.	4	Extensive	51-80%
	5	Extreme	Surface has a ravelled appearance.	5	Throughout	81-100%
Potholes	1	Negligible	Barely noticeable (pop-out of coarse aggregate).	1	Few	<10%
	2	Minor	Disintegration of the surrounding material.	2	Intermittent	10-20%
	3	Moderate	Size of hole much larger than pop-out of coarse aggregate & also deeper.	3	Frequent	21-50%
	4	Major	Pothole over 15 cm deep and 15 cm of diameter.	4	Extensive	51-80%
	5	Extreme	Interfere with ridability.	5	Throughout	81-100%
Scaling	1	Negligible	Barely noticeable	1	Few	<10%
	2	Minor	Noticeable.	2	Intermittent	10-20%
	3	Moderate	Open texture	3	Frequent	21-50%
	4	Major	Disintegration in shallow patches closely spaced.	4	Extensive	51-80%
	5	Extreme	Disintegration in shallow patches covering the whole surface area.	5	Throughout	81-100%
Ravelling	1	Negligible	Barely noticeable	1	Few	<10%
	2	Minor	Noticeable.	2	Intermittent	10-20%
	3	Moderate	Open texture	3	Frequent	21-50%
	4	Major	Disintegration appearance with shallow small potholes.	4	Extensive	51-80%
	5	Extreme	Disintegration appearance with shallow large potholes.	5	Throughout	81-100%

* Guidelines for severity is based on observation of appearance.

** Guidelines for extent is based on percent of surface area in the pavement section being affected by defect.

Table C5: Surface Deformation: Description, Possible Causes, and Solution for Rigid Pavements
(Adapted from MTO (b), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Faulting (Stepping)	Differential vertical displacement of abutting slabs at joints or cracks creating a 'step' deformation in the pavement surface. Usually the 'upstream' slab is higher than the 'downstream' slab.	<ol style="list-style-type: none"> 1. Pumping of concrete pavement slab. 2. Lack of subgrade support. 3. Under compressive stresses, the upstream slab shatters at the bottom of the slab and rides over the downstream slab. 4. Expansion of freezing water which accumulated under the slab through capillary activity, or from surface water seeping into base and subgrade through joints or cracks, additionally, due to differential frost heave in poorly-drained cuts and transitions. 	Mud-jacking to restore slab support; multiple layers or hot-mix resurfacing; joint and crack sealing; base drainage by perforated pipe under pavement edge.
Settlement (Sagging)	Longitudinal deviation of the pavement surface from its original construction profile. The change in elevation is generally in the order of > 2.5 cm with a wave-length of more than 3 m.	<ol style="list-style-type: none"> 1. Poorly compacted base or subgrade and/or structure backfill. 2. Differential settlement of subgrade or base materials. 3. Lack of subgrade support. 	Hot-mix padding to eliminate deformation, and hot-mix resurfacing.

Table C5: Guide for Surface Deformation: Severity and Extent for Rigid Pavements
(Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines	Class	Uniform Description	Guidelines*
**Faulting (Stepping)	1	Negligible	Barely noticeable (< 3 mm).	1	Few	<10%
	2	Minor	3 mm to 6 mm.	2	Intermittent	10-20%
	3	Moderate	7 mm to 13 mm.	3	Frequent	21-50%
	4	Major	14 mm to 19 mm.	4	Extensive	51-80%
	5	Extreme	> 19 mm.	5	Throughout	81-100%
***Settlement (Sagging)	1	Negligible	Noticeable (swaying motion)	1	Few	<10%
	2	Minor	Good control of the car still present for driver of vehicle.	2	Intermittent	10-20%
	3	Moderate	Fair control of car when driving over pavement.	3	Frequent	21-50%
	4	Major	Poor car control when driving over pavement with driver always have to anticipate settlement (distortion) ahead.	4	Extensive	51-80%
	5	Extreme	Continuous settlement (distortion) making it a dangerous situation if driving car at speed greater than 60 kph.	5	Throughout	81-100%

* Guidelines for describing extent are based on percent of pavement length in section affected by defect.

** Guidelines for describing severity are based on appearance and height of fault.

*** Guidelines for describing severity are based on personal ride quality experience of the interaction between vehicle and pavement surface distortion.

Table C6: Joint Deficiencies: Description, Possible Causes, and Solution for Rigid Pavements
(Adapted from MTO (b), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Joint Creeping	It's noticeable at transverse joints where one lane's joint moves ahead (or behind) the one in the adjacent lane from its original alignment straight across both lanes.	<ol style="list-style-type: none"> 1. Concrete slab alternately curls and wraps due to temperature and moisture differentials within the slab. This motion, combined with the horizontal thrust of traffic, causes creep between two adjacent lanes, and the differential movement occurs. 2. The above describe situation may be aggravated by gravitational force at steep grade. 	None
Joint Sealant Loss	Transverse or longitudinal joint sealant being squeezed or pulled out of the joint.	<ol style="list-style-type: none"> 1. Pulled out of an open joint by traffic action. 2. Expulsion of sealant due to compressive forces closing the joint too tightly. 3. Deterioration of sealant material. 	Clean joint, fill with approved hot-pour joint sealant.
Joint Failures	Excessive breakdown of slab adjacent to joint such that patching is required to maintain or restore rideability.	<ol style="list-style-type: none"> 1. High deflections of slab edges at joints under dynamic loads initiating spalls which progress into secondary spalls and then into joint failure. High deflections result from poor slab support and from loss of material supporting the slab by pumping. 2. High compressive stresses resulting from creeping slabs, restrained joints, and frozen dowels can result in pavements blow-up or shattering of the concrete near the joint. 3. Combination of both possible causes. 	Removal of failed area, full depth or partial depth, and replacement with fresh concrete slab or asphalt concrete patch.

Table C6: Guide for Joint Deficiencies: Severity and Extent for Rigid Pavements
(Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines*	Class	Uniform Description	Guidelines**
Joint Creeping	1	Negligible	Joints barely out of line.	1	Few	<10%
	2	Minor	Noticeably out of line.	2	Intermittent	10-20%
	3	Moderate	19 mm out of line.	3	Frequent	21-50%
	4	Major	25 mm out of line.	4	Extensive	51-80%
	5	Extreme	50 mm out of line.	5	Throughout	81-100%
Joint Sealant Loss	1	Negligible	Barely pop-out or breaking.	1	Few	<10%
	2	Minor	Sealant broken and begins to pull out.	2	Intermittent	10-20%
	3	Moderate	Sealant broken and pulled out up to 50% of its length.	3	Frequent	21-50%
	4	Major	Sealant broken and pulled out up to 80% of its length.	4	Extensive	51-80%
	5	Extreme	Sealant completely broken and pulled out more than	5	Throughout	81-100%
Joint Failures	All joint failures are major to extreme in severity because it presents a very distressing visual effect, very rough ride and is inherently dangerous to the travelling public.			1	Few	<10%
				2	Intermittent	10-20%
				3	Frequent	21-50%
				4	Extensive	51-80%
				5	Throughout	81-100%

* Guidelines for severity is based on observation of appearance.

** Guidelines for extent is based on percent of surface area in the pavement section being affected by defect.

Table C7: Cracking: Description, Possible Causes, and Solution for Rigid Pavements
(Adapted from MTO (b), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Longitudinal Crack	Cracks which follow a course approximately parallel to the centre line of the pavement and are generally quite straight.	<ol style="list-style-type: none"> 1. Lateral contraction, bending or curling. 2. Fill settlement downwards and/or outward. 3. Insufficient bearing support. 4. Poor construction paving procedure. 	Clean crack of debris and seal with asphalt if crack is moderate. If crack is spalled and broken with loose pieces, repairs might consist of sawing and removing the slab, partial or full depth, and filling with rapid-setting concrete mix or hot-mix asphalt.
Mandering Crack	Cracks which wander like a serpent across the traffic lane and generally occurs at a transverse joint.	<ol style="list-style-type: none"> 1. Expansion and contraction of the concrete due to thermal changes with poorly performing transverse joints. 2. Pumping through an adjacent transverse joint which created a void and subsequent traffic loading induces failure. 3. Lack of bearing support due to subgrade mass movement. 4. Improper construction procedures such as late sawing of joints. 	Clean crack of debris and seal or patch with asphaltic materials.
Corner Crack	Diagonal cracks forming a triangle with a longitudinal edge or joint, and a transverse joint or crack. The size of the triangle is about 30 cm and, no larger than 60 cm.	<ol style="list-style-type: none"> 1. Insufficient bearing support. 2. Excessive compressive stresses. 	<i>Same as Mandering Crack</i>
"D" Crack	A series of closely-spaced, fine, crescent-shaped cracks in the concrete surface usually parallel to a joint or crack and curving across slab corners. They are very similar in appearance to corner cracks. However, "D" cracks has concave crescent in relation to slab corners or joints while corner crack's crescent is convex to the slab corners or pavement edge.	Distress is initiated through freeze-thaw activity in critically saturated coarse aggregate particles located in the lower level of pavement slabs.	<i>Same as Mandering Crack</i>
Transverse Crack	Crack which follows a course approximately at right angles to the pavement centre line.	<ol style="list-style-type: none"> 1. Thermal expansion or contraction. 2. Overlong joint spacing. 3. Insufficient bearing support. 4. Swelling or shrinkage of subsoils. 5. Poor aggregates in concrete mix. 6. Poor joint performance due to improper construction. 	Clean crack of debris or route and seal or patch with asphaltic materials.
Diagonal Crack	Crack which follows a course approximately diagonal to the centre line.	<ol style="list-style-type: none"> 1. Concrete shrinkage. 2. Lack of bearing support. 	<i>Same as Transverse Crack</i>
Edge Crescent Crack	Arc crack extending from transverse joint or transverse crack to the pavement edge generally 0.5 m to 1 m inward from pavement edge and covering an area of 5 m to 6 m from end to end.	<ol style="list-style-type: none"> 1. Poor transverse joint performance. 2. Lack of bearing support due to pumping action of pavement slab. 	<i>Same as Mandering Crack</i>
Reflection Crack	Crack which reflects through the hot-mix asphalt patching or resurfacing.	Stresses which caused the original failure oversteering the new surface at the same location.	<i>Same as Mandering Crack</i>

Table C7: Guide for Cracking: Severity and Extent for Rigid Pavements
(Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines	Class	Uniform Description	Guidelines
*Longitudinal Crack	1	Negligible	< 3 mm.	1	Few	<10%
	2	Minor	3 mm to 13 mm.	2	Intermittent	10-20%
	3	Moderate	14 mm to 19 mm.	3	Frequent	21-50%
	4	Major	20 mm to 25 mm (with spalling and faulting developed).	4	Extensive	51-80%
	5	Extreme	>25 mm (with spalling and faulting developed).	5	Throughout	81-100%
*Mandering Crack			<i>Same as mentioned for Longitudinal Crack</i>			
**Corner Crack			<i>Same as mentioned for Longitudinal Crack</i>			
***"D" Crack			<i>Same as mentioned for Longitudinal Crack</i>			
***Transverse Crack	1	Negligible	< 3 mm (partial or singular).	1	Few	<10%
	2	Minor	3 mm to 13 mm (full and singular with very slight spalling and faulting).	2	Intermittent	10-20%
	3	Moderate	14 mm to 19 mm (singular or multiple with slight spalling and faulting).	3	Frequent	21-50%
	4	Major	20 mm to 25 mm (with spalling, faulting in singular or multiple cracks).	4	Extensive	51-80%
	5	Extreme	>25 mm (with spalling, faulting, and debris trapped between in singular or multiple cracks).	5	Throughout	81-100%
(The characteristics of the transverse crack along with the severity must also be described in terms of of spacing between the cracks, for e.g., "minor transverse cracks spaced 3 m apart.")						
**Diagonal Crack			<i>Same as mentioned for Longitudinal Crack</i>			
**Edge Crescent Crack			<i>Same as mentioned for Longitudinal Crack</i>			
** Reflection Crack			<i>Same as mentioned for Longitudinal Crack</i>			

* Guidelines for describing severity are based on crack width and its condition; guidelines for describing extent are based on percent of total length in the pavement section affected by defect.

** Guidelines for describing severity are based on crack width and its condition; guidelines for describing extent are based on percent of total pavement surface area in the pavement section affected by defect.

***Guidelines for describing severity are based on crack width, condition and multiplicity; guidelines for describing extent are based on percent of total pavement surface area in the pavement section affected by defect.

Table C8: Spalling: Description, Possible Causes, and Solution for Rigid Pavements
(Adapted from MTO (b), 1982)

Defect	Description	Possible Causes	Possible Remedial Solution
Joint Spalling	The breaking or chipping of the pavement at joints usually resulting in fragments with feathered edges.	<ol style="list-style-type: none"> 1. Expansive internal pressure due to corrosion of rebar or dowels. 2. Infiltration of debris preventing movement of slabs due to thermal expansion creating excessive compressive stresses. 3. Seized dowel bars combined with thermal expansion. 4. Misalignment of dowel bars and base movement. 	Clean joint of debris; patch over with cold-mix or hot-mix asphalt. For more lasting result, saw cut and hot-mix patching is highly recommended.
Crack Spalling	The chipping or breaking away of fragments along the crack edges usually resulting in pot-holes.	<ol style="list-style-type: none"> 1. Expansive internal pressure which causes the original cracks. 2. Infiltration of debris into crack preventing movement of slab due to thermal expansion creating excessive compressive stresses. 3. Combined traffic action. 	Clean crack of debris; patch over with cold-mix or hot-mix asphalt. For more lasting result, saw cut and hot-mix patching is highly recommended.
(Spalling of concrete edges is generally due to excessive pressure locally, resulting from combination of traffic, expansion, warping, and curbing; spalling is progressive).			

Table C8: Guide for Spalling: Severity and Extent for Rigid Pavements
(Adapted from MTO, 1980)

(Cont'd.)

Defect	Severity			Extent		
	Class	Uniform Description	Guidelines	Class	Uniform Description	Guidelines
*Joint Spalling	1	Negligible	Small crack(s) with very small fractures.	1	Few	<10%
	2	Minor	Small crack(s) with small pieces, broken or disappeared.	2	Intermittent	10-20%
	3	Moderate	Cracked with fractures but no actual large missing pieces.	3	Frequent	21-50%
	4	Major	Large pieces actually missing and at wheel paths.	4	Extensive	51-80%
	5	Extreme	Large pieces actually missing across joint.	5	Throughout	81-100%
** Crack Spalling	1	Negligible	Small crack(s) with very small fractures in the spalled area.	1	Few	<10%
	2	Minor	Small crack(s) with few small pieces missing from the fractured area.	2	Intermittent	10-20%
	3	Moderate	Many small pieces missing from fractured area.	3	Frequent	21-50%
	4	Major	Large pieces missing from the fractured area.	4	Extensive	51-80%
	5	Extreme	Large potholes form at places along the crack.	5	Throughout	81-100%

* Guidelines for describing severity are based on width, length, and depth of spalling; guidelines for describing extent are based on percent of pavement length in section affected by defect.

** Guidelines for describing severity are based on appearance of spalling; guidelines for describing extent are based on percent of pavement length in section affected by defect.

**APPENDIX D: TYPICAL TREATMENT ALTERNATIVE MATRIX
FOR FLEXIBLE PAVEMENTS WITH UNIT COST (\$/m²) AND
EXPECTED LIFE (Years)**

Table D1: Unit Cost and Expected Life for Various Treatment Alternative (Flexible Pavement)

Treatment Alternative (TA)	TA Code	Unit Cost (\$/sq.m)	Expected Life (year)	
Do Nothing	0	0.00	0.00	
Spray patching	1	2.20	1.00	
Rout & crack seal	2	2.50	2.00	
Chip seal (fine)	3	3.50	5.00	
Chip seal (course)	4	3.25	5.00	
Slurry seal	5	2.75	5.00	
Fog seal	6	0.80	3.00	
Cold mix patching	7	2.35	1.00	
Hot mix patching	8	2.85	4.00	
Improve drainage	9	40.00	5.00	per lm 70.00 Storm Sewer per lm
Cold mill + fix catch basin	10	105.00	6.00	per catchbasin/manhole
Rout & crack seal + hot mix patch	11	5.35	5.00	
Rout & crack seal + cold mix patch	12	4.85	3.00	
Clean & seal + hot mix patch	13	4.85	4.00	
Clean & seal + cold mix patch	14	4.35	2.00	
Fix catchbasin/manhole	15	100.00	5.00	per catchbasin/manhole
Cold mill with hot mix patch	16	5.25	6.00	
Surface treatment	17	6.75	7.00	
Improve drainage + hot mix patch	18	4.25	5.00	
AC Overlay + milling	19	9.00	10.00	
Reconstruction	20	12.75	20.00	

Note: For unit cost, consult the local contractors. The life span of any treatment varies with material quality, construction practices, traffic and environment.

References: MTO, 1980, MTO (a), 1989, and Hicks, 1998

Table D1-A: Yearly Maintenance Cost

Treatment Alternatives	Type	Yearly Maintenance Cost
Slurry seal	Preventive	10% of its calculated EAC
Fog seal	Preventive	20% of its calculated EAC
Improve drainage	Preventive	5% of its calculated EAC
Cold mill + fix catchbasin	Preventive	10% of its calculated EAC
Rout & crack seal + hot mix patching	Preventive	10% of its calculated EAC
Rout & crack seal + cold mix patching	Preventive	15% of its calculated EAC
Fix catchbasin/manhole	Preventive	10% of its calculated EAC
Surface treatment	Preventive	10% of its calculated EAC
Clean & seal + hot mix patching	Preventive	10% of its calculated EAC
Clean & seal + cold mix patching	Preventive	10% of its calculated EAC

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Coarse Aggregate Loss</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	7						
		81-100%	7	8					
	Minor	<10%	0						
		10-20%	0						
		21-50%	7	8					
		51-80%	8						
		81-100%	8						
	Moderate	<10%	0						
		10-20%	7	8					
		21-50%	7	8					
		51-80%	7	8					
		81-100%	7	8	19				
	Major	<10%	7	8					
		10-20%	7	8					
		21-50%	7	8					
		51-80%	7	8					
		81-100%	19						
	Extreme	<10%	7	8					
		10-20%	7	8					
		21-50%	7	8					
		51-80%	19						
		81-100%	20						
<i>Ravelling/Streaking</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	6						
		81-100%	6						
	Minor	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	6						
		81-100%	6						
	Moderate	<10%	1	3	4				
		10-20%	3	4					
		21-50%	3	4					
		51-80%	3	4	6				
		81-100%	3	4	6	17			
	Major	<10%	3	4					
		10-20%	3	4					
		21-50%	3	4	7	8			
		51-80%	8	16					
		81-100%	20						
	Extreme	<10%	3	4					
		10-20%	3	4	7	8			
		21-50%	7	8					
		51-80%	8	16					
		81-100%	20						
<i>Flushing</i>	Negligible	<10%	0						
		10-20%	0						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Potholes</i>	Minor	21-50%	0						
		51-80%	0						
		81-100%	0						
		<10%	0						
		10-20%	0						
	Moderate	21-50%	0						
		51-80%	0						
		81-100%	0						
		<10%	0						
		10-20%	0						
	Major	21-50%	0						
		51-80%	7	8	16				
		81-100%	8	16	19				
		<10%	0						
		10-20%	3	4	5	8			
	Extreme	21-50%	8	16					
		51-80%	16						
		81-100%	19	20					
		<10%	8						
		10-20%	8	16					
	Negligible	21-50%	16						
		51-80%	19						
		81-100%	20						
		<10%	0						
		10-20%	0						
	Minor	21-50%	1						
		51-80%	1						
		81-100%	7	8	19				
		<10%	1						
		10-20%	1						
	Moderate	21-50%	1	7	8				
		51-80%	8	19					
		81-100%	8	19					
		<10%	7	8					
		10-20%	7	8					
	Major	21-50%	7	8	19				
		51-80%	8	19					
		81-100%	8	19	20				
		<10%	7	8					
		10-20%	7	8					
	Extreme	21-50%	7	8	19				
		51-80%	8	19					
		81-100%	19	20					
		<10%	7	8					
		10-20%	7	8					
<i>Manholes & catchbasins</i>	Negligible	21-50%	8	19	20				
		51-80%	8	19					
		81-100%	19	20					
		<10%	7	8					
		10-20%	7	8					
	Major	21-50%	8	19					
		51-80%	8	19	20				
		81-100%	19	20					
		<10%	7	8					
		10-20%	7	8					
	Extreme	21-50%	8	19					
		51-80%	8	19	20				
		81-100%	19	20					
		<10%	7	8					
		10-20%	7	8					
	Negligible	21-50%	0						
		51-80%	0						
		81-100%	0						
		<10%	0						
		10-20%	0						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Rippling/Shoving</i>	Minor	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	0						
		81-100%	0						
	Moderate	<10%	0						
		10-20%	0						
		21-50%	15						
		51-80%	15						
		81-100%	15						
	Major	<10%	0						
		10-20%	15						
		21-50%	15						
		51-80%	15						
		81-100%	15						
	Extreme	<10%	15						
		10-20%	15						
		21-50%	15						
		51-80%	15						
		81-100%	15						
	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	0						
		81-100%	0						
	Minor	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	7	8					
		81-100%	7	8					
	Moderate	<10%	0						
		10-20%	0						
		21-50%	8	16					
		51-80%	8	16					
		81-100%	8	16					
	Major	<10%	7	8					
		10-20%	8	16					
		21-50%	16						
		51-80%	16	19					
		81-100%	16	19	20				
	Extreme	<10%	8						
		10-20%	16						
		21-50%	16						
		51-80%	19						
		81-100%	20						
<i>Wheel Track Rutting</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	7	8					
		81-100%	3	4	7	8			
	Minor	<10%	0						
		10-20%	7	8					
		21-50%	7	8					

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
Distortion	Moderate	51-80%	3	4	7	8			
		81-100%	3	4	7	8			
		<10%	3	4					
		10-20%	3	4					
		21-50%	3	4	7	8			
		51-80%	3	4	8	19			
	Major	81-100%	19	20					
		<10%	7	8					
		10-20%	3	4	7	8			
		21-50%	3	4	8	16	19		
		51-80%	3	4	8	16	19		
		81-100%	19	20					
	Extreme	<10%	3	4	7	8			
		10-20%	3	4	7	8	16		
		21-50%	8	16	19				
		51-80%	19	20					
		81-100%	20						
	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	0						
		81-100%	0						
	Minor	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	7	8					
		81-100%	7	8					
	Moderate	<10%	7	8					
		10-20%	7	8					
		21-50%	7	8					
		51-80%	7	8					
		81-100%	7	8	19				
	Major	<10%	7	8					
		10-20%	7	8					
		21-50%	7	8	19				
		51-80%	8	19					
		81-100%	19	20					
	Extreme	<10%	7	8					
		10-20%	7	8	19				
		21-50%	7	8	19				
		51-80%	8	19					
		81-100%	20						
Utility Trenches	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	0						
		81-100%	0						
	Minor	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	0						
		81-100%	7	8					
	Moderate	<10%	0						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
Longitudinal Wheel Track Crack (Single)	Major	10-20%	7	8					
		21-50%	7	8					
		51-80%	8	16					
		81-100%	16						
		<10%	7	8					
		10-20%	8	16					
	Extreme	21-50%	16						
		51-80%	16						
		81-100%	20						
		<10%	7	8					
		10-20%	8	16					
		21-50%	16						
	Negligible	51-80%	16						
		81-100%	20						
		<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	2						
	Minor	81-100%	2						
		<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8				
		51-80%	2	13	14				
		81-100%	11	12					
		<10%	2						
	Major	10-20%	2	7	8				
		21-50%	2	11	12				
		51-80%	11	12	13	14			
		81-100%	19						
		<10%	2						
		10-20%	2	7	8				
	Extreme	21-50%	7	8	11	12			
		51-80%	11	12					
		81-100%	19						
		<10%	2						
10-20%		2	7	8					
21-50%		7	8	11	12				
Longitudinal Wheel Track Crack (Multiple)	Negligible	51-80%	11	12					
		81-100%	19						
		<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
	Minor	81-100%	2						
		<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						
Moderate	<10%	2							
	10-20%	2							
	21-50%	2	7	8					
	51-80%	2	13	14					

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Longitudinal Wheel Track Crack (Alligator)</i>	Major	81-100%	11	12					
		<10%	2						
		10-20%	2	7	8				
		21-50%	2	11	12				
		51-80%	11	12	13	14			
	Extreme	81-100%	19	20					
		<10%	2						
		10-20%	2	7	8				
		21-50%	7	8	11	12			
		51-80%	11	12					
		81-100%	19	20					
	Negligible	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8				
		51-80%	2	13	14				
		81-100%	11	12					
	Major	<10%	2						
		10-20%	2	7	8				
		21-50%	2	11	12				
		51-80%	11	12	13	14			
		81-100%	19	20					
	Extreme	<10%	2						
		10-20%	2	7	8				
		21-50%	7	8	11	12			
		51-80%	11	12					
		81-100%	19	20					
<i>Longitudinal Mid Lane Crack (Single)</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8				
		51-80%	2	13	14				
		81-100%	11	12					
	Major	<10%	2						
		10-20%	2						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Longitudinal Mid Lane Crack (Multiple)</i>	Extreme	21-50%	2	11	12				
		51-80%	11	12	13	14			
		81-100%	19						
		<10%	2						
		10-20%	2	7	8				
		21-50%	7	8	11	12			
		51-80%	11	12					
		81-100%	19	20					
	Negligible	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8				
		51-80%	2	13	14				
		81-100%	11	12					
	Major	<10%	2						
		10-20%	2	7	8				
		21-50%	2	11	12				
		51-80%	11	12	13	14			
		81-100%	19	20					
	Extreme	<10%	2						
		10-20%	2	7	8				
		21-50%	7	8	11	12			
		51-80%	11	12					
		81-100%	19	20					
<i>Longitudinal Mid Lane Crack (Alligator)</i>	Negligible	<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8				
		51-80%	2	13	14				
		81-100%	11	12					
	Major	<10%	2						
		10-20%	2	7	8				
		21-50%	2	11	12				
		51-80%	11	12	13	14			
		81-100%	19	20					

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Centre Lane Crack (Single)</i>	Extreme	<10%	2						
		10-20%	2	7	8				
		21-50%	7	8	11	12			
		51-80%	11	12					
		81-100%	19	20					
	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2	7	8				
		81-100%	7	8					
	Major	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2	7	8				
		81-100%	19						
	Extreme	<10%	2						
		10-20%	2						
		21-50%	2	7	8				
		51-80%	2	7	8	11	12		
		81-100%	19	20					
<i>Centre Lane Crack (Multiple)</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2	7	8	11	12		
		81-100%	7	8	11	12	19		
	Major	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2	7	8	11	12		
		81-100%	19						
	Extreme	<10%	2						
		10-20%	2						
		21-50%	2	7	8	11	12		

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Centre Lane Crack (Alligator)</i>	Negligible	51-80%	2	7	8	11	12		
		81-100%	19						
		<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
	Minor	81-100%	2						
		<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2	7	8	11	12		
		81-100%	7	8	11	12	19		
		<10%	2						
	Major	10-20%	2						
		21-50%	2						
		51-80%	2	7	8	11	12		
		81-100%	19						
	Extreme	<10%	2						
		10-20%	2						
		21-50%	2	7	8	11	12		
		51-80%	2	7	8	11	12		
		81-100%	19						
<i>Meandering Crack (Single)</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	2						
		81-100%	2	7	8				
	Minor	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	7	8					
		81-100%	2	7	8				
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8	13	14		
		51-80%	2	7	8	11	12		
		81-100%	7	8	11	12			
	Major	<10%	2						
		10-20%	2						
		21-50%	7	8	11	12			
		51-80%	19	20					
		81-100%	20						
	Extreme	<10%	2						
		10-20%	7	8	11	12			
		21-50%	7	8	11	12			
		51-80%	19						
		81-100%	20						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Meandering Crack (Multiple)</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2	7	8	13	14		
	Minor	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	7	8	13	14			
		81-100%	2	7	8	13	14		
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8	13	14		
		51-80%	2	7	8	11	12		
		81-100%	7	8	11	12			
	Major	<10%	2						
		10-20%	2						
		21-50%	7	8	11	12			
		51-80%	19	20					
		81-100%	20						
	Extreme	<10%	2						
		10-20%	7	8	11	12			
		21-50%	7	8	11	12			
		51-80%	19	20					
		81-100%	20						
<i>Meandering Crack (Alligator)</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	2						
		81-100%	2	7	8	13	14		
	Minor	<10%	0						
		10-20%	0						
		21-50%	2						
		51-80%	7	8	13	14			
		81-100%	2	7	8	13	14		
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2	7	8	13	14		
		51-80%	2	7	8	11	12		
		81-100%	7	8	11	12			
	Major	<10%	2						
		10-20%	2						
		21-50%	7	8	11	12			
		51-80%	19	20					
		81-100%	20						
	Extreme	<10%	2						
		10-20%	7	8	11	12			
		21-50%	7	8	11	12			
		51-80%	19	20					
		81-100%	20						
<i>Pavement Edge Crack (Single)</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Pavement Edge Crack (Multiple)</i>	Minor	51-80%	1						
		81-100%	1						
		<10%	0						
		10-20%	1						
		21-50%	1						
	Moderate	51-80%	3	4					
		81-100%	3	4					
		<10%	1						
		10-20%	1						
		21-50%	1						
	Major	51-80%	3	4					
		81-100%	3	4					
		<10%	1						
		10-20%	1						
		21-50%	3	4					
	Extreme	51-80%	3	4					
		81-100%	19						
		<10%	3	4					
		10-20%	3	4					
		21-50%	3	4					
	Negligible	51-80%	3	4					
		81-100%	19						
		<10%	0						
		10-20%	0						
		21-50%	1						
<i>Pavement Edge Crack (Alligator)</i>	Minor	51-80%	1						
		81-100%	1						
		<10%	0						
		10-20%	1						
		21-50%	1						
	Moderate	51-80%	3	4					
		81-100%	3	4					
		<10%	1						
		10-20%	1						
		21-50%	1						
	Major	51-80%	3	4					
		81-100%	3	4					
		<10%	1						
		10-20%	1						
		21-50%	3	4					
	Extreme	51-80%	3	4					
		81-100%	19	20					
		<10%	3	4					
		10-20%	3	4					
		21-50%	3	4					
<i>Pavement Edge Crack (Alligator)</i>	Negligible	51-80%	3	4					
		81-100%	19	20					
		<10%	0						
		10-20%	1						
		21-50%	1						
	Minor	51-80%	1						
		81-100%	1						
		<10%	0						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Transverse Crack (Single)</i>	Moderate	10-20%	1						
		21-50%	1						
		51-80%	3	4					
		81-100%	3	4					
		<10%	1						
	Major	10-20%	1						
		21-50%	1						
		51-80%	3	4					
		81-100%	3	4					
		<10%	1						
	Extreme	10-20%	1						
		21-50%	3	4					
		51-80%	3	4					
		81-100%	19	20					
		<10%	3	4					
		10-20%	3	4					
		21-50%	3	4					
		51-80%	3	4					
		81-100%	19	20					
	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	19	20					
	Major	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	19						
		81-100%	19	20					
	Extreme	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	19	20					
		81-100%	20						
<i>Transverse Crack (Multiple)</i>	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	2						
		81-100%	2						
	Minor	<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
Transverse Crack (Alligator)	Moderate	81-100%	2						
		<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2						
	Major	81-100%	19	20					
		<10%	2						
		10-20%	2						
		21-50%	2	7	8				
		51-80%	19	20					
	Extreme	81-100%	19	20					
		<10%	2						
		10-20%	2						
		21-50%	7	8	11	12			
		51-80%	19	20					
		81-100%	20						
	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	2						
		81-100%	2						
Alligator Crack	Minor	<10%	0						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	2						
	Moderate	<10%	2						
		10-20%	2						
		21-50%	2						
		51-80%	2						
		81-100%	19						
	Major	<10%	2						
		10-20%	2						
		21-50%	7	8	11	12			
		51-80%	19						
		81-100%	19	20					
	Extreme	<10%	2						
		10-20%	2						
		21-50%	7	8	11	12			
		51-80%	19	20					
		81-100%	20						
	Negligible	<10%	0						
		10-20%	1						
		21-50%	1						
		51-80%	1						
		81-100%	7	8					
	Minor	<10%	1						
		10-20%	1						
		21-50%	7	8					
		51-80%	7	8					
		81-100%	8	18					
	Moderate	<10%	1						
		10-20%	1	7	8				

Table D2: Treatment Alternative (TA) for Flexible Pavement

Reference: MTO, 1980 and MTO (a), 1989

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
Map Cracking	Major	21-50%	7	8					
		51-80%	8	18					
		81-100%	8	18					
		<10%	7	8					
		10-20%	7	8	18				
		21-50%	8	18					
	Extreme	51-80%	8	18	19				
		81-100%	20						
		<10%	7	8	18				
		10-20%	7	8	18				
		21-50%	7	8	18				
		51-80%	19	20					
		81-100%	20						
	Negligible	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	0						
		81-100%	0						
	Minor	<10%	0						
		10-20%	0						
		21-50%	0						
		51-80%	0						
		81-100%	0						
	Moderate	<10%	0						
		10-20%	0						
		21-50%	3	4					
		51-80%	3	4	7	8			
		81-100%	19						
	Major	<10%	3	4					
		10-20%	3	4					
		21-50%	3	4	7	8			
		51-80%	8						
		81-100%	19	20					
	Extreme	<10%	3	4					
		10-20%	3	4	8				
		21-50%	8						
		51-80%	19						
		81-100%	20						

**APPENDIX E: TYPICAL TREATMENT ALTERNATIVE MATRIX
FOR RIGID PAVEMENTS WITH UNIT COST (\$/m²) AND
EXPECTED LIFE (Years)**

Table E1: Unit Cost and Expected Life for Various Treatment Alternative (Rigid Pavement)

Treatment Alternative (TA)	TA Code	Unit Cost (cost/sq.m)	Expected Life (year)
Do nothing	0	0.00	0.0
Clean & seal crack	1	2.50	2.0
Clean & seal joint	2	2.75	2.0
Clean & seal crack + joint	3	4.25	3.0
Clean & seal joint + repair	4	4.00	4.0
Clean & seal crack + cold mix patch	5	5.25	5.0
Clean & seal crack + hot mix patch	6	5.75	7.0
Joint repair	7	2.50	3.0
Transverse grooving	8	2.50	3.0
Cold mix patch	9	2.75	2.0
Hot mix patch	10	3.25	4.0
Heater planing	11	3.75	4.0
Cold planing	12	3.25	4.0
Mud jacking	13	3.00	5.0
Improve drainage + fix manholes & catchbasins	14	5.00	5.0
Slab grinding	15	4.00	3.0
Slab replacement	16	10.00	10.0
AC Overlay	17	12.00	15.0
Reconstruction	18	17.00	25.0

Note: For unit cost, consult the local contractors. The life span of any treatment varies with material quality, construction practices, traffic and environment.

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Polishing</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	8						
		80-100%	8						
	Moderate	<10%	0						
		10-20%	8	11	12				
		20-50%	11	12					
		50-80%	11	12	17				
		80-100%	17						
	Major	<10%	0						
		10-20%	11	12					
		20-50%	11	12	17				
		50-80%	11	12	17				
		80-100%	17						
	Extreme	<10%	11	12					
		10-20%	11	12					
		20-50%	11	12					
		50-80%	11	12	17				
		80-100%	17						
<i>Coarse Aggregate Loss</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	9	10					
	Moderate	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	9	10					
		80-100%	9	10					
	Major	<10%	0						
		10-20%	0						
		20-50%	9	10					

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Potholes</i>	Extreme	50-80%	9	10					
		80-100%	9	10	17				
		<10%	0						
		10-20%	0						
		20-50%	9	10					
		50-80%	9	10	17				
		80-100%	17						
	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	9	10					
	Minor	<10%	0						
		10-20%	9	10					
		20-50%	9	10					
		50-80%	9	10					
		80-100%	9	10					
	Moderate	<10%	9	10					
		10-20%	9	10					
		20-50%	9	10					
		50-80%	9	10					
		80-100%	9	10	17				
	Major	<10%	9	10					
		10-20%	9	10					
		20-50%	9	10					
		50-80%	9	10	17				
		80-100%	17						
	Extreme	<10%	9	10					
		10-20%	9	10					
		20-50%	9	10					
		50-80%	17						
		80-100%	17	18					
<i>Scaling</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	9	10					

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Ravelling</i>	Moderate	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	9	10					
		80-100%	9	10	16				
	Major	<10%	0						
		10-20%	0						
		20-50%	9	10					
		50-80%	9	10					
		80-100%	16	17					
	Extreme	<10%	0						
		10-20%	0						
		20-50%	9	10					
		50-80%	16	17					
		80-100%	17						
	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	9	10					
		50-80%	9	10					
		80-100%	9	10					
	Moderate	<10%	0						
		10-20%	0						
		20-50%	9	10					
		50-80%	9	10					
		80-100%	9	10					
	Major	<10%	0						
		10-20%	9	10					
		20-50%	9	10					
		50-80%	9	10	16	17			
		80-100%	16	17					
	Extreme	<10%	9	10					
		10-20%	9	10	16	17			
		20-50%	16	17					
		50-80%	16	17					
		80-100%	17						
<i>Utility Trenches</i>	Negligible	<10%	0						
		10-20%	0						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
Manholes & Catchbasins	Minor	20-50%	0						
		50-80%	0						
		80-100%	0						
		<10%	0						
		10-20%	0						
	Moderate	20-50%	0						
		50-80%	0						
		80-100%	9	10					
		<10%	0						
		10-20%	0						
	Major	20-50%	9	10					
		50-80%	9	10					
		80-100%	9	10					
		<10%	0						
		10-20%	9	10					
	Extreme	20-50%	9	10					
		50-80%	16						
		80-100%	16						
		<10%	9	10					
		10-20%	9	10					
	Negligible	20-50%	9	10					
		50-80%	16						
		80-100%	17						
		<10%	0						
		10-20%	0						
	Minor	20-50%	0						
		50-80%	0						
		80-100%	0						
		<10%	0						
		10-20%	0						
	Moderate	20-50%	0						
		50-80%	0						
		80-100%	0						
		<10%	0						
		10-20%	0						
	Major	20-50%	0						
		50-80%	0						
		80-100%	14						
		<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	14						
		80-100%	14						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Faulting (Stepping)</i>	Extreme	<10%	0						
		10-20%	0						
		20-50%	14						
		50-80%	14						
		80-100%	14						
	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	3						
	Minor	<10%	0						
		10-20%	3						
		20-50%	3	4					
		50-80%	3	4					
		80-100%	4						
	Moderate	<10%	0						
		10-20%	3	4					
		20-50%	13	14					
		50-80%	13	14					
		80-100%	15	16					
	Major	<10%	3	4					
		10-20%	13	14					
		20-50%	15	16					
		50-80%	17						
		80-100%	17						
	Extreme	<10%	3	4					
		10-20%	13	15	16				
		20-50%	16						
		50-80%	17						
		80-100%	17	18					
<i>Settlement (Sagging)</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	9	10					
		80-100%	9	10					
	Moderate	<10%	0						
		10-20%	9	10					

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Joint Creeping</i>	Major	20-50%	9	10					
		50-80%	9	10					
		80-100%	15	16					
		<10%	0						
		10-20%	9	10					
	Extreme	20-50%	15	16					
		50-80%	16	17					
		80-100%	17	18					
		<10%	9	10					
		10-20%	15	16					
		20-50%	16						
		50-80%	17						
		80-100%	18						
	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Moderate	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Major	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Extreme	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
<i>Joint Sealant Loss</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
Joint Failure	Minor	80-100%	0						
		<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
	Moderate	80-100%	2						
		<10%	0						
		10-20%	2	4					
		20-50%	2	4					
		50-80%	2	4					
	Major	80-100%	4						
		<10%	2						
		10-20%	2	4					
		20-50%	2	4					
		50-80%	4						
	Extreme	80-100%	4						
		<10%	2						
		10-20%	2	4					
		20-50%	2	4					
		50-80%	4						
	Negligible	80-100%	4						
		<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
	Minor	80-100%	0						
		<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	9	10					
	Moderate	80-100%	9	10					
		<10%	0						
		10-20%	0						
		20-50%	9	10					
		50-80%	9	10					
	Major	80-100%	16						
		<10%	0						
		10-20%	16						
		20-50%	16						
		50-80%	16						
	Extreme	80-100%	16						
		<10%	0						
		10-20%	16						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Longitudinal Crack</i>		20-50%	16						
		50-80%	16						
		80-100%	16						
	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	1						
		80-100%	1						
	Moderate	<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	1	5	6	9	10		
		80-100%	5	6	9	10			
	Major	<10%	0						
		10-20%	1						
		20-50%	1	5	6				
		50-80%	5	6	16				
		80-100%	16	17	18				
	Extreme	<10%	1						
		10-20%	1						
		20-50%	16						
		50-80%	16						
		80-100%	16	17	18				
<i>Meandering Crack</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	1						
		80-100%	1						
	Moderate	<10%	0						
		10-20%	1						
		20-50%	1						
		50-80%	1						
		80-100%	1						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Corner Crack</i>	Major	80-100%	1						
		<10%	1						
		10-20%	1						
		20-50%	1						
		50-80%	5	6	9	10			
	Extreme	80-100%	16	17	18				
		<10%	0						
		10-20%	1						
		20-50%	5	6					
		50-80%	16	17	18				
		80-100%	18						
	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	1						
		80-100%	1						
	Moderate	<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	5	6	9	10			
		80-100%	5	6					
	Major	<10%	0						
		10-20%	1						
		20-50%	5	6	9	10			
		50-80%	5	6	16				
		80-100%	16	17	18				
	Extreme	<10%	1						
		10-20%	1						
		20-50%	16						
		50-80%	16						
		80-100%	16	17	18				
<i>"D" Crack</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Reflection Crack</i>	Moderate	10-20%	2						
		20-50%	2						
		50-80%	2	4					
		80-100%	2	4	5	6			
		<10%	0						
	Major	10-20%	2						
		20-50%	2	4					
		50-80%	2	4	5	6			
		80-100%	5	6	16				
		<10%	0						
	Extreme	10-20%	2	4					
		20-50%	2	4	5	6			
		50-80%	5	6	16				
		80-100%	5	6	16				
		<10%	2	3					
	Negligible	10-20%	2	3					
		20-50%	2	3	5	6			
		50-80%	5	6	16				
		80-100%	16	18					
		<10%	0						
	Minor	10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
		<10%	0						
	Moderate	10-20%	0						
		20-50%	0						
		50-80%	1						
		80-100%	1						
		<10%	0						
	Major	10-20%	0						
		20-50%	1						
		50-80%	1						
		80-100%	1						
		<10%	1						
	Extreme	10-20%	1						
		20-50%	5	6					
		50-80%	5	6					
		80-100%	17						
		<10%	1						
		10-20%	1						
		20-50%	5	6					
		50-80%	5	6					

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Transverse Crack (Single)</i>	Negligible	80-100%	17						
		<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
	Minor	80-100%	0						
		<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	1						
	Moderate	80-100%	1						
		<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	1	5	6	9	10		
	Major	80-100%	5	6	9	10			
		<10%	0						
		10-20%	1						
		20-50%	5	6					
		50-80%	5	6	16				
	Extreme	80-100%	16	17	18				
		<10%	1						
		10-20%	1						
		20-50%	16						
		50-80%	16						
<i>Transverse Crack (Multiple)</i>	Negligible	80-100%	16	17	18				
		<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	1						
	Minor	80-100%	1						
		<10%	0						
		10-20%	1						
		20-50%	1						
		50-80%	1						
	Moderate	80-100%	1						
		<10%	0						
		10-20%	1						
		20-50%	1						
		50-80%	1	5	6	9	10		
	Major	80-100%	5	6	9	10			
		<10%	1						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Diagonal Crack</i>	Extreme	10-20%	1						
		20-50%	5	6					
		50-80%	5	6	16				
		80-100%	16	17	18				
		<10%	1						
		10-20%	5	6					
		20-50%	16						
		50-80%	16						
		80-100%	16	17	18				
	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	1						
		80-100%	1						
	Moderate	<10%	0						
		10-20%	0						
		20-50%	1						
		50-80%	1	5	6	9	10		
		80-100%	5	6	9	10			
	Major	<10%	0						
		10-20%	1						
		20-50%	1	5	6				
		50-80%	5	6	16				
		80-100%	16	17	18				
	Extreme	<10%	1						
		10-20%	1						
		20-50%	16						
		50-80%	16						
		80-100%	16	17	18				
<i>Edge Crescent Crack</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	0						
	Minor	<10%	0						
		10-20%	0						
		20-50%	1						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Joint Spalling</i>	Moderate	50-80%	1						
		80-100%	1						
		<10%	0						
		10-20%	0						
		20-50%	1						
	Major	50-80%	1	5	6	9	10		
		80-100%	5	6	9	10			
		<10%	0						
		10-20%	1						
		20-50%	1	5	6				
	Extreme	50-80%	5	6	16				
		80-100%	16	17	18				
		<10%	1						
		10-20%	1						
		20-50%	16						
	Negligible	50-80%	16						
		80-100%	16	17	18				
		<10%	0						
		10-20%	0						
		20-50%	0						
	Minor	50-80%	0						
		80-100%	2						
		<10%	0						
		10-20%	0						
		20-50%	2						
	Moderate	50-80%	2	4					
		80-100%	2	4					
		<10%	0						
		10-20%	2						
		20-50%	2	4					
	Major	50-80%	9	10					
		80-100%	9	10	16				
		<10%	2						
		10-20%	2	4					
		20-50%	9	10	16				
	Extreme	50-80%	16						
		80-100%	16						
		<10%	2	4					
		10-20%	9	10	16				
		20-50%	16						
		50-80%	16						
		80-100%	16						

Table E2: Treatment Alternative for Rigid Pavement

References: MTO, 1980, MTO (b), 1982 and Shahin, 1994

Distress Type	Severity	Extent	TA#1	TA#2	TA#3	TA#4	TA#5	TA#6	TA#7
<i>Crack Spalling</i>	Negligible	<10%	0						
		10-20%	0						
		20-50%	0						
		50-80%	0						
		80-100%	2						
	Minor	<10%	0						
		10-20%	0						
		20-50%	2						
		50-80%	2	4					
		80-100%	2	4					
	Moderate	<10%	0						
		10-20%	2						
		20-50%	2	4					
		50-80%	9	10					
		80-100%	9	10	16				
	Major	<10%	2						
		10-20%	2	4					
		20-50%	9	10	16				
		50-80%	16						
		80-100%	16						
	Extreme	<10%	2	4					
		10-20%	9	10	16				
		20-50%	16						
		50-80%	16						
		80-100%	16						

**APPENDIX F: INVENTORY, WINDSHIELD SURVEY,
EQUIVALENT ANNUAL COST, PRIORITY PROGRAMMING AND
SUMMARY WORKSHEETS PREPARED FOR CFB KINGSTON**

Table F1: Road Inventory Worksheet for CFB Kingston

Section Number	Street Name	Location From:	Road Classification	Drainage Condition	Annual Average Daily Traffic (AADT)	Section Length (m)	Pavement Type	Average Section Width (m)	Shoulder Type
00001	Craftsman Blvd.	Hwy 15 to Apprentice St.	Urban Local	Good	Low	250.0	Asphalt	5.80	Side Walk
00002	Craftsman Blvd	Apprentice St to Hwy 2	Urban Collector	Good	Moderate	1450	Asphalt	8.33	-
00003	Mercury Cr	Craftsman Blvd to Base HQ	Urban Local	Fair	Low	650	Asphalt	7.00	Curb
00004	Entertein Ave	Hwy 15 to Sadie Ave	Urban Local	Fair	Low	375	Asphalt	6.60	-
00005	Sadie Ave	Craftsman Blvd to Apprentice St	Urban Local	Fair	Low	400	Asphalt	7.28	-
00006	Apprentice St	Sadie Ave to Hwy 2	Urban Collector	Fair	Moderate	675	Asphalt	8.40	Curb
00007	Artesian Rd	WO & Sgt's Mess to Hwy 2	Urban Collector	Fair	Moderate	500	Asphalt	6.85	-
00008	Atlantic Ave	Apprentice St to Blue Bell Ln	Rural Local	Fair	Low	100	Asphalt	6.00	-
00009	Blue Bell Ln	B-43 (25 YD Range to Red Patch Ave	Rural Local	Inadequate	Low	225	Asphalt	6.10	-
00010	Red Patch Ave	Apprentice St to Moro St	Urban Local	Inadequate	Moderate	975	Asphalt	6.30	Gravel/Grass
00011	Moro St	Fire Training Area to Somme Ave	Urban Local	Inadequate	Low	300	Asphalt	6.10	-
00012	Givenchy St	Red Patch Ave to Somme Ave	Urban Local	Inadequate	Low	600	Asphalt	7.13	-
00013	Lance St	Red Patch Ave to Somme Ave	Rural Local	Fair	Low	800	Asphalt	6.50	-
00014	Festubert St	Red Patch Ave towards West End (Hwy 2)	Rural Local	Inadequate	Low	1000	Asphalt	6.00	-
00015	Somme Ave	Givenchy St to Craftsman Blvd (East End)	Rural Local	Fair	Low	850	Asphalt	6.00	-
00016	No Name	Givenchy St to Lance St (Cul-De-Sac)	Rural Local	Inadequate	Low	300	Asphalt	5.90	-
00017	Princess Marry Ave	Hwy 2 (South Entrance) to B-30 (Pol Storage)	Urban Collector	Fair	Moderate	800	Asphalt	6.83	Curb
00018	Estafette St	Princess Marry Ave to Signal Ave	Rural Local	Inadequate	Low	300	Asphalt	6.50	Curb
00019	Signal Ave	Estafette St to B-19 Parking Lot (JCSTC East)	Urban Local	Fair	Moderate	400	Asphalt	5.80	Curb & Grass
00020	Satellite Ave	Princess Marry Ave to Telegraphic St	Urban Local	Fair	Moderate	600	Asphalt	6.70	Curb & Grass
00021	Telegraphic St	Radar St to Hwy 2 (towards North End)	Rural Local	n/a	Low	300	Gravel	n/a	n/a
00022	Radar St	Signal Ave to Telegraphic St	Rural Local	Fair	Low	350	Asphalt	6.00	Curb & Grass
00023	Princess Royal Ave	Signal Ave to C-46 Quarter's East End Parking Lot	Rural Local	Inadequate	Low	175	Asphalt	5.50	Curb
00024	Cable Ln	Satellite Ave to Radar St	Rural Local	n/a	Low	200	Gravel	n/a	n/a
00025	Parade Rd	Satellite Ave to Princess Marry Ave	Urban Local	Fair	Moderate	250	Asphalt	6.70	Side Walk
00026	Byng Ave	Signal Ave to Canal Du Nord	Rural Local	Fair	Low	700	Asphalt	6.50	Curb & Grass
00027	Canal Du Nord	South End of Canal Du Nord to Hwy 2 (Cul-De-Sac)	Urban Collector	Good	Moderate	800	Asphalt	6.80	Curb & Grass
00028	Precision Dr	Fort Henry Dr (Guard House to General Crerar Cr	Urban Local	Good	Moderate	500	Asphalt	8.20	Curb
00029	Billy Bishop Rd	Verite Ave to Precision Dr	Urban Collector	Fair	Low	100	Asphalt	7.80	Curb
00030	Verite Ave	Hwy 2 to De La Merite Dr	Rural Local	Inadequate	Low	400	Asphalt	8.50	Curb & Grass
00031	De La Merite Dr	Valour Dr to Verite Ave	Rural Local	Inadequate	Low	175	Asphalt	3.40	Grass
00032	Valour Dr	Hwy 2 (Memorial Arch) to General Crerar Cr	Rural Local	Fair	Low	650	Asphalt	6.40	Curb & Grass
00033	Devercheres Dr	Valour Dr to Verite Ave	Rural Local	Fair	Low	200	Asphalt	3.70	Grass
00034	Hewett Ave	Valour Dr to Devercheres Dr	Rural Local	Inadequate	Low	175	Asphalt	6.55	Grass
00035	General Crerar Cr	Valour Dr to Point Frederick Dr	Urban Local	Fair	Moderate	700	Asphalt	7.30	Curb & Grass
00036	Point Frederick Dr	Valour Dr to Valour Dr	Rural Local	Inadequate	Low	800	Asphalt	5.56	Curb & Grass
00037	Amiens Ave	Valour Dr to Amiens Ave (South End)	Rural Local	Fair	Low	200	Asphalt	7.50	Curb

Table F1: Road Inventory Worksheet for CFB Kingston

Section Number	Street Name	Location From:	Road Classification	Drainage Condition	Annual Average Daily Traffic (AADT)	Section Length (m)	Pavement Type	Average Section Width (m)	Shoulder Type
00038	Ridout Sq	Intersection of Hewett Ave and Devercheres Dr to 9 and 9A (PMQs)	Rural Local	Inadequate	Low	100	Asphalt	4.18	Curb & Grass
00039	Duty Dr	Hwy 2 to Athletic Centre (S.A.M Centre)	Urban Local	Fair	Moderate	800	Asphalt	7.03	Grass & Gravel
00040	Lundy's Ln	Fort Henry Dr to Niagara Park	Urban Collector	Fair	Moderate	600	Asphalt	6.50	Curb & Grass
00041	Lundy's Ln	Niagara Park to Canal Du Nord Dr	Urban Collector	Fair	Moderate	1100	Asphalt	6.43	Curb & Grass
00042	Queenston Heights	Lundy's Ln to R-30: PMQ Service Centre (Lundy's Ln)	Urban Local	Fair	Moderate	600	Asphalt	6.10	Grass
00043	Ortona Point	Lundy's Ln to Cul-De-Sac	Rural Local	Inadequate	Low	50	Asphalt	6.60	-
00044	Flanders Place	Lundy's Ln to Cul-De-Sac	Rural Local	Inadequate	Low	50	Asphalt	6.50	-
00045	Niagara Park	Queenston Heights to Hwy 2	Urban Collector	Fair	Moderate	700	Asphalt	6.40	Curb
00046	Chateauguay Park	Queenston Heights to Lundy's Ln	Urban Local	Fair	Low	125	Asphalt	5.80	-
00047	Batoche Ave	R-26 (Community Centre) to Falaise Way	Rural Local	Fair	Low	150	Asphalt	5.40	-
00048	Normandy Cr	Lundy's Ln to Lundy's Ln	Rural Local	Fair	Low	900	Asphalt	5.40	-
00049	Falaise Way	Normandy Cr to Paardeburg Place	Rural Local	Fair	Low	200	Asphalt	5.40	-
00050	Mons Way	Normandy Cr to Caen Cr	Rural Local	Fair	Low	175	Asphalt	6.20	-
00051	Caen Cr	Canal Du Nord Dr to Canal Du Nord Dr	Rural Local	Fair	Low	250	Asphalt	5.60	-
00052	Dieppe Ave	Casino Ct to Caen Cr	Rural Local	Inadequate	Low	300	Asphalt	4.20	-
00053	Oswego Way	Dieppe Ave to Windmill Dr	Rural Local	Fair	Low	175	Asphalt	4.40	-
00054	Poplar Grove	Casino Ct to Lundy's Ln	Rural Local	Fair	Low	175	Asphalt	4.50	-
00055	Windmill Dr	Cambrai Ave to Cul-De-Sac	Rural Local	Fair	Low	200	Asphalt	5.40	-
00056	Cambrai Ave	Lundy's Ln to Mons Way	Rural Local	Fair	Low	150	Asphalt	5.60	-
00057	Casino Ct	Canal Du Nord Dr to DND Limits (Cartwright Point)	Rural Local	Fair	Low	200	Asphalt	5.30	-
00058	Hermes Dr	Niagara Park to Kapyong Cr	Rural Local	Fair	Low	275	Asphalt	6.00	-
00059	Kapyong Cr	Sicily Dr to Hermes Dr	Rural Local	Fair	Low	150	Asphalt	6.30	-
00060	Sicily Dr	Niagara Park to Assoro Cr & Kapyong Cr	Urban Local	Fair	Low	350	Asphalt	7.10	-
00061	Wolfe Ave	Niagara Park to Montcalm Ave	Rural Local	Fair	Low	50	Asphalt	5.00	-
00062	Montcalm Ave	Sicily Dr to R-23 (Niagara Park School)	Rural Local	Fair	Low	150	Asphalt	4.70	Grass
00063	Assoro Cr	Sicily Dr to Sicily Dr	Urban Local	Fair	Moderate	700	Asphalt	6.50	-
00064	Ypres Dr	Assoro Cr to Assoro Cr	Rural Local	Fair	Low	225	Asphalt	6.00	Grass
00065	Remorquage Dr	Niagara Park to Cul-De-Sac (Canex)	Rural Local	Fair	Low	300	Asphalt	6.5	Grass

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00001	Coarse Aggregate Loss	None	0.00%	<10%	8.0	85.0	0.0	0.0	3.0	0.00	2.50	88.76
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	Minor	2.00%	<10%			1.0	0.5	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	2.00%	<10%			2.0	0.5	1.0	2.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00002	Coarse Aggregate Loss	None	0.00%	<10%	9.0	85.0	0.0	0.0	3.0	0.00	2.25	94.22
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00003	Wheel Track Rutting	None	0.00%	<10%	8.0	80.0	0.0	0.0	3.0	0.00	11.00	86.44
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	5.00%	<10%			1.0	0.5	2.0	3.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00004	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	4.0	55.0	0.0	0.0	0.5	0.00	14.50	60.45
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	1.0	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Minor	10.00%	10-20%			1.0	1.0	3.0	6.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	5.00%	<10%			2.0	0.5	2.0	5.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	1.0	2.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	1.0	2.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	0.5	1.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	0.5	1.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00005	Meandering Crack (Single)	None	0.00%	<10%	6.0	70.0	0.0	0.0	0.5	0.00	9.75	75.16
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.75		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	1.50		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	Minor	10.00%	10-20%			1.0	1.0	1.5	3.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00006	Transverse Crack (Single)	None	0.00%	<10%	4.5	55.0	0.0	0.0	0.5	0.00	18.00	63.40
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	10.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00007	Coarse Aggregate Loss	Minor	10.00%	10-20%	4.0	60.0	1.0	1.0	3.0	6.00	21.00	59.20
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	10.00%	10-20%			1.0	1.0	2.0	4.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	Minor	15.00%	10-20%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			1.0	1.0	0.5	1.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Single)	Minor	20.00%	10-20%			0.0	0.0	1.5	0.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			1.0	1.0	0.5	1.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Alligator Crack	Minor	30.00%	21-50%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			1.0	2.0	3.0	9.00		
							0.0	0.0	0.5	0.00		
00008	Coarse Aggregate Loss	None	0.00%	<10%	5.5	75.0	0.0	0.0	3.0	0.00	1.00	73.94
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00009	Wheel Track Rutting	None	0.00%	<10%	5.0	75.0	0.0	0.0	3.0	0.00	4.00	69.85
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00010	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	4.5	50.0	0.0	0.0	0.5	0.00	49.00	57.06
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	30.00%	21-50%			2.0	2.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	1.0	9.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	20.00%	10-20%			1.0	1.0	0.5	1.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00011	Meandering Crack (Single)	None	0.00%	<10%	4.5	55.0	0.0	0.0	0.5	0.00	26.25	61.71
	Meandering Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	40.00%	21-50%			2.0	2.0	0.5	2.00		
	Pavement Edge Crack (Alligator)	Moderate	30.00%	21-50%			2.0	2.0	1.5	6.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Major	65.00%	51-80%			3.0	3.0	1.0	6.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Major	45.00%	21-50%			3.0	2.0	3.0	15.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	10.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	1.5	4.50		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00012	Transverse Crack (Single)	None	0.00%	<10%	3.0	40.0	0.0	0.0	0.5	0.00	25.25	50.56
	Transverse Crack (Multiple)	Moderate	10.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	20.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	25.00%	21-50%			2.0	2.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	55.00%	51-80%			2.0	3.0	1.0	5.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	20.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00013	Coarse Aggregate Loss	None	0.00%	<10%	4.5	55.0	0.0	0.0	3.0	0.00	17.75	63.45
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Major	20.00%	10-20%			3.0	1.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Moderate	10.00%	10-20%			2.0	1.0	0.5	1.50		
	Centre Lane Crack (Alligator)	Moderate	10.00%	10-20%			2.0	1.0	0.5	1.50		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Alligator)	Moderate	20.00%	10-20%			2.0	1.0	1.5	4.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	2.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00014	Coarse Aggregate Loss	Minor	15.00%	10-20%	4.5	55.0	1.0	1.0	3.0	6.00	29.75	61.00
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	45.00%	21-50%			2.0	2.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00015	Wheel Track Rutting	None	0.00%	<10%	3.0	45.0	0.0	0.0	3.0	0.00	25.50	50.51
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	35.00%	21-50%			2.0	2.0	0.5	2.00		
	Pavement Edge Crack (Alligator)	Moderate	35.00%	21-50%			2.0	2.0	1.5	6.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	25.00%	21-50%			2.0	2.0	1.0	4.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	15.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Sf)	Extent Weighting Factor (Ef)	Distress Weighting Factor (Wf)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00016	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	3.0	40.0	0.0	0.0	0.5	0.00	31.00	49.60
	Longitudinal Mid Lane Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Moderate	5.00%	<10%			2.0	0.5	1.0	2.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	5.00%	<10%			2.0	0.5	1.5	3.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Major	35.00%	21-50%			3.0	2.0	2.0	10.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)		
			Percent value	Range										
00017	Meandering Crack (Single)	None	0.00%	<10%	5.0	60.0	0.0	0.0	0.5	0.00	33.75	63.43		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50				
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00				
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00				
	Pavement Edge Crack (Multiple)	Moderate	40.00%	21-50%			2.0	2.0	0.5	2.00				
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00				
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00				
	Transverse Crack (Multiple)	Moderate	30.00%	21-50%			2.0	2.0	1.0	4.00				
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00				
	Alligator Crack	Moderate	30.00%	21-50%			2.0	2.0	3.0	12.00				
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00				
	Coarse Aggregate Loss	None	0.00%	<10%			5.0	60.0	0.0	0.0			3.0	0.00
	Ravelling/Streaking	None	0.00%	<10%					0.0	0.0			3.0	0.00
	Flushing	None	0.00%	<10%					0.0	0.0			0.5	0.00
	Potholes	Minor	10.00%	10-20%					1.0	1.0			2.0	4.00
	Manholes & Catchbasins	None	0.00%	<10%					0.0	0.0			0.0	0.00
	Rippling/Shoving	None	0.00%	<10%					0.0	0.0			1.0	0.00
	Wheel Track Rutting	Major	25.00%	10-20%					3.0	2.0			3.0	15.00
	Distortion	Moderate	15.00%	10-20%					2.0	1.0			3.0	9.00
	Utility Trenches	None	0.00%	<10%					0.0	0.0			0.0	0.00
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%					0.0	0.0			1.0	0.00
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%					0.0	0.0			1.0	0.00
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%					0.0	0.0			3.0	0.00
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%					0.0	0.0			0.5	0.00
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%					0.0	0.0			1.0	0.00
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%					0.0	0.0			2.0	0.00
	Centre Lane Crack (Single)	None	0.00%	<10%					0.0	0.0			0.5	0.00
	Centre Lane Crack (Multiple)	None	0.00%	<10%					0.0	0.0			0.5	0.00
	Centre Lane Crack (Alligator)	None	0.00%	<10%					0.0	0.0			0.5	0.00
	Meandering Crack (Single)	None	0.00%	<10%					0.0	0.0			0.5	0.00
	Meandering Crack (Multiple)	Minor	10.00%	10-20%					1.0	1.0			1.0	2.00
	Meandering Crack (Alligator)	None	0.00%	<10%					0.0	0.0			2.0	0.00
	Pavement Edge Crack (Single)	None	5.00%	<10%					0.0	0.0			0.5	0.00
	Pavement Edge Crack (Multiple)	Minor	0.00%	<10%					0.0	0.0			0.5	0.00
	Pavement Edge Crack (Alligator)	None	0.00%	<10%					0.0	0.0			0.5	0.00
Pavement Edge Crack (Single)	Minor	1.0	<10%	0.0	0.0	0.5			0.75					
Pavement Edge Crack (Multiple)	None	0.00%	<10%	0.0	0.0	1.5			0.00					

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00018	Transverse Crack (Single)	None	0.00%	<10%	5.0	60.0	0.0	0.0	0.5	0.00	14.25	67.64
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Major	20.00%	10-20%			3.0	1.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	0.5	1.00		
	Centre Lane Crack (Alligator)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00019	Coarse Aggregate Loss	None	0.00%	<10%	4.0	55.0	0.0	0.0	3.0	0.00	13.25	60.69
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	20.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	Minor	10.00%	10-20%			1.0	1.0	1.5	3.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00020	Coarse Aggregate Loss	None	0.00%	<10%	6.5	75.0	0.0	0.0	3.0	0.00	15.25	76.87
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	10.00%	10-20%			1.0	1.0	2.0	4.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00021	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Negligible	10.00%	10-20%			0.5	1.0	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	Negligible	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	10.00%	10-20%			0.5	1.0	0.5	0.75		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Alligator)	Minor	0.00%	<10%			0.0	0.0	1.0	0.00		
	Alligator Crack	None	15.00%	10-20%			1.0	1.0	3.0	6.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
			0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%	0.0	0.0	0.0	0.0	3.0	0.00	0.00	0.00
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00022	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	6.0	75.0	0.0	0.0	0.5	0.00	6.00	76.04
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Potholes	Minor	10.00%	10-20%			0.0	0.0	0.5	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			1.0	1.0	2.0	4.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (S _i)	Extent Weighting Factor (E _i)	Distress Weighting Factor (W _i)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00023	Meandering Crack (Single)	None	0.00%	<10%	5.5	70.0	0.0	0.0	0.5	0.00	25.50	68.40
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Major	30.00%	21-50%			3.0	2.0	2.0	10.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Moderate	5.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			2.0	0.5	1.0	2.50		
	Pavement Edge Crack (Single)	Minor	15.00%	10-20%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
							0.0	0.0	1.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severely Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00024	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	20.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%	0.0	0.0	0.0	0.0	3.0	0.00	0.00	0.00
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00025	Coarse Aggregate Loss	None	0.00%	<10%	6.5	75.0	0.0	0.0	3.0	0.00	9.75	78.23
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	10.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00026	Coarse Aggregate Loss	None	0.00%	<10%	6.0	70.0	0.0	0.0	3.0	0.00	7.25	75.75
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	10.00%	10-20%			1.0	1.0	2.0	4.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00027	Wheel Track Rutting	None	0.00%	<10%	6.5	70.0	0.0	0.0	3.0	0.00	15.25	76.87
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Negligible	5.00%	<10%			0.5	0.5	0.5	0.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	20.00%	10-20%			1.0	1.0	2.0	4.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00028	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	8.0	80.0	0.0	0.0	0.5	0.00	4.00	88.35
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	2.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	<10%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	1.5	4.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Negligible	1.00%	<10%			0.5	0.5	2.0	2.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	Negligible	2.00%	<10%			0.0	0.0	0.5	0.50		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Sf)	Extent Weighting Factor (Ef)	Distress Weighting Factor (Wf)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00029	Meandering Crack (Single)	None	0.00%	<10%	7.5	80.0	0.0	0.0	0.5	0.00	2.25	86.01
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Sf)	Extent Weighting Factor (Ef)	Distress Weighting Factor (Wf)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00030	Transverse Crack (Single)	None	0.00%	<10%	4.5	55.0	0.0	0.0	0.5	0.00	12.25	64.58
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Major	20.00%	10-20%			3.0	1.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00031	Coarse Aggregate Loss	None	0.00%	<10%	4.0	60.0	0.0	0.0	3.0	0.00	13.25	60.69
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	25.00%	21-50%			2.0	2.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00032	Coarse Aggregate Loss	None	0.00%	<10%	4.5	60.0	0.0	0.0	3.0	0.00	29.75	61.00
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	35.00%	21-50%			2.0	2.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wj)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00033	Wheel Track Rutting	None	0.00%	<10%	5.0	60.0	0.0	0.0	3.0	0.00	12.00	68.12
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Multiple)	Moderate	5.00%	<10%			2.0	0.5	0.5	1.25		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	1.5	4.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	30.00%	21-50%			2.0	2.0	1.0	4.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	20.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	5.00%	<10%			1.0	0.5	2.0	3.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	10.00%	10-20%			1.0	1.0	3.0	6.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00034	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	4.0	55.0	0.0	0.0	0.5	0.00	24.00	58.62
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	15.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	10.00%	10-20%			1.0	1.0	3.0	6.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00035	Meandering Crack (Single)	None	0.00%	<10%	4.5	60.0	0.0	0.0	0.5	0.00	16.00	63.81
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	20.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Minor	10.00%	10-20%			1.0	1.0	3.0	6.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	15.00%	10-20%			1.0	1.0	2.0	4.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00036	Transverse Crack (Single)	None	0.00%	<10%	4.0	45.0	0.0	0.0	0.5	0.00	39.25	55.68
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	65.00%	51-80%			2.0	3.0	2.0	10.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	20.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Major	45.00%	21-50%			3.0	2.0	3.0	15.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00037	Coarse Aggregate Loss	None	0.00%	<10%	6.0	65.0	0.0	0.0	3.0	0.00	10.25	75.04
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Minor	10.00%	10-20%			1.0	1.0	3.0	6.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00038	Coarse Aggregate Loss	None	0.00%	<10%	4.5	55.0	0.0	0.0	3.0	0.00	11.00	64.83
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	10.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00039	Wheel Track Rutting	None	0.00%	<10%	5.5	60.0	0.0	0.0	3.0	0.00	28.25	67.77
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Major	20.00%	10-20%			3.0	1.0	0.5	2.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	15.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
		None	0.00%	<10%			0.0	0.0	3.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (S _i)	Extent Weighting Factor (E _i)	Distress Weighting Factor (W _i)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00040	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	5.5	60.0	0.0	0.0	0.5	0.00	32.75	66.76
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Moderate	5.00%	<10%			2.0	0.5	0.5	1.25		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Alligator)	Minor	0.00%	<10%			0.0	0.0	1.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			1.0	0.5	2.0	3.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Single)	Moderate	25.00%	21-50%			2.0	2.0	1.5	6.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Alligator)	Moderate	20.00%	10-20%			2.0	1.0	1.0	3.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	Moderate	20.00%	10-20%			2.0	1.0	3.0	9.00		
		None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	15.00%	10-20%			1.0	1.0	2.0	4.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	15.00%	10-20%			1.0	1.0	3.0	6.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00041	Meandering Crack (Single)	None	0.00%	<10%	7.0	75.0	0.0	0.0	0.5	0.00	5.25	82.33
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	Minor	5.00%	<10%			1.0	0.5	1.5	2.25		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	10.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	Moderate	10.00%	10-20%			2.0	1.0	3.0	9.00		
	Alligator Crack	Minor	15.00%	10-20%			1.0	1.0	3.0	6.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Negligible	5.00%	<10%			0.5	0.5	3.0	3.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00042	Transverse Crack (Single)	None	0.00%	<10%	6.5	75.0	0.0	0.0	0.5	0.00	14.25	77.12
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	5.00%	<10%			1.0	0.5	2.0	3.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	Moderate	20.00%	10-20%			2.0	1.0	1.5	4.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00043	Coarse Aggregate Loss	None	0.00%	<10%	5.5	70.0	0.0	0.0	3.0	0.00	7.50	72.47
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00044	Coarse Aggregate Loss	None	0.00%	<10%	6.0	75.0	0.0	0.0	3.0	0.00	2.25	76.93
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00045	Wheel Track Rutting	None	0.00%	<10%	3.5	40.0	0.0	0.0	3.0	0.00	48.00	50.50
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Single)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Single)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	20.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	Moderate	25.00%	21-50%			2.0	2.0	3.0	12.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00046	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	5.5	65.0	0.0	0.0	0.5	0.00	6.00	72.81
	Longitudinal Mid Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Moderate	5.00%	<10%			2.0	0.5	0.5	1.25		
	Centre Lane Crack (Alligator)	Moderate	5.00%	<10%			2.0	0.5	0.5	1.25		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	Major	20.00%	10-20%			3.0	1.0	3.0	12.00		
	Alligator Crack	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	Moderate	5.00%	<10%			2.0	0.5	0.5	1.25		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Straking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00047	Meandering Crack (Single)	None	0.00%	<10%	4.5	55.0	0.0	0.0	0.5	0.00	39.75	58.95
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	15.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Moderate	10.00%	10-20%			2.0	1.0	3.0	9.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	1.5	4.50		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00048	Transverse Crack (Single)	None	0.00%	<10%	4.0	45.0	0.0	0.0	0.5	0.00	50.50	53.51
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Major	30.00%	21-50%			3.0	2.0	3.0	15.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	25.00%	21-50%			2.0	2.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Moderate	10.00%	10-20%			2.0	1.0	3.0	9.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	30.00%	21-50%			2.0	2.0	0.5	2.00		
	Pavement Edge Crack (Alligator)	Major	45.00%	21-50%			3.0	2.0	1.5	7.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	Minor	15.00%	10-20%			1.0	1.0	3.0	6.00		
	Alligator Crack	Major	25.00%	21-50%			3.0	2.0	3.0	15.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00049	Coarse Aggregate Loss	None	0.00%	<10%	4.0	45.0	0.0	0.0	3.0	0.00	39.50	55.63
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	15.00%	10-20%			1.0	1.0	2.0	4.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Moderate	10.00%	10-20%			2.0	1.0	3.0	9.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00		
	Alligator Crack	Major	20.00%	10-20%			3.0	1.0	3.0	12.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00050	Coarse Aggregate Loss	None	0.00%	<10%	3.5	45.0	0.0	0.0	3.0	0.00	31.50	53.48
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	20.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (S _i)	Extent Weighting Factor (E _i)	Distress Weighting Factor (W _i)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00051	Wheel Track Rutting	None	0.00%	<10%	6.0	70.0	0.0	0.0	3.0	0.00	15.00	73.92
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Major	25.00%	21-50%			3.0	2.0	3.0	15.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	1.00%	<10%			1.0	0.5	2.0	3.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	2.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00052	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	3.5	45.0	0.0	0.0	0.5	0.00	36.50	52.58
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	15.00%	10-20%			1.0	1.0	0.5	1.00		
	Pavement Edge Crack (Alligator)	Moderate	20.00%	10-20%			2.0	1.0	1.5	4.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	10.00%	10-20%			1.0	1.0	1.0	2.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Major	15.00%	10-20%			3.0	1.0	2.0	8.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Moderate	10.00%	10-20%			2.0	1.0	3.0	9.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00053	Meandering Crack (Single)	None	0.00%	<10%	5.5	65.0	0.0	0.0	0.5	0.00	10.50	71.79
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	1.5	4.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Major	20.00%	10-20%			3.0	1.0	3.0	12.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	2.00%	<10%			1.0	0.5	2.0	3.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	10.00%	10-20%			1.0	1.0	3.0	6.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00054	Transverse Crack (Single)	None	0.00%	<10%	5.5	65.0	0.0	0.0	0.5	0.00	14.25	70.94
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	5.00%	<10%			1.0	0.5	2.0	3.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Moderate	10.00%	10-20%			2.0	1.0	3.0	9.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00055	Coarse Aggregate Loss	None	0.00%	<10%	4.5	50.0	0.0	0.0	3.0	0.00	30.75	60.79
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Major	25.00%	21-50%			3.0	2.0	2.0	10.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Major	15.00%	10-20%			3.0	1.0	0.5	2.00		
	Pavement Edge Crack (Alligator)	Moderate	15.00%	10-20%			2.0	1.0	1.5	4.50		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Major	20.00%	10-20%			3.0	1.0	3.0	12.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00056	Coarse Aggregate Loss	None	0.00%	<10%	6.5	75.0	0.0	0.0	3.0	0.00	6.75	78.96
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	PCR (Calculated)				
			Percent value	Range			Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI
00057	Wheel Track Rutting	None	0.00%	<10%	5.0	60.0	0.0	0.0	3.0	0.00	27.50
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50	
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00	
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00	
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00	
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00	
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00	
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00	
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Meandering Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50	
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00	
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Pavement Edge Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75	
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00	
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00	
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00	
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00	
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Coarse Aggregate Loss	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00	
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00	
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00	
	Potholes	Moderate	15.00%	10-20%			2.0	1.0	2.0	6.00	
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00	
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00	
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00	
	Distortion	None	0.00%	<10%			0.0	0.0	0.0	0.00	
	Utility Trenches	None	0.00%	<10%			0.0	0.0	3.0	0.00	
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	0.0	0.00	
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00	
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.0	0.00	

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00058	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	6.0	70.0	0.0	0.0	0.5	0.00	12.25	74.57
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Negligible	2.00%	<10%			0.5	0.5	0.5	0.50		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	15.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	Minor	2.00%	<10%			1.0	0.5	3.0	4.50		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2; Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00059	Meandering Crack (Single)	None	0.00%	<10%	6.5	75.0	0.0	0.0	0.5	0.00	7.00	78.90
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	5.00%	<10%			2.0	0.5	1.0	2.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Minor	2.00%	<10%			1.0	0.5	0.5	0.75		
	Pavement Edge Crack (Alligator)	Moderate	5.00%	<10%			2.0	0.5	1.5	3.75		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00060	Transverse Crack (Single)	None	0.00%	<10%	7.0	75.0	0.0	0.0	0.5	0.00	4.50	82.52
	Transverse Crack (Multiple)	Moderate	5.00%	<10%			2.0	0.5	1.0	2.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Sf)	Extent Weighting Factor (Ef)	Distress Weighting Factor (Wf)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00061	Coarse Aggregate Loss	None	0.00%	<10%	6.0	70.0	0.0	0.0	3.0	0.00	1.50	77.11
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
00062	Coarse Aggregate Loss	None	0.00%	<10%	4.0	60.0	0.0	0.0	3.0	0.00	21.00	59.20
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	20.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Sf)	Extent Weighting Factor (Ef)	Distress Weighting Factor (Wf)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00063	Wheel Track Rutting	None	0.00%	<10%	6.5	75.0	0.0	0.0	3.0	0.00	9.00	78.41
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	0.5	1.50		
	Pavement Edge Crack (Alligator)	None	0.00%	<10%			0.0	0.0	1.5	0.00		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Moderate	15.00%	10-20%			2.0	1.0	1.0	3.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	Moderate	10.00%	10-20%			2.0	1.0	3.0	9.00		
	Map Crack	Moderate	10.00%	10-20%			2.0	1.0	0.5	1.50		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00064	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%	6.0	70.0	0.0	0.0	0.5	0.00	10.50	74.98
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	Minor	5.00%	<10%			1.0	0.5	1.5	2.25		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	1.0	1.50		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Minor	5.00%	<10%			1.0	0.5	2.0	3.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	Minor	5.00%	<10%			1.0	0.5	3.0	4.50		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	Minor	5.00%	<10%			1.0	0.5	0.5	0.75		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)	Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
			Percent value	Range								
00065	Meandering Crack (Single)	None	0.00%	<10%	5.5	65.0	0.0	0.0	0.5	0.00	16.25	70.49
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Alligator)	Minor	5.00%	<10%			1.0	0.5	1.5	2.25		
	Transverse Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Transverse Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Transverse Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Alligator Crack	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Map Crack	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Coarse Aggregate Loss	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Ravelling/Streaking	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Flushing	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Potholes	Moderate	10.00%	10-20%			2.0	1.0	2.0	6.00		
	Manholes & Catchbasins	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Rippling/Shoving	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Wheel Track Rutting	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Distortion	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Utility Trenches	None	0.00%	<10%			0.0	0.0	0.0	0.00		
	Longitudinal Wheel Track Crack (Single)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Wheel Track Crack (Alligator)	None	0.00%	<10%			0.0	0.0	3.0	0.00		
	Longitudinal Mid Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Longitudinal Mid Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Longitudinal Mid Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Centre Lane Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Multiple)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Centre Lane Crack (Alligator)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Meandering Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.0	0.00		
	Meandering Crack (Alligator)	None	0.00%	<10%			0.0	0.0	2.0	0.00		
	Pavement Edge Crack (Single)	None	0.00%	<10%			0.0	0.0	0.5	0.00		
	Pavement Edge Crack (Multiple)	None	0.00%	<10%			0.0	0.0	1.5	0.00		

Table F2: Windshield Survey Data for CFB Kingston Obtained in 1999

Section Number	Distress Type	Severity of Pavement Distress	Extent of Pavement Distress (%)		RCR (Observed)	PCR (Observed)
			Percent value	Range		
	Transverse Crack (Single)	None	0.00%	<10%		
	Transverse Crack (Multiple)	Minor	5.00%	<10%		
	Transverse Crack (Alligator)	None	0.00%	<10%		
	Alligator Crack	Moderate	5.00%	<10%		
	Map Crack	Moderate	5.00%	<10%		

Severity Weighting Factor (Si)	Extent Weighting Factor (Ei)	Distress Weighting Factor (Wi)	Distress Manifestation Index (DMI)	Cumulative DMI	PCR (Calculated)
0.0	0.0	0.5	0.00		
1.0	0.5	1.0	1.50		
0.0	0.0	3.0	0.00		
2.0	0.5	3.0	7.50		
2.0	0.5	0.5	1.25		

Section Number 00001
Section Area (sq.m.) 1450.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$58.48

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Utility Trenches	2.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$8.35	\$8.35	\$8.35	Do nothing
Transverse Crack (Multiple)	2.00%	Moderate	Rout & crack seal	2.50	2.0	\$41.77	\$8.35	\$50.13	\$50.13	Rout & crack seal

Section Number 00002
Section Area (sq.m.) 12078.50
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$349.72

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Pavement Edge Crack (Single)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$219.22	\$219.22	\$219.22	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$130.49	\$130.49	\$130.49	Do nothing

Section Number 00003
 Section Area (sq.m.) 4550.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$1,844.34

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	5.00%	Minor	Spray patching	2.20	1.0	\$550.55	\$27.53	\$578.08	\$578.08	Spray patching
Transverse Crack (Multiple)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$110.11	\$110.11	\$110.11	Do nothing
Alligator Crack	10.00%	Minor	Spray patching	2.20	1.0	\$1,101.10	\$55.06	\$1,156.16	\$1,156.16	Spray patching

Section Number 00004
 Section Area (sq.m.) 2475.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2,116.92

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	5.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$319.89 \$111.26	\$15.99 \$16.69	\$335.89 \$127.95	\$127.95	Hot mix patching
Longitudinal Wheel Track Crack (Multiple)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$134.63	\$134.63	\$134.63	Do nothing
Longitudinal Mid Lane Crack (Multiple)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$134.63	\$134.63	\$134.63	Do nothing
Centre Lane Crack (Multiple)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$134.63	\$134.63	\$134.63	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$898.42	\$44.92	\$943.35	\$943.35	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$534.78	\$106.96	\$641.73	\$641.73	Rout & crack seal

Section Number 00005
 Section Area (sq.m.) 2912.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2,759.25

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$77.18	\$77.18	\$77.18	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$77.18	\$77.18	\$77.18	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$1,057.06	\$52.85	\$1,109.91	\$1,109.91	Spray patching
Pavement Edge Crack (Alligator)	10.00%	Minor	Spray patching	2.20	1.0	\$704.70	\$35.24	\$739.94	\$739.94	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$629.20	\$125.84	\$755.04	\$755.04	Rout & crack seal

Section Number 00006
 Section Area (sq.m.) 5670.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$5,096.90

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$1,465.70 \$509.79	\$73.28 \$76.47	\$1,538.98 \$586.25	\$586.25	Hot mix patching
Pavement Edge Crack (Single)	15.00%	Minor	Spray patching	2.20	1.0	\$2,058.21	\$102.91	\$2,161.12	\$2,161.12	Spray patching
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$1,225.13	\$245.03	\$1,470.15	\$1,470.15	Rout & crack seal
Alligator Crack	15.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$2,198.54 \$764.68 \$2,058.21	\$109.93 \$114.70 \$102.91	\$2,308.47 \$879.38 \$2,161.12	\$879.38	Hot mix patching

Section Number 00007
 Section Area (sq.m.) 3425.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$3,582.52

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Coarse Aggregate Loss	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$186.31	\$186.31	\$186.31	Do nothing
Potholes	10.00%	Minor	Spray patching	2.20	1.0	\$828.85	\$41.44	\$870.29	\$870.29	Spray patching
Longitudinal Mid Lane Crack (Single)	15.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$279.46	\$279.46	\$279.46	Do nothing
Transverse Crack (Single)	20.00%	Minor	Rout & crack seal	2.50	2.0	\$986.73	\$197.35	\$1,184.07	\$1,184.07	Rout & crack seal
Alligator Crack	30.00%	Minor	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$2,656.09 \$923.82	\$132.80 \$138.57	\$2,788.89 \$1,062.39	\$1,062.39	Hot mix patching

Section Number 00008
 Section Area (sq.m.) 600.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$155.57

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Transverse Crack (Single)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$129.64	\$25.93	\$155.57	\$155.57	Rout & crack seal

Section Number 00009
 Section Area (sq.m.) 1372.50
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$879.00

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Pavement Edge Crack (Multiple)	15.00%	Minor	Spray patching	2.20	1.0	\$498.22	\$24.91	\$523.13	\$523.13	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$296.56	\$59.31	\$355.87	\$355.87	Rout & crack seal

Section Number 00010
 Section Area (sq.m.) 6142.50
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (Reconstruction) \$9,659.02
 Total EAC for the section (AC overlay + milling) \$9,896.67
 Total EAC for the section (Other) \$19,162.13

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	30.00%	Moderate	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$4,763.51 \$1,656.80 \$8,996.97	\$238.18 \$248.52 \$899.70	\$5,001.68 \$1,905.32 \$9,896.67	\$1,905.32	Hot mix patching
Longitudinal Wheel Track Crack (Alligator)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,327.22	\$265.44	\$1,592.66	\$1,592.66	Rout & crack seal
Centre Lane Crack (Multiple)	20.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$1,074.57	\$1,074.57	\$1,074.57	Do nothing
Meandering Crack (Multiple)	15.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$805.93	\$805.93	\$805.93	Do nothing
Pavement Edge Crack (Multiple)	40.00%	Moderate	Spray patching	2.20	1.0	\$5,945.94	\$297.30	\$6,243.24	\$6,243.24	Spray patching
Pavement Edge Crack (Alligator)	30.00%	Moderate	Spray patching	2.20	1.0	\$4,459.46	\$222.97	\$4,682.43	\$4,682.43	Spray patching
Transverse Crack (Multiple)	65.00%	Major	AC overlay + milling Reconstruction	9.00 12.75	10.0 20.0	\$8,996.97 \$9,199.07	\$899.70 \$459.95	\$9,896.67 \$9,659.02	\$9,659.02	Reconstruction
Alligator Crack	45.00%	Major	Hot mix patching Improve drainage + hot mix patching	2.85 4.25	4.0 5.0	\$2,485.20 \$3,098.97	\$372.78 \$154.95	\$2,857.98 \$3,253.92	\$2,857.98	Hot mix patching

Section Number 00011
 Section Area (sq.m.) 1830.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2,425.35

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$473.06 \$164.53	\$23.65 \$24.68	\$496.71 \$189.21	\$189.21	Hot mix patching
Longitudinal Mid Lane Crack (Single)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$73.18	\$73.18	\$73.18	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$73.18	\$73.18	\$73.18	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$664.29	\$33.21	\$697.50	\$697.50	Spray patching
Pavement Edge Crack (Alligator)	15.00%	Moderate	Spray patching	2.20	1.0	\$664.29	\$33.21	\$697.50	\$697.50	Spray patching
Transverse Crack (Multiple)	10.00%	Moderate	Rout & crack seal	2.50	2.0	\$263.61	\$52.72	\$316.33	\$316.33	Rout & crack seal
Alligator Crack	20.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$946.11 \$329.07 \$885.72	\$47.31 \$49.36 \$44.29	\$993.42 \$378.43 \$930.01	\$378.43	Hot mix patching

Section Number 00012
 Section Area (sq.m.) 4278.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$6,892.63
 Total EAC for the section (Other) \$6,534.90

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (VMC)	EAC + VMC	Min EAC	Optimal Treatment Alternative
Potholes	25.00%	Moderate	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$2,764.66 \$961.58 \$6,266.02	\$138.23 \$144.24 \$626.60	\$2,902.89 \$1,105.82 \$6,892.63	\$1,105.82	Hot mix patching
Centre Lane Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$119.32	\$119.32	\$119.32	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$119.32	\$119.32	\$119.32	Do nothing
Pavement Edge Crack (Multiple)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$238.64	\$238.64	\$238.64	Do nothing
Transverse Crack (Multiple)	55.00%	Moderate	Rout & crack seal	2.50	2.0	\$3,389.30	\$677.86	\$4,067.16	\$4,067.16	Rout & crack seal
Alligator Crack	20.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$2,211.73 \$769.26 \$2,070.55	\$110.59 \$115.39 \$103.53	\$2,322.31 \$884.65 \$2,174.08	\$884.65	Hot mix patching

Section Number 00013
 Section Area (sq.m.) 5200.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$5,818.54

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Major	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$2,688.40 \$935.06	\$134.42 \$140.26	\$2,822.82 \$1,075.31	\$1,075.31	Hot mix patching
Centre Lane Crack (Multiple)	10.00%	Moderate	Rout & crack seal	2.50	2.0	\$749.05	\$149.81	\$898.86	\$898.86	Rout & crack seal
Centre Lane Crack (Alligator)	10.00%	Moderate	Rout & crack seal	2.50	2.0	\$749.05	\$149.81	\$898.86	\$898.86	Rout & crack seal
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$216.33	\$216.33	\$216.33	Do nothing
Pavement Edge Crack (Alligator)	20.00%	Moderate	Spray patching	2.20	1.0	\$2,516.80	\$125.84	\$2,642.64	\$2,642.64	Spray patching
Transverse Crack (Multiple)	2.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$86.53	\$86.53	\$86.53	Do nothing

Section Number 00014
 Section Area (sq.m.) 6000.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$9,667.08
 Total EAC for the section (Other) \$18,756.12

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Coarse Aggregate Loss	15.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$857.75	\$857.75	\$857.75	Do nothing
Potholes	45.00%	Moderate	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$6,979.50 \$2,427.55 \$8,788.25	\$348.98 \$364.13 \$878.83	\$7,328.47 \$2,791.68 \$9,667.08	\$2,791.68	Hot mix patching
Centre Lane Crack (Single)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$285.92	\$285.92	\$285.92	Do nothing
Meandering Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,296.43	\$259.29	\$1,555.71	\$1,555.71	Rout & crack seal
Pavement Edge Crack (Multiple)	35.00%	Moderate	Spray patching	2.20	1.0	\$5,082.00	\$254.10	\$5,336.10	\$5,336.10	Spray patching
Pavement Edge Crack (Alligator)	35.00%	Moderate	Spray patching	2.20	1.0	\$5,082.00	\$254.10	\$5,336.10	\$5,336.10	Spray patching
Transverse Crack (Multiple)	25.00%	Moderate	Rout & crack seal	2.50	2.0	\$2,160.71	\$432.14	\$2,592.86	\$2,592.86	Rout & crack seal

Section Number 00015
 Section Area (sq.m.) 5100.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$5,635.44

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Coarse Aggregate Loss	15.00%	Moderate	Cold mix patching	2.35	1.0	\$1,977.53	\$98.88	\$2,076.40	\$790.98	Hot mix patching
			Hot mix patching	2.85	4.0	\$687.81	\$103.17	\$790.98		
Potholes	15.00%	Moderate	Cold mix patching	2.35	1.0	\$1,977.53	\$98.88	\$2,076.40	\$790.98	Hot mix patching
			Hot mix patching	2.85	4.0	\$687.81	\$103.17	\$790.98		
Longitudinal Mid Lane Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,101.96	\$220.39	\$1,322.36	\$1,322.36	Rout & crack seal
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$320.03	\$320.03	\$320.03	Do nothing
Meandering Crack (Multiple)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$367.32	\$73.46	\$440.79	\$440.79	Rout & crack seal
Pavement Edge Crack (Multiple)	5.00%	Moderate	Spray patching	2.20	1.0	\$617.10	\$30.86	\$647.96	\$647.96	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,101.96	\$220.39	\$1,322.36	\$1,322.36	Rout & crack seal

Section Number 00016
 Section Area (sq.m.) 1770.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$2,851.79
 Total EAC for the section (Other) \$4,026.62

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	35.00%	Major	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$1,601.41 \$556.99 \$2,592.53	\$80.07 \$83.55 \$259.25	\$1,681.48 \$640.54 \$2,851.79	\$640.54	Hot mix patching
Longitudinal Mid Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$60.08	\$60.08	\$60.08	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$60.08	\$60.08	\$60.08	Do nothing
Pavement Edge Crack (Multiple)	40.00%	Moderate	Spray patching	2.20	1.0	\$1,713.36	\$85.67	\$1,799.03	\$1,799.03	Spray patching
Transverse Crack (Multiple)	30.00%	Moderate	Rout & crack seal	2.50	2.0	\$764.89	\$152.98	\$917.87	\$917.87	Rout & crack seal
Alligator Crack	30.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$1,372.64 \$477.42	\$68.63 \$71.61	\$1,441.27 \$549.03	\$549.03	Hot mix patching

Section Number 00017
 Section Area (sq.m.) 5464.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$8,803.48
 Total EAC for the section (Other) \$5,550.60

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Minor	Spray patching	2.20	1.0	\$1,322.29	\$66.11	\$1,388.40	\$1,388.40	Spray patching
Wheel Track Rutting	25.00%	Major	Chip seal (fine)	3.50	5.0	\$1,261.22	\$126.12	\$1,387.34	\$1,346.80	Chip seal (course)
			Chip seal (course)	3.25	5.0	\$1,171.13	\$175.67	\$1,346.80		
			Cold mix patching	2.35	1.0	\$3,531.11	\$176.56	\$3,707.67		
			Hot mix patching	2.85	4.0	\$1,228.16	\$184.22	\$1,412.38		
			Cold mill + hot mix patching	5.25	6.0	\$1,646.63	\$82.33	\$1,728.96		
Distortion	15.00%	Moderate	AC overlay + milling	9.00	10.0	\$8,003.17	\$800.32	\$8,803.48		
Meandering Crack (Multiple)	10.00%	Minor	Cold mix patching	2.35	1.0	\$2,118.67	\$105.93	\$2,224.60	\$847.43	Hot mix patching
			Hot mix patching	2.85	4.0	\$736.90	\$110.53	\$847.43		
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$367.49	\$367.49	\$367.49	Do nothing
Transverse Crack (Multiple)	15.00%	Moderate	Do nothing	0.00	0.0	\$0.00	\$183.74	\$183.74	\$183.74	Do nothing
			Rout & crack seal	2.50	2.0	\$1,180.61	\$236.12	\$1,416.74	\$1,416.74	Rout & crack seal

Section Number 00018
Section Area (sq.m.) 1950.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$1,358.63

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Major	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$1,008.15 \$350.65	\$50.41 \$52.60	\$1,058.56 \$403.24	\$403.24	Hot mix patching
Centre Lane Crack (Multiple)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$106.07	\$106.07	\$106.07	Do nothing
Centre Lane Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$53.04	\$53.04	\$53.04	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$53.04	\$53.04	\$53.04	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Minor	Spray patching	2.20	1.0	\$707.85	\$35.39	\$743.24	\$743.24	Spray patching
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$421.34	\$84.27	\$505.61	\$505.61	Rout & crack seal

Section Number 00019
 Section Area (sq.m.) 2320.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$1,277.55

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$1,199.44 \$417.18	\$59.97 \$62.58	\$1,259.41 \$479.76	\$479.76	Hot mix patching
Centre Lane Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$49.06	\$49.06	\$49.06	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$49.06	\$49.06	\$49.06	Do nothing
Pavement Edge Crack (Alligator)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$98.13	\$98.13	\$98.13	Do nothing
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$501.29	\$100.26	\$601.54	\$601.54	Rout & crack seal

Section Number 00020
 Section Area (sq.m.) 4020.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2,392.72

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Minor	Spray patching	2.20	1.0	\$972.84	\$48.64	\$1,021.48	\$1,021.48	Spray patching
Distortion	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$164.46	\$164.46	\$164.46	Do nothing
Centre Lane Crack (Multiple)	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$164.46	\$164.46	\$164.46	Do nothing
Transverse Crack (Alligator)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$868.61	\$173.72	\$1,042.33	\$1,042.33	Rout & crack seal

Section Number 00021 (Gravel)
Section Area (sq.m.) n/a
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
				n/a						

Section Number 00024 (Gravel)
Section Area (sq.m.) n/a
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
				n/a						

Section Number 00022
 Section Area (sq.m.) 2100.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$1,078.11

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Minor	Spray patching	2.20	1.0	\$508.20	\$25.41	\$533.61	\$533.61	Spray patching
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$453.75	\$90.75	\$544.50	\$544.50	Rout & crack seal

Section Number 00023
 Section Area (sq.m.) 962.50
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$1,550.76
 Total EAC for the section (Other) \$1,030.82

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	30.00%	Major	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$746.42 \$259.61 \$1,409.78	\$37.32 \$38.94 \$140.98	\$783.74 \$298.55 \$1,550.76	\$298.55	Hot mix patching
Meandering Crack (Multiple)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$69.32	\$13.86	\$83.19	\$83.19	Rout & crack seal
Pavement Edge Crack (Single)	15.00%	Minor	Spray patching	2.20	1.0	\$349.39	\$17.47	\$366.86	\$366.86	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$69.32	\$13.86	\$83.19	\$83.19	Rout & crack seal
Alligator Crack	20.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$497.61 \$173.08 \$465.85	\$24.88 \$25.96 \$23.29	\$522.49 \$199.04 \$489.14	\$199.04	Hot mix patching

Section Number 00025
 Section Area (sq.m.) 1675.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$1,291.47

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$432.99 \$150.60	\$21.65 \$22.59	\$454.64 \$173.19	\$173.19	Hot mix patching
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$45.56	\$45.56	\$45.56	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Minor	Spray patching	2.20	1.0	\$608.03	\$30.40	\$638.43	\$638.43	Spray patching
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$361.92	\$72.38	\$434.30	\$434.30	Rout & crack seal

Section Number 00026
 Section Area (sq.m.) 4550.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2,522.04

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Minor	Spray patching	2.20	1.0	\$1,101.10	\$55.06	\$1,156.16	\$1,156.16	Spray patching
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$93.07	\$93.07	\$93.07	Do nothing
Pavement Edge Crack (Multiple)	5.00%	Negligible	Do nothing	0.00	0.0	\$0.00	\$93.07	\$93.07	\$93.07	Do nothing
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$983.12	\$196.63	\$1,179.75	\$1,179.75	Rout & crack seal

Section Number 00027
Section Area (sq.m.) 5440.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$8,569.97

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Minor	Spray patching	2.20	1.0	\$2,632.96	\$131.65	\$2,764.61	\$2,764.61	Spray patching
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$177.10	\$177.10	\$177.10	Do nothing
Meandering Crack (Multiple)	2.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$70.84	\$70.84	\$70.84	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$1,974.72	\$98.74	\$2,073.46	\$2,073.46	Spray patching
Pavement Edge Crack (Alligator)	15.00%	Moderate	Spray patching	2.20	1.0	\$1,974.72	\$98.74	\$2,073.46	\$2,073.46	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,175.43	\$235.09	\$1,410.51	\$1,410.51	Rout & crack seal

Section Number 00028
 Section Area (sq.m.) 4100.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$66.03

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	1.00%	Negligible	Do nothing	0.00	0.0	\$0.00	\$9.92	\$9.92	\$9.92	Do nothing
Centre Lane Crack (Multiple)	2.00%	Negligible	Do nothing	0.00	0.0	\$0.00	\$11.81	\$11.81	\$11.81	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$44.29	\$44.29	\$44.29	Do nothing

Section Number 00029
 Section Area (sq.m.) 780.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$14.04

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$5.62	\$5.62	\$5.62	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$8.43	\$8.43	\$8.43	Do nothing

Section Number 00030
Section Area (sq.m.) 3400.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$2,973.04

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Major	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$1,757.80 \$611.38	\$87.89 \$91.71	\$1,845.69 \$703.09	\$703.09	Hot mix patching
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$92.47	\$92.47	\$92.47	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$1,234.20	\$61.71	\$1,295.91	\$1,295.91	Spray patching
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$734.64	\$146.93	\$881.57	\$881.57	Rout & crack seal

Section Number 00031
 Section Area (sq.m.) \$95.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$958.65
 Total EAC for the section (Other) \$551.04

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	25.00%	Moderate	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$384.52 \$133.74 \$871.50	\$19.23 \$20.06 \$87.15	\$403.74 \$153.80 \$958.65	\$153.80	Hot mix patching
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$16.18	\$16.18	\$16.18	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$215.99	\$10.80	\$226.78	\$226.78	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$128.56	\$25.71	\$154.28	\$154.28	Rout & crack seal

Section Number 00032
 Section Area (sq.m.) 4160.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$6,702.51
 Total EAC for the section (Other) \$8,053.66

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (VMC)	EAC + VMC	Min EAC	Optimal Treatment Alternative
Potholes	35.00%	Moderate	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$3,763.76 \$1,309.08 \$6,093.19	\$188.19 \$196.36 \$609.32	\$3,951.95 \$1,505.44 \$6,702.51	\$1,505.44	Hot mix patching
Centre Lane Crack (Multiple)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$299.62	\$59.92	\$359.54	\$359.54	Rout & crack seal
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$1,510.08	\$75.50	\$1,585.58	\$1,585.58	Spray patching
Pavement Edge Crack (Alligator)	15.00%	Moderate	Spray patching	2.20	1.0	\$1,510.08	\$75.50	\$1,585.58	\$1,585.58	Spray patching
Transverse Crack (Multiple)	30.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,797.71	\$359.54	\$2,157.26	\$2,157.26	Rout & crack seal
Alligator Crack	20.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$2,150.72 \$748.04 \$2,013.44	\$107.54 \$112.21 \$100.67	\$2,258.26 \$860.25 \$2,114.11	\$860.25	Hot mix patching

Section Number 00033
Section Area (sq.m.) 740.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$607.17

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	5.00%	Minor	Spray patching	2.20	1.0	\$89.54	\$4.48	\$94.02	\$94.02	Spray patching
Distortion	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$39.23	\$39.23	\$39.23	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Minor	Spray patching	2.20	1.0	\$268.62	\$13.43	\$282.05	\$282.05	Spray patching
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$159.89	\$31.98	\$191.87	\$191.87	Rout & crack seal

Section Number 00034
 Section Area (sq.m.) 1146.25
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$1,454.65

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	15.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$444.46 \$154.59	\$22.22 \$23.19	\$466.68 \$177.78	\$177.78	Hot mix patching
Distortion	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$76.22	\$76.22	\$76.22	Do nothing
Centre Lane Crack (Single)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$38.11	\$38.11	\$38.11	Do nothing
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$38.11	\$38.11	\$38.11	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$416.09	\$20.80	\$436.89	\$436.89	Spray patching
Transverse Crack (Multiple)	20.00%	Moderate	Rout & crack seal	2.50	2.0	\$330.23	\$66.05	\$396.28	\$396.28	Rout & crack seal
Alligator Crack	10.00%	Minor	Spray patching	2.20	1.0	\$277.39	\$13.87	\$291.26	\$291.26	Spray patching

Section Number 00035
 Section Area (sq.m.) 5110.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$4,065.15

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	15.00%	Minor	Spray patching	2.20	1.0	\$1,854.93	\$92.75	\$1,947.68	\$1,947.68	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,104.13	\$220.83	\$1,324.95	\$1,324.95	Rout & crack seal
Alligator Crack	15.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$1,981.40 \$689.15 \$1,854.93	\$99.07 \$103.37 \$92.75	\$2,080.47 \$792.53 \$1,947.68	\$792.53	Hot mix patching

Section Number 00036
 Section Area (sq.m.) 4448.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$7,166.53
 Total EAC for the section (Other) \$9,343.53

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	65.00%	Moderate	Hot mix patching AC overlay + milling	2.85 9.00	4.0 10.0	\$2,599.45 \$6,515.02	\$389.92 \$651.50	\$2,989.37 \$7,166.53	\$2,989.37	Hot mix patching
Distortion	15.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$1,724.71 \$599.87	\$86.24 \$89.98	\$1,810.95 \$689.86	\$689.86	Hot mix patching
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$180.96	\$180.96	\$180.96	Do nothing
Pavement Edge Crack (Multiple)	20.00%	Moderate	Spray patching	2.20	1.0	\$2,152.83	\$107.64	\$2,260.47	\$2,260.47	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$961.09	\$192.22	\$1,153.30	\$1,153.30	Rout & crack seal
Alligator Crack	45.00%	Major	Hot mix patching Improve drainage + hot mix patching	2.85 4.25	4.0 5.0	\$1,799.62 \$2,244.07	\$269.94 \$112.20	\$2,069.57 \$2,356.28	\$2,069.57	Hot mix patching

Section Number 00037
 Section Area (sq.m.) 1500.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$701.80

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$30.68	\$30.68	\$30.68	Do nothing
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$30.68	\$30.68	\$30.68	Do nothing
Transverse Crack (Multiple)	10.00%	Minor	Rout & crack seal	2.50	2.0	\$216.07	\$43.21	\$259.29	\$259.29	Rout & crack seal
Alligator Crack	10.00%	Minor	Spray patching	2.20	1.0	\$363.00	\$18.15	\$381.15	\$381.15	Spray patching

Section Number 00038
 Section Area (sq.m.) 417.50
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$363.59

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$107.92 \$37.54	\$5.40 \$5.63	\$113.32 \$43.17	\$43.17	Hot mix patching
Pavement Edge Crack (Multiple)	20.00%	Major	Spray patching	2.20	1.0	\$202.07	\$10.10	\$212.17	\$212.17	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$90.21	\$18.04	\$108.25	\$108.25	Rout & crack seal

Section Number 00039
 Section Area (sq.m.) 5624.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$8,310.15

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	15.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$2,180.71 \$758.47	\$109.04 \$113.77	\$2,289.74 \$872.24	\$872.24	Hot mix patching
Centre Lane Crack (Multiple)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$405.06	\$81.01	\$486.07	\$486.07	Rout & crack seal
Meandering Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$271.90	\$271.90	\$271.90	Do nothing
Pavement Edge Crack (Alligator)	25.00%	Moderate	Spray patching	2.20	1.0	\$3,402.52	\$170.13	\$3,572.65	\$3,572.65	Spray patching
Transverse Crack (Multiple)	20.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,620.25	\$324.05	\$1,944.30	\$1,944.30	Rout & crack seal
Alligator Crack	20.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$2,907.61 \$1,011.30 \$2,722.02	\$145.38 \$151.69 \$136.10	\$3,052.99 \$1,162.99 \$2,858.12	\$1,162.99	Hot mix patching

Section Number 00040
Section Area (sq.m.) 3900.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$7,089.74

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	15.00%	Minor	Spray patching	2.20	1.0	\$1,415.70	\$70.79	\$1,486.49	\$1,486.49	Spray patching
Distortion	15.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$549.43	\$549.43	\$549.43	Do nothing
Centre Lane Crack (Multiple)	15.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$549.43	\$549.43	\$549.43	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$1,415.70	\$70.79	\$1,486.49	\$1,486.49	Spray patching
Pavement Edge Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$183.14	\$183.14	\$183.14	Do nothing
Transverse Crack (Multiple)	10.00%	Moderate	Rout & crack seal	2.50	2.0	\$561.79	\$112.36	\$674.14	\$674.14	Rout & crack seal
Transverse Crack (Alligator)	10.00%	Moderate	Rout & crack seal	2.50	2.0	\$561.79	\$112.36	\$674.14	\$674.14	Rout & crack seal
Alligator Crack	15.00%	Minor	Spray patching	2.20	1.0	\$1,415.70	\$70.79	\$1,486.49	\$1,486.49	Spray patching

Section Number 00041
 Section Area (sq.m.) 7073.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2,037.70

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Distortion	5.00%	Negligible	Do nothing	0.00	0.0	\$0.00	\$101.88	\$101.88	\$101.88	Do nothing
Centre Lane Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,528.27	\$305.65	\$1,833.93	\$1,833.93	Rout & crack seal
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$101.88	\$101.88	\$101.88	Do nothing

Section Number 00042
 Section Area (sq.m.) 3660.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2,457.87

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	5.00%	Minor	Spray patching	2.20	1.0	\$442.86	\$22.14	\$465.00	\$465.00	Spray patching
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$44.29	\$44.29	\$44.29	Do nothing
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$44.29	\$44.29	\$44.29	Do nothing
Pavement Edge Crack (Alligator)	20.00%	Moderate	Spray patching	2.20	1.0	\$1,771.44	\$88.57	\$1,860.01	\$1,860.01	Spray patching
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$44.29	\$44.29	\$44.29	Do nothing

Section Number 00043
Section Area (sq.m.) 330.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$218.09

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$6.75	\$6.75	\$6.75	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Minor	Spray patching	2.20	1.0	\$119.79	\$5.99	\$125.78	\$125.78	Spray patching
Transverse Crack (Multiple)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$71.30	\$14.26	\$85.56	\$85.56	Rout & crack seal

Section Number 00044
Section Area (sq.m.) 325.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$9.41

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$5.90	\$5.90	\$5.90	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$3.51	\$3.51	\$3.51	Do nothing

Section Number 00045
 Section Area (sq.m.) 4480.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$7,252.38

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (VMC)	EAC + VMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$2,316.16 \$805.59	\$115.81 \$120.84	\$2,431.97 \$926.42	\$926.42	Hot mix patching
Wheel Track Rutting	25.00%	Moderate	Chip seal (fine) Chip seal (course) Cold mix patching Hot mix patching	3.50 3.25 2.35 2.85	5.0 5.0 1.0 4.0	\$1,034.09 \$960.22 \$2,895.20 \$1,006.98	\$103.41 \$144.03 \$434.28 \$151.05	\$1,137.49 \$1,104.26 \$3,329.48 \$1,158.03	\$1,104.26	Chip seal (course)
Centre Lane Crack (Multiple)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$322.67	\$64.53	\$387.20	\$387.20	Rout & crack seal
Centre Lane Crack (Alligator)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$322.67	\$64.53	\$387.20	\$387.20	Rout & crack seal
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$968.00	\$193.60	\$1,161.60	\$1,161.60	Rout & crack seal
Transverse Crack (Alligator)	20.00%	Major	Rout & crack seal	2.50	2.0	\$1,290.67	\$258.13	\$1,548.80	\$1,548.80	Rout & crack seal
Alligator Crack	15.00%	Moderate	Spray patching Cold mix patching Hot mix patching	2.20 2.35 2.85	1.0 1.0 4.0	\$1,626.24 \$1,737.12 \$604.19	\$81.31 \$86.86 \$90.63	\$1,707.55 \$1,823.98 \$694.82	\$694.82	Hot mix patching
Map Crack	5.00%	Moderate	Do nothing	0.00	0.0	\$0.00	\$347.36	\$347.36	\$347.36	Do nothing
Pavement Edge Crack (Single)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$347.36	\$347.36	\$347.36	Do nothing
Longitudinal Mid Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$347.36	\$347.36	\$347.36	Do nothing

Section Number 00046
 Section Area (sq.m.) 725.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$12.72

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$4.89	\$4.89	\$4.89	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$7.83	\$7.83	\$7.83	Do nothing

Section Number 00047
 Section Area (sq.m.) 810.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$1,325.97

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	15.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$314.08 \$109.24	\$15.70 \$16.39	\$329.78 \$125.63	\$125.63	Hot mix patching
Distortion	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$209.39 \$72.83	\$10.47 \$10.92	\$219.85 \$83.75	\$83.75	Hot mix patching
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$37.85	\$37.85	\$37.85	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$294.03	\$14.70	\$308.73	\$308.73	Spray patching
Pavement Edge Crack (Alligator)	15.00%	Moderate	Spray patching	2.20	1.0	\$294.03	\$14.70	\$308.73	\$308.73	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$175.02	\$35.00	\$210.02	\$210.02	Rout & crack seal
Alligator Crack	30.00%	Major	Hot mix patching Improve drainage + hot mix patching	2.85 4.25	4.0 5.0	\$218.48 \$272.44	\$32.77 \$13.62	\$251.25 \$286.06	\$251.25	Hot mix patching

Section Number 00048
 Section Area (sq.m.) 4860.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$11,396.31

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	25.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$3,140.78 \$1,092.40	\$157.04 \$163.86	\$3,297.81 \$1,256.26	\$1,256.26	Hot mix patching
Distortion	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$1,256.31 \$436.96	\$62.82 \$65.54	\$1,319.13 \$502.50	\$502.50	Hot mix patching
Pavement Edge Crack (Multiple)	30.00%	Moderate	Spray patching	2.20	1.0	\$3,528.36	\$176.42	\$3,704.78	\$3,704.78	Spray patching
Pavement Edge Crack (Alligator)	45.00%	Major	Chip seal (fine) Chip seal (course)	3.50 3.25	5.0 5.0	\$2,019.24 \$1,875.01	\$201.92 \$281.25	\$2,221.16 \$2,156.26	\$2,156.26	Chip seal (course)
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$1,050.11	\$210.02	\$1,260.13	\$1,260.13	Rout & crack seal
Transverse Crack (Alligator)	15.00%	Minor	Rout & crack seal	2.50	2.0	\$1,050.11	\$210.02	\$1,260.13	\$1,260.13	Rout & crack seal
Alligator Crack	25.00%	Major	Hot mix patching Improve drainage + hot mix patching	2.85 4.25	4.0 5.0	\$1,092.40 \$1,362.18	\$163.86 \$68.11	\$1,256.26 \$1,430.29	\$1,256.26	Hot mix patching

Section Number 00049
 Section Area (sq.m.) 1080.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$1,777.09

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (VMC)	EAC + VMC	Min EAC	Optimal Treatment Alternative
Potholes	15.00%	Minor	Spray patching	2.20	1.0	\$392.04	\$19.60	\$411.64	\$411.64	Spray patching
Distortion	10.00%	Moderate	Cold mix patching	2.35	1.0	\$279.18	\$13.96	\$293.14	\$111.67	Hot mix patching
			Hot mix patching	2.85	4.0	\$97.10	\$14.57	\$111.67		
Longitudinal Wheel Track Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$58.75	\$58.75	\$58.75	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Minor	Spray patching	2.20	1.0	\$392.04	\$19.60	\$411.64	\$411.64	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$233.36	\$46.67	\$280.03	\$280.03	Rout & crack seal
Transverse Crack (Alligator)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$233.36	\$46.67	\$280.03	\$280.03	Rout & crack seal
Alligator Crack	20.00%	Major	Cold mix patching	2.35	1.0	\$558.36	\$27.92	\$586.28	\$223.33	Hot mix patching
			Hot mix patching	2.85	4.0	\$194.20	\$29.13	\$223.33		
			Improve drainage + hot mix patching	4.25	5.0	\$242.17	\$12.11	\$254.27		

Section Number 00050
Section Area (sq.m.) 1085.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$1,273.35

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$560.95 \$195.10	\$28.05 \$29.27	\$588.99 \$224.37	\$224.37	Hot mix patching
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$36.83	\$36.83	\$36.83	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$36.83	\$36.83	\$36.83	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$393.86	\$19.69	\$413.55	\$413.55	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$234.44	\$46.89	\$281.33	\$281.33	Rout & crack seal
Alligator Crack	25.00%	Major	Hot mix patching Improve drainage + hot mix patching	2.85 4.25	4.0 5.0	\$243.88 \$304.11	\$36.58 \$15.21	\$280.46 \$319.31	\$280.46	Hot mix patching

Section Number 00051
Section Area (sq.m.) 1400.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$1,540.89

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	1.00%	Minor	Spray patching	2.20	1.0	\$33.88	\$1.69	\$35.57	\$35.57	Spray patching
Distortion	2.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$18.23	\$18.23	\$18.23	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Minor	Spray patching	2.20	1.0	\$508.20	\$25.41	\$533.61	\$533.61	Spray patching
Pavement Edge Crack (Alligator)	20.00%	Moderate	Spray patching	2.20	1.0	\$677.60	\$33.88	\$711.48	\$711.48	Spray patching
Transverse Crack (Multiple)	10.00%	Minor	Rout & crack seal	2.50	2.0	\$201.67	\$40.33	\$242.00	\$242.00	Rout & crack seal

Section Number 00052
Section Area (sq.m.) 1260.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$1,587.49

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	15.00%	Major	Cold mix patching	2.35	1.0	\$488.57	\$24.43	\$512.99	\$195.42	Hot mix patching
			Hot mix patching	2.85	4.0	\$169.93	\$25.49	\$195.42		
Distortion	10.00%	Moderate	Cold mix patching	2.35	1.0	\$325.71	\$16.29	\$342.00	\$130.28	Hot mix patching
			Hot mix patching	2.85	4.0	\$113.29	\$16.99	\$130.28		
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$457.38	\$22.87	\$480.25	\$480.25	Spray patching
Pavement Edge Crack (Alligator)	15.00%	Moderate	Spray patching	2.20	1.0	\$457.38	\$22.87	\$480.25	\$480.25	Spray patching
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$40.74	\$40.74	\$40.74	Do nothing
Alligator Crack	20.00%	Major	Cold mix patching	2.35	1.0	\$651.42	\$32.57	\$683.99	\$260.56	Hot mix patching
			Hot mix patching	2.85	4.0	\$226.57	\$33.99	\$260.56		
			Improve drainage + hot mix patching	4.25	5.0	\$282.53	\$14.13	\$296.65		

Section Number 00053
 Section Area (sq.m.) 770.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$53.11

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	2.00%	Minor	Spray patching	2.20	1.0	\$37.27	\$1.86	\$39.13	\$39.13	Spray patching
Distortion	10.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$9.32	\$9.32	\$9.32	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$4.66	\$4.66	\$4.66	Do nothing

Section Number 00054
 Section Area (sq.m.) 787.50
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$201.63

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	5.00%	Minor	Spray patching	2.20	1.0	\$95.29	\$4.76	\$100.05	\$100.05	Spray patching
Distortion	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$203.57 \$70.80	\$10.18 \$10.62	\$213.75 \$81.42	\$81.42	Hot mix patching
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$10.07	\$10.07	\$10.07	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$10.07	\$10.07	\$10.07	Do nothing

Section Number 00055
 Section Area (sq.m.) 1080.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section (AC overlay + milling) \$1,740.07
 Total EAC for the section (Other) \$1,381.05

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	25.00%	Major	Cold mix patching Hot mix patching AC overlay + milling	2.35 2.85 9.00	1.0 4.0 10.0	\$697.95 \$242.75 \$1,581.89	\$34.90 \$36.41 \$158.19	\$732.85 \$279.17 \$1,740.07	\$279.17	Hot mix patching
Centre Lane Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$27.63	\$27.63	\$27.63	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Major	Spray patching	2.20	1.0	\$392.04	\$19.60	\$411.64	\$411.64	Spray patching
Pavement Edge Crack (Alligator)	15.00%	Moderate	Spray patching	2.20	1.0	\$392.04	\$19.60	\$411.64	\$411.64	Spray patching
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$27.63	\$27.63	\$27.63	Do nothing
Alligator Crack	20.00%	Major	Cold mix patching Hot mix patching Improve drainage + hot mix patching	2.35 2.85 4.25	1.0 4.0 5.0	\$558.36 \$194.20 \$242.17	\$27.92 \$29.13 \$12.11	\$586.28 \$223.33 \$254.27	\$223.33	Hot mix patching

Section Number 00056
 Section Area (sq.m.) 840.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$29.99

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$5.66	\$5.66	\$5.66	Do nothing
Meandering Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$9.08	\$9.08	\$9.08	Do nothing
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$15.25	\$15.25	\$15.25	Do nothing

Section Number 00057
 Section Area (sq.m.) 1060.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$936,21

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Coarse Aggregate Loss	15.00%	Moderate	Cold mix patching Hot mix patching	2.35	1.0	\$411.02	\$20.55	\$431.57	\$164.40	Hot mix patching
				2.85	4.0	\$142.96	\$21.44	\$164.40		
Potholes	15.00%	Moderate	Cold mix patching Hot mix patching	2.35	1.0	\$411.02	\$20.55	\$431.57	\$164.40	Hot mix patching
				2.85	4.0	\$142.96	\$21.44	\$164.40		
Centre Lane Crack (Multiple)	2.00%	Negligible	Do nothing	0.00	0.0	\$0.00	\$11.14	\$11.14	\$11.14	Do nothing
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$384.78	\$19.24	\$404.02	\$404.02	Spray patching
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$27.86	\$27.86	\$27.86	Do nothing
Alligator Crack	15.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35	1.0	\$411.02	\$20.55	\$431.57	\$164.40	Hot mix patching
				2.85	4.0	\$142.96	\$21.44	\$164.40		
				2.20	1.0	\$384.78	\$19.24	\$404.02		

Section Number 00058
Section Area (sq.m.) 1650.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$399.49

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Coarse Aggregate Loss	2.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$13.50	\$13.50	\$13.50	Do nothing
Pavement Edge Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$33.75	\$33.75	\$33.75	Do nothing
Transverse Crack (Multiple)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$118.84	\$23.77	\$142.61	\$142.61	Rout & crack seal
Alligator Crack	5.00%	Minor	Spray patching	2.20	1.0	\$199.65	\$9.98	\$209.63	\$209.63	Spray patching

Section Number 00059
 Section Area (sq.m.) 945.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$209.47

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Pavement Edge Crack (Multiple)	2.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$7.73	\$7.73	\$7.73	Do nothing
Pavement Edge Crack (Alligator)	5.00%	Moderate	Spray patching	2.20	1.0	\$114.35	\$5.72	\$120.06	\$120.06	Spray patching
Transverse Crack (Multiple)	5.00%	Moderate	Rout & crack seal	2.50	2.0	\$68.06	\$13.61	\$81.68	\$81.68	Rout & crack seal

Section Number 00060
 Section Area (sq.m.) 2485.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$16.76

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$16.76	\$16.76	\$16.76	Do nothing

Section Number 00061
 Section Area (sq.m.) 250.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$2.70

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$2.70	\$2.70	\$2.70	Do nothing

Section Number 00062
 Section Area (sq.m.) 705.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$718.05

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	20.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$364.49 \$126.77	\$18.22 \$19.02	\$382.71 \$145.79	\$145.79	Hot mix patching
Pavement Edge Crack (Multiple)	15.00%	Moderate	Spray patching	2.20	1.0	\$255.92	\$12.80	\$268.71	\$268.71	Spray patching
Transverse Crack (Multiple)	15.00%	Moderate	Rout & crack seal	2.50	2.0	\$152.33	\$30.47	\$182.80	\$182.80	Rout & crack seal
Alligator Crack	10.00%	Moderate	Cold mix patching Hot mix patching Spray patching	2.35 2.85 2.20	1.0 4.0 1.0	\$182.24 \$63.39 \$170.61	\$9.11 \$9.51 \$8.53	\$191.35 \$72.89 \$179.14	\$72.89	Hot mix patching
Map Crack	10.00%	Moderate	Do nothing	0.00	0.0	\$0.00	\$47.86	\$47.86	\$47.86	Do nothing

Section Number 00063
 Section Area (sq.m.) 4550.00
 Interest Rate 10.00%
 Salvage Value \$0.00
 Total EAC for the section \$167.66

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$30.68	\$30.68	\$30.68	Do nothing
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$32.77	\$32.77	\$32.77	Do nothing
Pavement Edge Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$55.06	\$55.06	\$55.06	Do nothing
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$49.16	\$49.16	\$49.16	Do nothing

00064
Section Area (sq.m.) 1350.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$196.02

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	5.00%	Minor	Spray patching	2.20	1.0	\$163.35	\$8.17	\$171.52	\$171.52	Spray patching
Distortion	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$8.17	\$8.17	\$8.17	Do nothing
Centre Lane Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$8.17	\$8.17	\$8.17	Do nothing
Pavement Edge Crack (Alligator)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$8.17	\$8.17	\$8.17	Do nothing

00065
Section Area (sq.m.) 1950.00
Interest Rate 10.00%
Salvage Value \$0.00
Total EAC for the section \$483.91

Distresses Present	Area Affected	Severity	Suggested Treatment Alternatives	Unit Cost (\$/sq.m.)	Exp. Life (years)	Equivalent Annual Cost (EAC)	Yearly Maintenance Cost (YMC)	EAC + YMC	Min EAC	Optimal Treatment Alternative
Potholes	10.00%	Moderate	Cold mix patching Hot mix patching	2.35 2.85	1.0 4.0	\$504.08 \$175.32	\$25.20 \$26.30	\$529.28 \$201.62	\$201.62	Hot mix patching
Transverse Crack (Multiple)	5.00%	Minor	Do nothing	0.00	0.0	\$0.00	\$17.27	\$17.27	\$17.27	Do nothing
Alligator Crack	5.00%	Moderate	Spray patching	2.20	1.0	\$235.95	\$11.80	\$247.75	\$247.75	Spray patching
Map Crack	5.00%	Moderate	Do nothing	0.00	0.0	\$0.00	\$17.27	\$17.27	\$17.27	Do nothing

Priority Programming (Planning Year 2000/2001)

Threshold PCR/PCI **Budget for the** **\$140,000.00**
 Maximum 70.00 year 2000-2001
 Minimum 30.00

Section Number	Numeric Values				Priority Score (PS)	PCR/PCI (before improvement)	Total EAC (\$)	Budget Remaining	Improvements
	Road Classification RC	Drainage (DC)	AADT (TI)	Need's Index (NI)					
00001	0.2857	0.1695	0.1429	0.0449	0.0269	88.76	\$58.48		
00002	0.5714	0.1695	0.2857	0.0225	0.0231	94.22	\$349.72		
00003	0.2857	0.2542	0.1429	0.0449	0.0307	86.44	\$1,844.34		
00004	0.2857	0.2542	0.1429	0.0899	0.0614	60.45	\$2,116.92		
00005	0.2857	0.2542	0.1429	0.0562	0.0384	75.16	\$2,759.25		
00006	0.5714	0.2542	0.2857	0.0899	0.0999	63.40	\$5,096.90		
00007	0.5714	0.2542	0.2857	0.1124	0.1249	59.20	\$3,582.52		
00008	0.1429	0.2542	0.1429	0.0562	0.0303	73.94	\$155.57		
00009	0.1429	0.5085	0.1429	0.0899	0.0714	69.85	\$879.00		
00010	0.2857	0.5085	0.2857	0.1124	0.1214	57.06	\$9,659.02		
00011	0.2857	0.5085	0.1429	0.0899	0.0842	61.71	\$2,425.35		
00012	0.1429	0.5085	0.1429	0.1124	0.0893	50.56	\$6,534.90		
00013	0.1429	0.2542	0.1429	0.0899	0.0485	63.45	\$5,818.54		
00014	0.1429	0.5085	0.1429	0.0899	0.0714	61.00	\$9,667.08		
00015	0.1429	0.2542	0.1429	0.1124	0.0607	50.51	\$5,635.44		
00016	0.1429	0.5085	0.1429	0.1124	0.0893	49.60	\$2,851.79		
00017	0.5714	0.2542	0.2857	0.0899	0.0999	63.43	\$5,550.60		
00018	0.1429	0.5085	0.1429	0.0899	0.0714	67.64	\$1,358.63		
00019	0.2857	0.2542	0.2857	0.0899	0.0742	60.69	\$1,277.55		
00020	0.2857	0.2542	0.2857	0.0562	0.0464	76.87	\$2,392.72		
00021	0.1429	0.0000	0.1429	0.5056	0.0000	0.00	\$0.00		
00022	0.1429	0.2542	0.1429	0.0562	0.0303	76.04	\$1,078.11		
00023	0.1429	0.5085	0.1429	0.0899	0.0714	68.40	\$1,030.82		
00024	0.1429	0.0000	0.1429	0.5056	0.0000	0.00	\$0.00		
00025	0.2857	0.2542	0.2857	0.0562	0.0464	78.23	\$1,291.47		
00026	0.1429	0.2542	0.1429	0.0562	0.0303	75.75	\$2,522.04		
00027	0.5714	0.1695	0.2857	0.0562	0.0577	76.87	\$8,569.97		
00028	0.5714	0.1695	0.2857	0.0449	0.0461	88.35	\$66.03		
00029	0.2857	0.2542	0.1429	0.0449	0.0307	86.01	\$14.04		
00030	0.1429	0.5085	0.1429	0.0899	0.0714	64.58	\$2,973.04		

Section Number	Road Classification RC	Numeric Values			Priority Score (PS)	PCR/PCI (before improvement)	Total EAC (\$)	Budget Remaining	Improvements
		Drainage (DC)	AADT (TI)	Need's Index (NI)					
00031	0.1429	0.5085	0.1429	0.0899	0.0714	60.69	\$551.04		
00032	0.1429	0.2542	0.1429	0.0899	0.0485	61.00	\$6,702.51		
00033	0.1429	0.2542	0.1429	0.0899	0.0485	68.12	\$607.17		
00034	0.1429	0.5085	0.1429	0.1124	0.0893	58.62	\$1,454.65		
00035	0.2857	0.2542	0.2857	0.0899	0.0742	63.81	\$4,065.15		
00036	0.1429	0.5085	0.1429	0.1124	0.0893	55.68	\$7,166.53		
00037	0.1429	0.2542	0.1429	0.0562	0.0303	75.04	\$701.80		
00038	0.1429	0.5085	0.1429	0.0899	0.0714	64.83	\$363.59		
00039	0.2857	0.2542	0.2857	0.0899	0.0742	67.77	\$8,310.15		
00040	0.5714	0.2542	0.2857	0.0899	0.0999	66.76	\$7,089.74		
00041	0.5714	0.2542	0.2857	0.0449	0.0499	82.33	\$2,037.70		
00042	0.2857	0.2542	0.2857	0.0562	0.0464	77.12	\$2,457.87		
00043	0.1429	0.5085	0.1429	0.0562	0.0446	72.47	\$218.09		
00044	0.1429	0.5085	0.1429	0.0562	0.0446	76.93	\$9.41		
00045	0.5714	0.2542	0.2857	0.1124	0.1249	50.50	\$7,252.38		
00046	0.1429	0.2542	0.1429	0.0562	0.0303	72.81	\$12.72		
00047	0.1429	0.2542	0.1429	0.1124	0.0607	58.95	\$1,325.97		
00048	0.1429	0.2542	0.1429	0.1124	0.0607	53.51	\$11,396.31		
00049	0.1429	0.2542	0.1429	0.1124	0.0607	55.63	\$1,777.09		
00050	0.1429	0.2542	0.1429	0.1124	0.0607	53.48	\$1,273.35		
00051	0.1429	0.2542	0.1429	0.0562	0.0303	73.92	\$1,540.89		
00052	0.1429	0.5085	0.1429	0.1124	0.0893	52.58	\$1,587.49		
00053	0.1429	0.2542	0.1429	0.0562	0.0303	71.79	\$53.11		
00054	0.1429	0.2542	0.1429	0.0562	0.0303	70.94	\$201.63		
00055	0.1429	0.2542	0.1429	0.0899	0.0485	60.79	\$1,381.05		
00056	0.1429	0.2542	0.1429	0.0562	0.0303	78.96	\$29.99		
00057	0.1429	0.2542	0.1429	0.0899	0.0485	64.78	\$936.21		
00058	0.1429	0.2542	0.1429	0.0562	0.0303	74.57	\$399.49		
00059	0.1429	0.2542	0.1429	0.0562	0.0303	78.90	\$209.47		
00060	0.2857	0.2542	0.1429	0.0562	0.0307	82.52	\$16.76		
00061	0.1429	0.2542	0.1429	0.0449	0.0303	77.11	\$2.70		
00062	0.1429	0.2542	0.1429	0.1124	0.0607	59.20	\$718.05		
00063	0.2857	0.2542	0.2857	0.0562	0.0464	78.41	\$167.66		
00064	0.1429	0.2542	0.1429	0.0562	0.0303	74.98	\$196.02		
00065	0.1429	0.2542	0.1429	0.0562	0.0303	70.49	\$483.91		

Section Number	Road Classification RC	Numeric Values			Priority Score (PS)	PCR/PCI (before improvement)	Total EAC (\$)	Budget Remaining	Improvements
		Drainage (DC)	AADT (TI)	Need's Index (NI)					
Prioritization									
00007	0.5714	0.2542	0.2857	0.1124	0.1249	59.20	\$3,582.52	\$136,417.48	YES
00045	0.5714	0.2542	0.2857	0.1124	0.1249	50.50	\$7,252.38	\$129,165.11	YES
00010	0.2857	0.5085	0.2857	0.1124	0.1214	57.06	\$9,659.02	\$119,506.08	YES
00040	0.5714	0.2542	0.2857	0.0899	0.0999	66.76	\$7,089.74	\$112,416.35	YES
00017	0.5714	0.2542	0.2857	0.0899	0.0999	63.43	\$5,550.60	\$106,865.75	YES
00006	0.5714	0.2542	0.2857	0.0899	0.0999	63.40	\$5,096.90	\$101,768.85	YES
00034	0.1429	0.5085	0.1429	0.1124	0.0893	58.62	\$1,454.65	\$100,314.20	YES
00036	0.1429	0.5085	0.1429	0.1124	0.0893	55.68	\$7,166.53	\$93,147.67	YES
00052	0.1429	0.5085	0.1429	0.1124	0.0893	52.58	\$1,587.49	\$91,560.19	YES
00012	0.1429	0.5085	0.1429	0.1124	0.0893	50.56	\$6,534.90	\$85,025.29	YES
00016	0.1429	0.5085	0.1429	0.1124	0.0893	49.60	\$2,851.79	\$82,173.50	YES
00011	0.2857	0.5085	0.1429	0.0899	0.0842	61.71	\$2,425.35	\$79,748.15	YES
00039	0.2857	0.2542	0.2857	0.0899	0.0742	67.77	\$8,310.15	\$71,438.00	YES
00035	0.2857	0.2542	0.2857	0.0899	0.0742	63.81	\$4,065.15	\$67,372.85	YES
00019	0.2857	0.2542	0.2857	0.0899	0.0742	60.69	\$1,277.55	\$66,095.30	YES
00009	0.1429	0.5085	0.1429	0.0899	0.0714	69.85	\$879.00	\$65,216.30	YES
00023	0.1429	0.5085	0.1429	0.0899	0.0714	68.40	\$1,030.82	\$64,185.48	YES
00018	0.1429	0.5085	0.1429	0.0899	0.0714	67.64	\$1,358.63	\$62,826.85	YES
00038	0.1429	0.5085	0.1429	0.0899	0.0714	64.83	\$363.59	\$62,463.25	YES
00030	0.1429	0.5085	0.1429	0.0899	0.0714	64.58	\$2,973.04	\$59,490.21	YES
00014	0.1429	0.5085	0.1429	0.0899	0.0714	61.00	\$9,667.08	\$49,823.13	YES
00031	0.1429	0.5085	0.1429	0.0899	0.0714	60.69	\$551.04	\$49,272.09	YES
00004	0.2857	0.2542	0.1429	0.0899	0.0614	60.45	\$2,116.92	\$47,155.17	YES
00062	0.1429	0.2542	0.1429	0.1124	0.0607	59.20	\$718.05	\$46,437.12	YES
00047	0.1429	0.2542	0.1429	0.1124	0.0607	58.95	\$1,325.97	\$45,111.16	YES
00049	0.1429	0.2542	0.1429	0.1124	0.0607	55.63	\$1,777.09	\$43,334.07	YES
00048	0.1429	0.2542	0.1429	0.1124	0.0607	53.51	\$11,396.31	\$31,937.76	YES
00050	0.1429	0.2542	0.1429	0.1124	0.0607	53.48	\$1,273.35	\$30,664.41	YES
00015	0.1429	0.2542	0.1429	0.1124	0.0607	50.51	\$5,635.44	\$25,028.97	YES
00027	0.5714	0.1695	0.2857	0.0562	0.0577	76.87	\$8,569.97	\$16,459.00	YES
00041	0.5714	0.2542	0.2857	0.0449	0.0499	82.33	\$2,037.70	\$14,421.30	YES
00033	0.1429	0.2542	0.1429	0.0899	0.0485	68.12	\$607.17	\$13,814.14	YES
00057	0.1429	0.2542	0.1429	0.0899	0.0485	64.78	\$936.21	\$12,877.92	YES
00013	0.1429	0.2542	0.1429	0.0899	0.0485	63.45	\$5,818.54	\$7,059.39	YES

Section Number	Road Classification RC	Numeric Values			Priority Score (PS)	PCR/PCI (before improvement)	Total EAC (\$)	Budget Remaining	Improvements
		Drainage (DC)	AADT (TI)	Need's Index (NI)					
Prioritization	0.1429	0.2542	0.1429	0.0899	0.0485	61.00	\$6,702.51	\$356.88	YES
00055	0.1429	0.2542	0.1429	0.0899	0.0485	60.79	\$1,381.05	-\$1,024.17	NO
00063	0.2857	0.2542	0.2857	0.0562	0.0464	78.41	\$167.66	-\$1,191.84	NO
00025	0.2857	0.2542	0.2857	0.0562	0.0464	78.23	\$1,291.47	-\$2,483.31	NO
00042	0.2857	0.2542	0.2857	0.0562	0.0464	77.12	\$2,457.87	-\$4,941.18	NO
00020	0.2857	0.2542	0.2857	0.0562	0.0464	76.87	\$2,392.72	-\$7,333.91	NO
00028	0.5714	0.1695	0.2857	0.0449	0.0461	88.35	\$66.03	-\$7,399.94	NO
00044	0.1429	0.5085	0.1429	0.0562	0.0446	76.93	\$9.41	-\$7,409.35	NO
00043	0.1429	0.5085	0.1429	0.0562	0.0446	72.47	\$218.09	-\$7,627.44	NO
00005	0.2857	0.2542	0.1429	0.0562	0.0384	75.16	\$2,759.25	-\$10,386.69	NO
00003	0.2857	0.2542	0.1429	0.0449	0.0307	86.44	\$1,844.34	-\$12,231.03	NO
00029	0.2857	0.2542	0.1429	0.0449	0.0307	86.01	\$14.04	-\$12,245.08	NO
00060	0.2857	0.2542	0.1429	0.0449	0.0307	82.52	\$16.76	-\$12,261.84	NO
00056	0.1429	0.2542	0.1429	0.0562	0.0303	78.96	\$29.99	-\$12,291.82	NO
00059	0.1429	0.2542	0.1429	0.0562	0.0303	78.90	\$209.47	-\$12,501.29	NO
00061	0.1429	0.2542	0.1429	0.0562	0.0303	77.11	\$2.70	-\$12,503.99	NO
00022	0.1429	0.2542	0.1429	0.0562	0.0303	76.04	\$1,078.11	-\$13,582.10	NO
00026	0.1429	0.2542	0.1429	0.0562	0.0303	75.75	\$2,522.04	-\$16,104.14	NO
00037	0.1429	0.2542	0.1429	0.0562	0.0303	75.04	\$701.80	-\$16,805.94	NO
00064	0.1429	0.2542	0.1429	0.0562	0.0303	74.98	\$196.02	-\$17,001.96	NO
00058	0.1429	0.2542	0.1429	0.0562	0.0303	74.57	\$399.49	-\$17,401.45	NO
00008	0.1429	0.2542	0.1429	0.0562	0.0303	73.94	\$155.57	-\$17,557.03	NO
00051	0.1429	0.2542	0.1429	0.0562	0.0303	73.92	\$1,540.89	-\$19,097.92	NO
00046	0.1429	0.2542	0.1429	0.0562	0.0303	72.81	\$12.72	-\$19,110.64	NO
00053	0.1429	0.2542	0.1429	0.0562	0.0303	71.79	\$53.11	-\$19,163.75	NO
00054	0.1429	0.2542	0.1429	0.0562	0.0303	70.94	\$201.63	-\$19,365.37	NO
00065	0.1429	0.2542	0.1429	0.0562	0.0303	70.49	\$483.91	-\$19,849.28	NO
00001	0.2857	0.1695	0.1429	0.0449	0.0269	88.76	\$58.48	-\$19,907.77	NO
00002	0.5714	0.1695	0.2857	0.0225	0.0231	94.22	\$349.72	-\$20,257.48	NO
00021	0.1429	0.0000	0.1429	0.5056	0.0000	0.00	\$0.00	-\$20,257.48	NO
00024	0.1429	0.0000	0.1429	0.5056	0.0000	0.00	\$0.00	-\$20,257.48	NO

**Summary of Maintenance and Rehabilitation Strategies
for the year 2000/2001**

Planning Year	Item	
2000/2001	Total Budget	\$140,000.00
	Total EAC excluding Agency Cost (\$)	\$160,257.48
	Expenditure on Repairs (\$)	\$139,643.12
	Deficiency or Surplus (\$)	-\$20,614.36
	Total Number of Sections	65
	Sections Improved	35
	Avg.Overall PCR/PCI (Calculated)	66.37
	(Before Improvement)	

**APPENDIX G: CANADIAN FORCES BASE KINGSTON – BASE
SITE PLAN (Presentation Edition: May, 2000)**

Figure G2: McNughton Barracks

Figure G3: Royal Military College of Canada

APPENDIX H: TRAFFIC DATA FOR CFB KINGSTON AT STRATEGIC LOCATIONS

Table H: Traffic Data for CFB Kingston

Location: At the intersection of Apprentice St. and Artisan Rd. on Highway 2 **Location:** Craftsman Blvd on Highway 15 **Location:** Craftsman Blvd on Highway 2

Date	24-Hour Volume (both lanes) (vehicles)	Date	24-Hour Volume (both lanes) (vehicles)	Date	24-Hour Volume (both lanes) (vehicles)
1/9/99	3398	1/9/99	2070	1/9/99	2938
2/9/99	3366	2/9/99	2117	2/9/99	2669
3/9/99	2713	3/9/99	1975	3/9/99	2137
4/9/99	1120	4/9/99	1155	4/9/99	579
5/9/99	856	5/9/99	767	5/9/99	538
6/9/99	1130	6/9/99	628	6/9/99	708
7/9/99	2529	7/9/99	2128	7/9/99	2469

7-Day Average Volume

2159 1549 1720

Adjusted 7-Day Average Volume (pcu/day)

2694 1932 2146

Annual Average Daily Traffic (pcu/day)

2828 2029 2253

Location: At the intersection of Crerar Cr. and Precision Dr.

Location: Duty Drive on Highway 2

Location: Estafetein St. on Highway 15

Date	24-Hour Volume (both lanes) (vehicles)	Date	24-Hour Volume (both lanes) (vehicles)	Date	24-Hour Volume (both lanes) (vehicles)
9/9/99	1996	9/9/99	854	1/9/99	1498
10/9/99	1936	10/9/99	736	2/9/99	1469
11/9/99	417	11/9/99	317	3/9/99	1230
12/9/99	420	12/9/99	235	4/9/99	353
13/9/99	1977	13/9/99	556	5/9/99	340
14/9/99	2125	14/9/99	573	6/9/99	566
15/9/99	2071	15/9/99	551	7/9/99	1373

Table H: Traffic Data for CFB Kingston

7-Day Average Volume	1563	546	976
Adjusted 7-Day Average Volume (pcu/day)	1950	681	1217
Annual Average Daily Traffic (pcu/day)	2048	715	1278

Location: At the intersection of Lundy's Ln.
and Canal Du Nord Dr.

Location: At the intersection of Lundy's Ln.
and Niagara Park

Location: Niagara Park and Highway 2

Date	24-Hour Volume (both lanes) (vehicles)	Date	24-Hour Volume (both lanes) (vehicles)	Date	24-Hour Volume (both lanes) (vehicles)
31/8/99	903	31/8/99	2598	31/8/99	4038
1/9/99	939	1/9/99	2383	1/9/99	3726
2/9/99	1016	2/9/99	2558	2/9/99	3755
3/9/99	805	3/9/99	2458	3/9/99	3655
4/9/99	431	4/9/99	1676	4/9/99	2489
5/9/99	365	5/9/99	1481	5/9/99	2061
6/9/99	381	6/9/99	1385	6/9/99	2040

7-Day Average Volume

Adjusted 7-Day Average Volume (pcu/day)	691	2077	3109
Annual Average Daily Traffic (pcu/day)	863	2592	3879
	906	2721	4073

Location: Precision Drive and Highway 2

Location: Princess Marry Ave. and Highway 2

Date	24-Hour Volume (both lanes) (vehicles)	Date	24-Hour Volume (both lanes) (vehicles)
9/9/99	3377	31/8/99	4690
10/9/99	3395	1/9/99	4379
11/9/99	1628	2/9/99	4192
12/9/99	1390	3/9/99	3740
13/9/99	3239	4/9/99	1735
14/9/99	3554	5/9/99	1541
15/9/99	3534	6/9/99	1607

Table H: Traffic Data for CFB Kingston

7-Day Average Volume	2874	3126
Adjusted 7-Day Average Volume (pcu/day)	3586	3901
Annual Average Daily Traffic (pcu/day)	3765	4096

*Seasonal Factor of 1.05 was used to calculate Annual Average Daily Traffic (AADT)