



PMS Review Report



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EXECUTIVE SUMMARY

The review of Pavement Management Systems was carried out as part of project commissioned by the Department of the Environment, Heritage and Local Government to carry out a Pavement Condition Study of the Non-National Road Network in Ireland.

This report describes the results of the review of Pavement Management Systems. It includes details of the determination of needs and requirements, evaluation of available Pavement Management Systems, and conclusions and recommendations arising from the study.

User needs and requirements were established through a series of questionnaires, circulated to local authorities in Ireland, followed by interviews with selected authorities, both in Ireland and in the United Kingdom. Information gathered during this process, together with information on good PMS practice, was used to develop a set of PMS System Requirements that could be used to evaluate the suitability of available pavement management systems. In addition, a number of factors and issues were identified that would affect any implementation process.

A total of ten commercially available pavement management systems were evaluated against these requirements to determine which best satisfied the needs. The conclusion of this evaluation was that four commercially available systems (Exor Highways, Insight Pavement Manager, dTIMS and Confirm Pavement Manager) provided excellent features and functionality, with the required degree of openness to allow for customisation to suit Irish conditions. The initial cost of a typical commercial system is around €45,000 per authority.

A possible alternative to purchasing a commercial PMS is to develop an in-house system that is designed to provide the functionality required by road authorities in Ireland. This alternative was explored through evaluation of MapRoad, an existing GIS-enabled Road Management Information System, provided by the Local Government Computer Services Board and currently installed in most road authorities. This evaluation concluded that the present system could be relatively easily modified and improved within a year to provide the majority of the PMS functionality that is required, with further improvements following thereafter. The total cost of this enhancement is estimated at €500,000 or around €14,700 per local authority.

The recommendations arising from the study are:

1. That the enhancement of MapRoad be adopted as part of a structured implementation process, in cognisance of the following factors:
 - The need for an incremental, structured approach towards implementation
 - The timescale required to implement PMS in Ireland
 - The need to properly define data and processing requirements before system implementation
 - The availability of a strong, dedicated, system development team to enhance MapRoad
 - The anticipated reasonable cost of MapRoad system development compared to commercial systems

2. That the structured implementation process take into account, *inter alia*, the implementation factors identified in the report, to ensure the initiative is a success.
3. That external expert assistance should be brought in to help guide the implementation process.
4. That a steering group be instituted to oversee and coordinate the implementation process, with working groups as needed to focus on specific data and processing issues.
5. That the implementation process should include a review of network definition rules and should ensure that the network definition system can accommodate all the anticipated data needs of the road authorities.
6. That the implementation process should also allow for raising the profile and awareness of PMS within local authorities, as this will pay dividends in obtaining participation in the process and in ultimately using the system.

1 INTRODUCTION

1.1 BACKGROUND

RPS-MCOS, in association with PMS Pavement Management Services, was appointed in November 2003 to carry out a contract for the Pavement Condition Study of the Non-National Road Network in Ireland. The Department of the Environment and Local Government commissioned this study in order to quantify the extent of deficiencies in the non-national road network. This network comprises some 87,000 kilometres of regional and local roads throughout the country. The study forms part of their ongoing process of securing and allocating resources to the non-national road network and in the implementation of multi-year restoration programmes.

The main objectives of the study were:

- (a) To establish, by county and nationally, the lengths and areas of various categories of non-national roads requiring remedial works, and
- (b) To review existing pavement management systems and recommend a system suitable for use on the non-national road network.

In fulfilling the requirements of the brief, RPS-MCOS and PMS Pavement Management Services surveyed and assessed a statistically selected sample of approximately 8,000 kilometres of the non-national road network to provide the Department with details describing its condition. The condition survey was done using special survey vehicles, fitted with video and computer equipment to record road condition and riding quality as they travelled along selected sections of road. The video records were subsequently analysed to assign condition categories to each road section and to determine likely remedial measures.

The review of Pavement Management Systems involved making contact with and holding discussions with appropriate persons and authorities in order to establish their existing systems, needs and requirements before carrying out an evaluation of the suitability of available Pavement Management Systems.

This report describes the results of the review of Pavement Management Systems. It includes details of the determination of needs and requirements, evaluation of available Pavement Management Systems, and conclusions and recommendations arising from the study.

What is a PMS?

A PMS is a tool that can be used to make informed decisions about the maintenance and rehabilitation of a pavement network. The American Public Works Association (APWA) defines a pavement management system (PMS) as, "....A systematic method for routinely collecting, storing, and retrieving the kind of decision-making information needed (about pavements) to make maximum use of limited maintenance (and construction) dollars." The American Association of Highway Transportation Officials (AASHTO) states that the "...function of a PMS is to improve the efficiency of decision making, expand its scope, provide feedback on the consequences of decisions, facilitate the coordination of activities within the agency, and ensure the consistency of decisions made at different management levels within the organization."

2 STUDY METHODOLOGY

2.1 DESCRIPTION OF METHODOLOGY

The methodology used for this review of pavement management systems followed a conventional systems development approach, where user needs and requirements are established before the suitability of available software or systems are evaluated.

The steps included:

1. Meetings with client to clarify the requirements and brief, including deliverables and outputs, programmes and timescales, reporting protocols and frequencies.
2. Obtaining contact details of appropriate persons and sections within local authorities and other government institutions and establishing preliminary contacts.
3. Preparation of a study questionnaire to facilitate collection of information and any discussions that took place.
4. Visits to selected authorities and individuals to discuss needs and requirements, as well as their organisational and operating arrangements for carrying out their functions. Where possible, these visits involved groups of people within organizations to elicit balanced responses.
5. Visits to authorities in other countries to discuss their experiences with PMS.
6. Contact with vendors of pavement management system software for product details and information.
7. Compiling a synthesis of user needs and requirements, together with details of existing systems and capabilities, which were used to measure the adequacy and suitability of available PMS software.
8. Formulation of recommendations.
9. Production of a draft report for discussion with the client before finalising the recommendations in the report, and once these were approved, compilation and submission of the final reports.

The methodology described above was intended to ensure that account was taken of factors that influence the selection of a Pavement Management System, and that any recommendations subsequently adopted by DOEHLG can be rationally defended.

2.2 USER NEEDS AND REQUIREMENTS

The primary methods used to determine user needs and requirements in relation to Pavement Management Systems included a questionnaire, circulated to road authorities in Ireland, and subsequent visits to selected authorities to develop a good understanding of the environment in which they operate and the way in which they operate. In addition, discussions were held with the Local Government Computer Services Board and a few road authorities in the United Kingdom.

2.2.1 Pavement Management Questionnaire

The questionnaire was designed to elicit information about the current status of Pavement Management implementation within road authorities. It covered the following topics:

- Information Technology Environment
- Road Network Information
- Geographic Information Systems
- Existing and proposed Pavement Management Systems
- Personnel involved in Pavement Management
- Pavement Management objectives
- Pavement Management responsibilities
- Time spent on PMS activities
- Data recorded in existing Pavement Management Systems
- Existing and proposed road management systems

A copy of the questionnaire is included in Appendix A.

Questionnaires were sent out on 23rd January 2004 to the thirty-four local authorities listed in Table 1, with a return date of 20th February 2004. The original request was followed up by faxed reminders subsequent to the return date, and further reminders were later sent to those that had still not responded. A total of twenty-seven responses were received, a response rate of 79%.

Evaluation of the information gleaned from the questionnaires is reported on in Section 3 below.

2.2.2 Visits to Road Authorities

Selected road authorities as listed in Table 1 were visited between January and the end of May 2004, and discussions held with individuals involved in the management of the road networks. In most cases these discussions included the Senior Roads Engineer, and in some instances the relevant Director of Services attended. A total of eighteen interviews were held. Although focussed on Pavement Management, the discussions inevitably covered other areas of road construction and maintenance, budgets and programmes, all of which all fall within the ambit of management of roads.

Without exception, the individuals concerned in the discussions were open and frank about their situations and received us cordially, which helped our understanding of their capabilities and constraints.

In addition, three road authorities in the United Kingdom and Northern Ireland were visited to obtain information on their experiences with implementation of pavement management and other road management systems.

Table 1 : Questionnaires and Visits

Organisation	Questionnaire		Visited
	Sent	Returned	
Cavan CC	23-Jan-04	03-Mar-04	27-Jan-04
Carlow CC	23-Jan-04	15-Mar-04	03-Mar-04
Clare CC	23-Jan-04	09-Mar-04	
Cork CC	23-Jan-04	20-Feb-04	12-Mar-04
Cork City Council	23-Jan-04	02-Mar-04	17-Feb-04
Donegal CC	23-Jan-04	02-Apr-04	22-Mar-04
Dublin City Council	23-Jan-04	05-Mar-04	
Dunlaoghaire Rathdown CC	23-Jan-04	03-Mar-04	
Fingal CC	23-Jan-04	07-May-04	16-Feb-04
Galway CC	23-Jan-04	17-Feb-04	02-Mar-04
Galway City Council	23-Jan-04	05-Apr-04	
Kerry County Council	23-Jan-04	01-Apr-04	24-Feb-04
Kildare County Council	23-Jan-04	25-Mar-04	
Kilkenny County Council	23-Jan-04	04-Feb-04	15-Mar-04
Laois County Council,	23-Jan-04		
Leitrim County Council	23-Jan-04	10-Feb-04	21-Mar-04
Limerick City Council	23-Jan-04		
Limerick County Council	23-Jan-04	17-Feb-04	
Longford City Council	23-Jan-04		
Louth County Council	23-Jan-04	27-Feb-04	
Mayo County Council	23-Jan-04	01-Mar-04	
Meath County Council	23-Jan-04	02-Mar-04	08-Mar-04
Monahan County Council	23-Jan-04	18-Feb-04	22-Mar-04
North Tipperary County Council	23-Jan-04	28-Apr-04	
Offaly County Council	23-Jan-04		
Roscommon County Council	23-Jan-04	10-Aug-04	01-Mar-04
Sligo County Council	23-Jan-04	09-Feb-04	21-Mar-04
South Dublin County Council	23-Jan-04		
South Tipperary County Council	23-Jan-04	12-Feb-04	12-Feb-04
Waterford City Council	23-Jan-04	18-Feb-04	
Waterford County Council	23-Jan-04	10-Mar-04	28-Jan-04
Westmeath County Council	23-Jan-04	13-Apr-04	08-Mar-04
Wexford County Council	23-Jan-04		26-Feb-04
Wicklow County Council	23-Jan-04		
			Visited
Northern Ireland Roads Service	-	-	13-Feb-04
Stirling CC, Scotland, UK	-	-	29-Mar-04
Cambridgeshire CC, UK	-	-	21-Apr-04
National Roads Authority, Ireland	-	-	20-May-04

3 EVALUATION OF EXISTING SITUATION

3.1 INTRODUCTION

This section describes the existing institutional and technical factors that are relevant to the selection and implementation of Pavement Management Systems within local authorities in Republic of Ireland. These have been gleaned from the information gathered during interviews with local authority personnel, from the PMS questionnaires, and from published information on local authorities.

The factors are relevant, because no computer system exists in isolation. A need must exist for the system, and it must be relevant to the day-to-day operations of the institution if it is to be of value. Implementation of a system also requires the commitment of resources, time, and effort, both in the initial (setup) phases and during its operational phases, and management commitment is therefore a prerequisite.

3.2 BUSINESS BACKGROUND

3.2.1 Local Authorities in Ireland

The twenty-six counties in the Republic of Ireland are administered through the County Council structures in each county. These county councils are responsible for provision of services in their areas of jurisdiction, with the services described under the seven general headings of housing and building, road transportation and safety, water supply and sewerage, development incentives and controls, environmental protection, recreation and amenity, and miscellaneous services.

The County Councils are elected bodies, each of which has a full time chief executive, the City or County Manager, with supporting administrative staff.

3.2.2 Roads and Local Authority Structures

Local Authorities are responsible for the administration, construction, and maintenance of approximately 87,000 kilometres of Non-National roads. In addition to these, local authorities are responsible, in partnership with the National Roads Authority, for construction and maintenance of the National Road network, comprising approximately 5,400 kilometres of National Primary and National Secondary roads.

Non-national roads account for 94% of this country's road network and carry 54% [NRA 2001] of all road traffic. These roads serve as an indispensable complement to national roads, affording access to the larger urban centres, ports and airports. They are vital to local enterprises, agriculture, forestry and tourism, as well as having a valuable social and community function.

The twenty-nine county local authorities in the Republic vary considerably in size, with their road networks ranging from 600 km in Dun Laoghaire Rathdown County to 11,600 km in County Cork. Most local authorities (20) however have between 1,500 and 4,500 km of road.

Within each local authority, responsibility for roads is assigned to one of the Directors of Services, with a “Roads” component dealing with day to day administration of the network. A Senior Road Engineer usually heads the roads component. He or she would typically be supported in the county office by two or three engineers and technicians. Larger counties would generally have greater staff numbers, Cork, for instance, being divided into three divisions, each responsible for portion of the county.

Counties are usually divided into two or more “Engineering Areas” where the Area Engineer is responsible for roads and other engineering functions. The number of permanent technical and engineering staff dedicated to roads within each engineering area is generally relatively small, with the Area Engineer supported by two or three engineers and technicians.

Road maintenance and minor road improvements are generally carried out by direct labour maintenance teams managed by overseers and foremen based in the areas, with some work being contracted out to private contractors. Some local authorities have a road reconstruction unit that moves around the county to handle projects where they occur.

3.2.3 Road Network Provision

Provision of the road network involves planning for new and improved roads, based on identified needs, construction of new roads, and maintenance of the existing network, to ensure that it remains in serviceable condition.

Activities involved in the provision of road infrastructure include:

Resourcing	<ul style="list-style-type: none"> Management of funds Management of manpower Provision and management of offices and depots and facilities Provision and management of equipment, consumables and supplies Provision of information Provision of IT infrastructure and tools Provision of plant Administration of contracts for supplies and services
Planning:	<ul style="list-style-type: none"> Identifying needs Developing strategies Prioritising Preliminary and detailed design
Construction:	<ul style="list-style-type: none"> Budgeting / Funding Contracts Execution
Maintenance:	<ul style="list-style-type: none"> Routine pavement maintenance Road verge and fence maintenance

- Traffic signs and signals
- Safety barriers
- Bridges and structures
- Pavement repair & strengthening
- Control of access and encroachments
- Control of roadside development

Effective management requires that good information is available to the individuals and components that have to make decisions in the course of carrying out these activities.

Ideally, the information needed should be easily shared amongst the different people, components, and levels of management involved.

3.3 INFORMATION TECHNOLOGY ENVIRONMENT

The implementation of computerised management systems is affected by the information technology environment that exists or is planned for the authority. This environment includes the physical computer hardware, networks, operating systems and software, as well as the extent to which computer facilities are integrated into the normal work of the organisation.

Based on information supplied by local authorities, the following summarises the current situation.

3.3.1 Networks and Computers

Computer networks have been implemented in virtually all local authorities. These networks typically provide full connectivity for all workstations within the county offices via a Local Area Network (LAN), with robust file servers. The predominant network operating system used is Microsoft NT. Computer workstations are generally Windows XP operating system.

Most local authorities also maintain network connectivity between their head office and their area and other smaller offices via a Wide Area Network (WAN). The WAN also enables connectivity with other government bodies.

In some cases, full rollout of network connectivity to smaller offices in the county has not yet been achieved.

Deployment of computer workstations and PC's is well advanced, with most being networked. It was reported that some stand-alone PC's exist, especially in smaller offices.

3.3.2 Databases

Information supplied by Local Authorities on this topic was sketchy, however it appears that the database systems most extensively used are MS-Access and MS SQL Server. The Local Government Computer Service Board (LGCSB) promotes use of these two databases.

3.3.3 Desktop Software

Most authorities have standardised on Microsoft Office products (MS-Word, MS-Excel, MS-Powerpoint, MS-Project) for normal use.

Autocad is the predominant software used for Computer Aided Drafting.

3.3.4 Geographic Information Systems

The great majority of local authorities make use of MAPINFO for Geographic Information System services. A couple of Arcview / Arcinfo installations were encountered, and one authority reported using Autodesk Map.

3.3.5 IT Personnel / Software resources

Most authorities reported having few available in-house personnel to undertake software development, and that they relied on external resources such as LGCSB or contractors for any significant software projects.

Most authorities did however have an IT department with personnel for support of their computer networks.

3.3.6 Existing Systems

Authorities reported the existence of various information technology systems related to their road networks within their organisations. (Table 3.1) Interviews with authorities indicated that several of these systems were supplied by Local Government Computer Services Board (LGCSB) or were prescribed for use on the national road network. Some of the less-well-distributed systems were locally developed databases. It was not clear from the information provided what the status of these systems was or whether these systems were all in regular use. It was ascertained that authorities also made use of a costing and financial management system (Agresso)

Table 3.1: Systems in use

System	Number	Name
Road Network Information	22	MapRoad
GIS (Geographic Information System)	19	Mapinfo / MapRoad
Traffic Accidents	8	NRA / MapRoad
Bridges / Structures	14	NRA / MapRoad
Traffic Counts / Analysis	13	NRA / MapRoad
Road Maintenance	7	
Road Pavements	7	MapRoad
Road Construction	6	
Plant & Job Costing	5	
Contracts Administration	4	
Road Openings & Encroachments	3	
CPO / Expropriation	3	CPO
Project Prioritisation	3	
Traffic Signs	1	
Traffic Signals	1	
Roadside Development	1	

3.3.7 Road Network Information

Each local authority is required to maintain a “Road Schedule” that defines their road network, and this contains basic road descriptors such as road number, road category, road name, section length, width, and descriptions of section start and end points.

The majority of authorities have recorded this road schedule within MapRoad GIS which provides tools for maintaining the basic network information, using a link and node referencing system.

3.3.8 Existing Pavement Management Systems

A number of authorities reported an existing pavement management system within their organisations. The majority of these use MapRoad, as supplied by LGCSB. One city council makes use of RoSy pavement management system (supplied by Carlbro), and one county makes use of MicroPAVER (supplied by PMS Ltd). The level of utilisation of these systems varies greatly between authorities.

MapRoad is an “integrated, Geographic Information System (GIS) enabled, Roads Management Information System”, modular in nature, comprising a core road network module displaying the road network. It is built around the Mapinfo Geographic Information System. The core module displays the road network and the descriptive data associated with each road in an authority. It can produce the “Road Schedule” and various plots of the road network. Additional modules such as “Road Accident”, “Road Bridge”, “Road Traffic”, and “Road Management” run in parallel with the road network module. The Road Management module allows for management of road survey data per road segment including inputting, editing, spatial analysis, reporting and costing of the data.

At present, authorities with MapRoad installed make limited use of the road management modules, especially those elements related to recording and utilisation of survey information. No standard methods have been defined for the collection, processing and utilisation of pavement condition data.

4 PMS SYSTEM REQUIREMENTS

4.1 INTRODUCTION

4.1.1 Why Pavement Management?

One of the critical points which limit the level of economic activity in a country - and therefore its wealth and welfare - is the capacity of freight transport within the country, and between the country and its neighbours. In Ireland, as in many countries, a high proportion of freight is transported by road, and therefore the condition of the road network strongly influences the country's economic activity. An efficient policy of road construction, rehabilitation and maintenance is therefore a basic requirement for sustaining the economic activity. Despite this, the funds available for road construction and especially for road maintenance and rehabilitation are often limited.

Road authorities need to convince the political authorities of their needs in this regard, especially if increases in funding are justified, and also need to make the best use of their allocated budgets, by optimising road maintenance management.

Pavement management systems (PMS) are tools used by authorities to optimise the maintenance of their road networks. The ultimate goal of these systems is to optimise the allocation and the use of maintenance and rehabilitation. In its broadest sense Pavement Management "...encompasses all the activities involved in the planning, design, construction, maintenance, evaluation and rehabilitation of the pavement portion of a public works program --- a pavement management system provides an organised coordinated way of handling the pavement management process". [AASHTO 1993]

4.1.2 Pavement Management and Road Management

Road Management encompasses both management of the physical assets such as pavements, bridges, as well as human resources, equipment and materials, and other items of value such as finances, CPO, data, computer systems, methods, technologies and partners. [FHWA and AASHTO 1997].

It is desirable that the road authority makes use of management systems, focused on different areas of operation, to assist it to meet its objectives, help personnel to carry out their duties and make the best use of available resources. These management systems typically include a database containing information relevant to the activity concerned, with tools that facilitate gathering of the information, keeping of records, analysis, and reporting of results. Most management systems involve monitoring of relevant factors in order to provide information to the decision maker and his managers. For example, monitoring of traffic flows helps to identify the need for geometric improvements and pavement strengthening, monitoring of speeds could help direct enforcement activities, whilst monitoring of pavement condition will identify where maintenance resources should be directed. Taken together, and functioning in a coordinated fashion, these management systems comprise an integrated road management system.

Examples of systems that could form part of an integrated road management system are:

Traffic Counting	Traffic Analysis
Accidents	Road Safety
Traffic Signals	Public Lighting
Footpaths	Structures and bridges
Road Openings and encroachments	Roadside development / planning
Pavements	Suppliers
Contracts	CPO / Land
Public Transport	Road Maintenance
Plant & Job Costing	Project Prioritisation
Forward Planning	Financial Management

As the various assets and activities associated with a road network are interrelated, it is desirable that individual management systems are effectively linked or integrated in order that data or information in one system may be effectively utilised in another.

4.1.3 Network Level or Project Level

Pavement Management at network level deals primarily with summary information related to the entire network or a significant portion thereof. As such, it involves policy and programming decisions frequently made by upper and middle management. Examples of network-level pavement management is the use of PMS information to:

- Identify and prioritise candidate projects
- Establish rehabilitation programmes
- Estimate overall short- and long-term needs
- Justify budget requests
- Answer “what-if” questions

PMS network-level information may include:

- The current condition of the road network
- Performance trend of the network, with past history
- Projection of future condition and needs
- Estimated impacts of alternative funding plans on future pavement condition.

At the project level, pavement management deals with detailed and technical information related to a specific pavement section. Consequently it involves more specific technical management decisions made by middle or lower management. Examples of project-level pavement management as it relates to specific pavement sections include the following:

- Details of pavement structures and history of pavement maintenance
- Diagnosis of problems with each pavement section
- Analysis of life-cycle costs of alternative strategies being considered for the pavement section
- Estimation of costs of various methods or materials that can be used

- Feedback of performance to provide input into pavement design, construction and maintenance activities
- Details of historical traffic loading

The vast majority of pavement management systems focus on the network level, with some elements of data serving the project level. Integration of project and network level pavement management has not generally become a reality.

4.2 PMS REQUIREMENTS

The requirements presented below are based on the findings of the first part of the study, taken together with those dictated by good practice in the implementation of road management systems.

4.2.1 Institutional Requirements

4.2.1.1 Organisation

The system will be used by authorities that have different organisational structures, and will be used at different levels in their organisations, depending on the size of the authority and the personnel available to carry out the tasks associated with running the system. It is therefore important that the system can be run by a minimum of one person, and can cater for usage by a number of persons simultaneously. For example, in a head office environment, the PMS technician and the senior roads engineer could access it. Area engineers may also require access to the system to carry out functions related to their engineering area.

The requirements are:

- System operation by one person, if required.
- A networked system must accommodate at least 5 simultaneous users.

4.2.1.2 Simplicity

A clear requirement, expressed by many authorities, is for a system that is simple. This requirement was interpreted to mean that; the system should be easy to operate, the data requirements should not be excessive and outputs should be clear and useful.

The requirements are:

- System must be customisable to suit user requirements
- Standard reports must be available and permit customisation

4.2.1.3 Quick Implementation

It is desirable that a system can be set up and become operational within a reasonable time, in order that staff do not become demotivated by delays. Whilst this factor can be dealt with to some degree by proper implementation planning, it is nevertheless important that the system can function with minimum data requirements or at a pilot level, so that users can become familiar with all the system features and data needs.

The requirements are:

- Initial setup not more than 2 days.
- Tools for import of existing data must be provided.

4.2.2 Information Technology Requirements

4.2.2.1 Windows NT Network / MS-Office Environment

The *de facto* standard network operating system used by local authorities is Windows NT, and MS-Office products are used for personal productivity. It is thus important that any new system be compatible with this environment.

The requirement is:

- System must operate in Windows NT network environment.

4.2.2.2 Networkable

As the system may need to be accessed by more than one person at a time and access may be via a local Area Network or Wide Area Network, it is important that it is network-enabled. This means that the system database should be able to reside on a fileserver. Depending on the system, copies of the software may have to be loaded on individual workstations.

The requirements are:

- System must be network-enabled

4.2.2.3 Databases

The system should be built around an industry-standard robust database that can be expanded to accommodate foreseeable data requirements, either within the database itself, or via a defined upgrade path. For example, a system could be based on an MS-Access database, which has a

practical 2Gb limit on its database size. A defined path must exist for transfer of the system to a more robust database such as MS-SQL Server or Oracle.

The requirement is:

- System database must be expandable to accommodate future data requirements.

4.2.2.4 Modularity

It is desirable that the system be supplied in modular form in order that authorities can select only those modules that they wish to implement immediately, and have the option of adding modules from time to time as their needs change and develop.

The requirement is:

- System must be modular with user-selectable modules for implementation.

4.2.2.5 GIS Compatibility

Mapinfo has been implemented in the vast majority of local authorities in Ireland. It is thus desirable that any PMS system be compatible with Mapinfo. Where Arcinfo / ArcView or other GIS software is used, it should also be possible to achieve compatibility.

The requirements are:

- System must be compatible with Mapinfo GIS
- System must link to Arcinfo / Arcview GIS

4.2.3 Functional Requirements

4.2.3.1 Network Referencing Systems

Existing road network data maintained by road authorities is generally referenced using a link and node system. The system adopted should therefore be able to import data structured in this way.

At a broader level, particularly when considering the demands of other road management systems, it is desirable that the system can accommodate multiple referencing systems. This enables the storage and utilisation of attributes that are related to the road network, but not necessarily associated with particular links or nodes. An example is a bus route, which can traverse many links, nodes and jurisdictions. A road-segment's status as part of a bus route could be a factor of importance in determining the maintenance strategy to be adopted on it.

The requirements are:

- Can the system utilise a link and node network referencing system
- Does the system accommodate multiple network referencing systems.

4.2.3.2 Network Maintenance Tools

A fundamental requirement of any system that deals with road networks is that it provides the necessary tools for generating and maintaining details of the road network. These would usually include tools for adding, deleting, modifying, breaking, joining, changing direction of links and nodes.

A desirable requirement is that the system should keep details of the history of the road network. This is important when the status of the network is required at various points in time, in order to present information or run analyses covering a time period. For example, a road may be realigned, either partially or completely, or may be reclassified, or become part of a separate network (e.g. when taken in charge by a city).

The requirement is:

- Does system provide network maintenance tools?
- Does system maintain network history?

4.2.3.3 Flexible Inventory and Attributes

It is highly desirable that the system allows users to define their own inventory items and road attributes in order to suit their particular requirements. These information requirements may change over time, as authorities develop experience with PMS or introduce further road management systems. Management requirements may change over time to adapt to the prevailing situations. It should therefore be relatively easy for the user to add new items and attributes.

The requirement is:

- Does the system allow users to define their own inventory and attributes?

4.2.3.4 Condition Monitoring

Monitoring of pavement condition over time is an essential part of a PMS as this allows the determination of maintenance needs at both strategic and operational levels. In the Irish context, where no standardisation of condition assessment has been done, it is important that any system adopted should permit one to define both the defects to be included in condition surveys and how these are to be utilised to describe the condition of the individual road segments and the network.

It is also useful to be able to define different ways of processing condition data in order to allow for reporting in different ways for different purposes, and to allow for local environments and variations to be accommodated. This is sometimes referred to as definition of “rules and parameters”.

The requirements are:

- Does the system permit definition of condition attributes?
- Does the system permit definition and use of alternate “rules and parameters”?

4.2.3.5 Prioritisation Tools

Following the evaluation of pavement condition, a typical PMS requirement is to assign appropriate treatments to road segments, and to prepare lists of priorities. Priority determination can be influenced by various factors, and it is important that the system allows for the use of alternative factors and combinations of factors in priority setting. For example, the priority of a particular segment may be influenced by the road category and the traffic carried. It is common to prepare different lists based on geographic areas and on road category.

Tools to allow road condition sections to be grouped into longer segments for reporting purposes and for prioritisation should also be available.

A desirable area of functionality is the ability to carry out network prioritisation based on pavement condition projections and economic analysis of costs and benefits. This type of analysis allows authorities to optimise their maintenance and repair strategies in order to achieve strategic objectives. Typical objectives would be to maximise pavement condition within budget constraints, or to select the optimum division of funding between surface restoration work and road reconstruction work.

The requirements are:

- Does the system permit user definition of prioritisation criteria?
- Are tools for grouping of condition sections provided?
- Are effective tools for economic analysis and optimisation provided?

4.2.3.6 Work Programming and Budgeting

The system should allow for the assignment of recommended maintenance treatments, together with costs, to selected segments, in order that budgets can be prepared and decisions made on work to be included in each budget year. The budgeting process should allow for user override of system calculated costs in order that the engineer can include additional cost items such as drainage in the cost of a project. Ideally, it should be possible to generate “projects” which may include a number of road segments. It is also useful to be able to generate multi-year programmes.

The requirements are:

- Does the system allow for generation of treatment options and costs?

- Does the system offer programming and budgeting tools?
- Does the system allow for multi-year programming?

4.2.3.7 Reporting and Viewing of data

The utility of a system is often judged on the usefulness of the data and information contained in reports and on the ease with which users can obtain required reports. It is therefore important that a system provides a wide selection of standard reports, and allows for user-defined reports to be produced for particular purposes. The facility to export reports for use in other systems or software is also useful.

The requirements are:

- Does the system provide in-built reporting tools?
- Are reports customisable to suit user requirements?
- Can reports be exported to other systems or software?

4.2.4 Compatibility Requirements

4.2.4.1 Expandability

The needs and requirements of authorities and users change over time. In the PMS context they may start out using relatively simple data, but as new data collection techniques become available, and further information needs are identified, it becomes necessary to expand the existing system. It is possible that the need for further road management systems are foreseen, and it is desirable that these can be integrated with the existing road network database, to avoid duplication of effort in maintaining disparate systems. It is thus desirable that the system can be expanded to include additional functionality through addition of further modules.

The requirement is:

- Does the system offer modular upgrading options?
- What additional modules are offered?

4.2.4.2 Compatibility with other systems

It is likely that road authorities have existing IT systems in place, and other systems may be envisaged for future implementation. It is desirable that the Pavement Management System allows for interfaces to be set up with these other systems for import / export of data. Obviously the degree of integration required will define the level of complexity of the interface required, but nevertheless it should be possible to set up such interfaces.

The requirement is:

- Can external interfaces be set up with the system?

4.2.5 Support and Training

Apart from the initial installation, continuing support by the system vendor is an important factor in system selection. The vendor should provide training for system users, both initially, and as required from time to time. Helpdesk support is desirable in order to deal with queries arising during usage, and active user groups are useful for sharing of experiences and learning.

System upgrades should form part of the vendor support package.

The requirements are:

- Does the vendor offer ongoing software support, including upgrades?
- Does the vendor provide initial training?
- Does the vendor provide on-going training?
- Does the vendor provide a Helpdesk?
- Does support include user groups?

4.2.6 Cost

The cost of the system is a factor to be considered in the selection of a system. The system has to be seen to be affordable relative to the perceived benefits it provides, bearing in mind that the software cost is likely to be low in comparison to the recurrent expenditure involved in data collection and operating the system.

Other costs to be considered are those involved with conversion of existing data for use with the new system, and the cost of consultancy services that may be required to adapt the system to conform with specific processing requirements of the road authority. For example, routines may need to be written to process condition data according to road authority rules and parameters.

The requirements are:

- Indicative system purchase price
- Indicative Annual Support costs
- Indicative training costs
- Consultancy Costs for Data conversion
- Consultancy Costs for System changes

5 EVALUATION OF PAVEMENT MANAGEMENT SYSTEMS

5.1 COMMERCIAL PAVEMENT MANAGEMENT SYSTEMS

A number of commercially available Pavement Management Systems were identified during the course of the investigation, and detailed information was obtained on most of these. These systems and suppliers are detailed in Table 5.1 below. More detailed contact information is given in Appendix B.

Table 5.1: PMS Systems and Suppliers

System	Supplier	Country
Micro PAVER	US Army Corps of Engineers Construction Engineering Research Laboratory (CERL)	USA
Confirm Pavement Manager	Southbank Systems plc / TRL	United Kingdom
MARCH PMS	Faber Maunsell Ltd.	United Kingdom
WDM PMS	WDM Limited	United Kingdom
INSIGHT for Pavement Management	Symology Ltd.	United Kingdom
Exor Highways	Exor Corporation Ltd.	United Kingdom
dTIMS CT	Deighton Associates Ltd.	Canada
RoSy	Carl Bro Pavement Consultants	Denmark
HDM4	PIARC / World Bank	France
ROMDAS Road Management System	Data Collection Ltd (DCL)	New Zealand
HIMS	Data Collection Ltd (DCL)	New Zealand
STREETSAVER	Metropolitan Transport Commission	USA

5.2 IN-HOUSE PAVEMENT MANAGEMENT SYSTEMS

An alternative to purchasing and implementing a commercially available PMS is to develop an in-house system to supply the functionality required by the road authorities. This option may be viable where the envisaged implementation timetable allows sufficient time for system development to be undertaken, and where suitable resources are available to undertake the development work.

In Chapter 3 above the existence of MapRoad, an existing GIS-based road management information system was noted. (para. 3.3.8) This system was developed by the Local Government Computer Services Board and has been installed in many local authorities in Ireland.

In view of its special position this system will be discussed separately from the following evaluation of commercial systems. The discussion will address the current performance of MapRoad in relation to the PMS system requirements, and the feasibility of enhancing it, if required, to conform to these requirements.

5.3 COMPLIANCE WITH REQUIREMENTS

5.3.1 Rating System

In order to provide a rational method for comparing systems a compliance rating system was devised that would generate numeric scores for the various assessment criteria. This approach has the advantage of minimising the amount of subjectivity involved in making an assessment, especially when a relatively high number of assessment criteria are evaluated.

Compliance with some of the requirements could be judged relatively easily, using YES / NO criteria. A YES response was assigned a score of 5 and a NO response a score of 0.

Other requirements, however, had to be judged using a relative scale in order to assess the degree of compliance. A numeric scale of values was used, as defined below, which provided values that could be used to determine an overall ranking.

Score	Rating
1	Unsatisfactory
2	Poor
3	Fair
4	Good
5	Excellent

As detailed in Section 4 of this report, requirements were grouped as follows:

- Institutional
- Information Technology
- PMS Functionality

- Future Expansion
- Support and Training

No weightings were applied to these groups.

5.3.2 Commercial Systems Excluded from Evaluation

During evaluation of the various commercial systems it became evident that certain commercial systems could not be regarded as true Pavement Management Systems, and these were therefore excluded from the final analysis.

These products are listed below, together with reasons for their exclusion.

Table 5.2: Systems excluded from analysis

System	Supplier	Reasons for exclusion
HDM-4	PIARC / World Bank	HDM-4 is software for investigating road investment choices. It provides powerful tools for investigating the effect of decisions at the policy, strategic and operational levels of road management. These include modelling of road deterioration, prediction of road user costs and emissions, economic analysis, and network optimisation. These tools are potentially very useful to road authorities, and can be included as part of a comprehensive PMS, however HDM-4 is not designed to provide the basic database functionality required for day-to-day management of a road network.
ROMDAS PMS	ROMDAS	This product is intended for use with the ROMDAS data capture system to assist with viewing and management of information collected by the system. It does not provide the basic database functionality required for management of a road network.

5.3.3 Comparison of Commercial Systems

Each system was evaluated with regard to the requirements identified in Section 4. The results of this evaluation are summarised in Table 5.3 below (bound in at the end of the report), with more detail given in Appendix B.

5.3.3.1 Overall Scores

The overall rating scores for each of the commercial systems are shown in Figure 5.1.

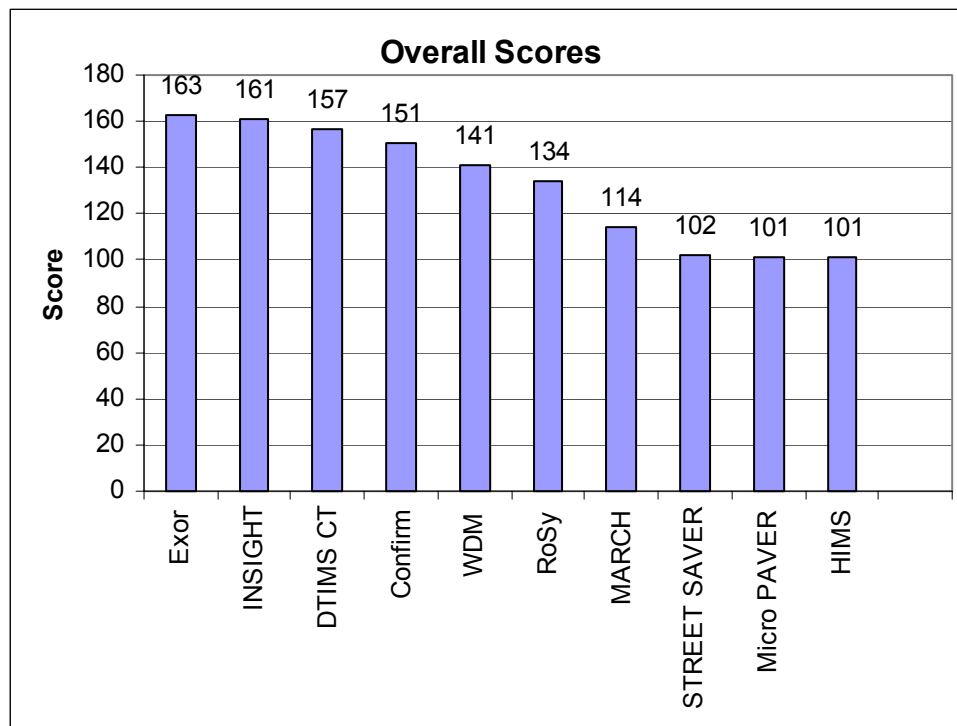


Figure 5.1 : Overall Scores

The systems that scored the highest were Exor for Highways (Exor Ltd), and Insight Pavement Manager (Symology Ltd), followed closely by dTIMS CT (Deighton Associates) and Confirm Pavement Manager (Southbank Systems). The scores for other systems were significantly lower.

Systems that generated high scores tended to be those that allowed for significant potential for adaptation and customisation, as can be seen in Table 5.3. These are important issues because no definite decisions have yet been taken in Ireland on standards to be adopted for Pavement Management purposes. In addition, no guidelines have been developed to assist authorities on the adoption or implementation of road management systems. If the road network defined for PMS purposes is to form the basis for other road management systems, it is logical that a system that allows for addition of further modules should rate highly.

Systems that generated intermediate scores (such as WDM, RoSy, MARCH) tended to be those that provided good PMS functionality, but with limited flexibility for adaptation or customisation.

Some of the lower scoring systems (such as STREETSAVER and MicroPAVER) provide good PMS functionality, but cannot be easily adapted for use outside their design parameters.

5.3.3.2 Scoring for PMS Functionality

The scores obtained by each commercial system in respect of their PMS functionality are presented in Figure 5.2.

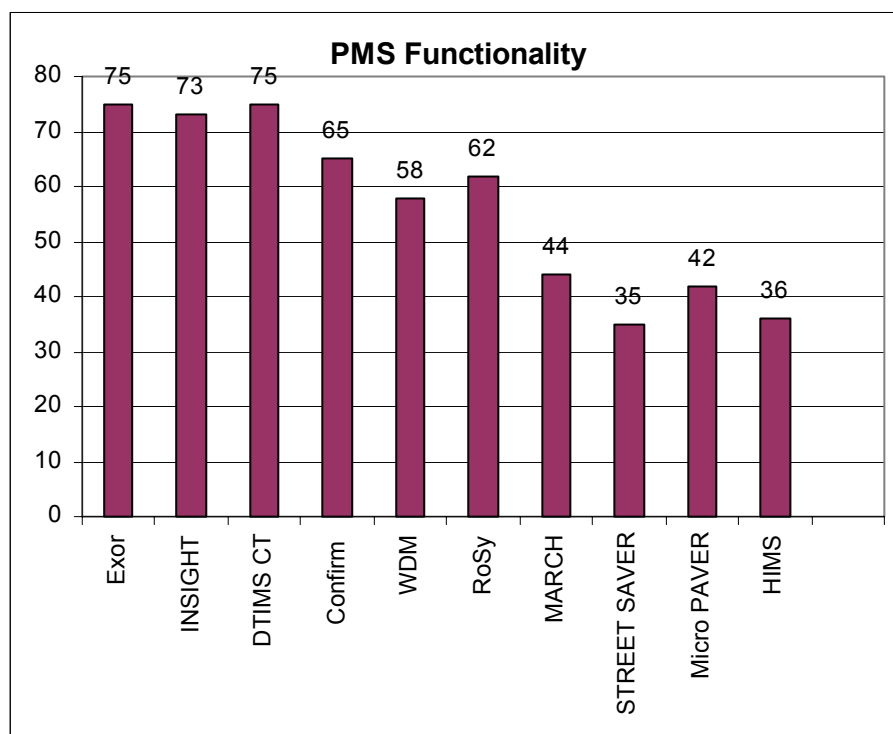


Figure 5.2 : Scoring for PMS Functionality

Ranking under this category is generally similar to the overall scoring, with Exor, Insight and dTIMS gaining the highest ratings. These scores reflect the flexibility and advanced functionality provided.

Lower rated systems provided a lesser range of features, and were limited in the ways in which they dealt with aspects such as prioritisation and analysis. Some of these systems (such as MARCH and WDM) were focussed primarily on UKPMS requirements, which limited their suitability outside these parameters.

STREETSAVER and MicroPAVER are designed for use using the PCI method of condition evaluation, which limits their applicability to other situations. HIMS provides very good data management facilities, but lacks any prioritisation and analysis tools.

5.3.4 Comparison of Top-Scoring Commercial Systems

A comparison of the four top scoring systems is presented in Table 5.4. This table indicates, in descriptive terms, the degree of similarity between the systems.

dTIMS is currently available with an MS-Access database only, but a MS-SQL Server version is due for release within weeks. dTIMS also does not have integrated GIS functionality, but can export data for presentation via GIS.

The CONFIRM system is somewhat restricted regarding user intervention in the prioritisation and economic analysis / optimisation modules, but is otherwise similar in functionality to the remaining systems.

Note that these systems all have a good installed user base, especially Exor and dTIMS, which are used extensively around the world.

Each of the systems has merit, and any one of them could form the basis for an integrated and effective pavement management system, with an open upgrade path for user authorities to add additional functionality, as they require it.

5.3.5 Indicative costs of commercial systems

Each PMS Supplier was asked to provide indicative costs for their systems, based on a typical user profile, in order to complete the comparison. It was made clear to suppliers that this pricing was required for evaluation purposes only, in order to obtain an idea of the relative costs, and would not be used for tender or procurement purposes.

Costing was based on the following:

Single Installation with data residing on File Server
Maximum concurrent users: 5
Standard database (i.e. Access / MS SQL-server / Oracle)

Typical pricing to be provided for:

Initial purchase, installation prices for	-	Required Modules
	-	Additional Modules
Annual Maintenance Fees for:	-	Software
	-	Helpdesk
	-	other
Training costs	-	Typical Initial Training
	-	Further training (Daily rates)
Data Conversion	(Daily rates)	
Customisation	(Daily rates)	

Prices to be provided for Non - UKPMS system.

Prices supplied for each system are detailed in Appendix B, and are summarised in Table 5.4 below:

Table 5.3 : Comparison of Top-Scoring Commercial Systems

Feature	Exor Highways	Insight Pavement Manager	dTIMS	Confirm Pavement manager
RDMS	Oracle	Platform Independent	MS-Access / MS-SQL Server	Platform Independent
Server-based	Yes	Yes	Yes	Yes
Multi-user	Yes	Yes (Concurrent user licence)	Yes (MS-Access 5-10 users)	Yes
GIS Compatible	ESRI / Mapinfo	ESRI / Mapinfo	GIS Links	ESRI / Mapinfo
Modular Upgrades	Yes	Yes	Yes	Yes
Network Referencing	Multiple	Multiple	Multiple	Multiple
Network History	Yes	Yes	Limited	Yes
Network Attributes	User definable	User definable	User definable	User definable
Inventory	User definable	User definable	User definable	User definable
Condition Items	User definable	User definable	User definable	User definable
Condition Evaluation	User definable	User definable	User definable	User definable
Condition Projection	Yes	Yes	Yes	Yes
Prioritisation Tools	Yes	Yes	Yes	Yes (limited)
RMS Integration	Yes	Yes	Yes	Yes
Strategy and Optimisation Tools	Yes	Yes	Yes	Yes (limited)
Work Planning and Programming	Yes	Yes	Yes	Yes
Additional Modules	Maintenance, Planning, Lighting, Structures, Accidents, Traffic, Utilities, Scheduling	Bridges, Public Lighting, Maintenance, Customer Service, Contracts, Works Orders, Inspections	Tools provided for users to build additional modules	Safety Insp, Works Orders, Customer Services, Works Management, Performance Monitoring, Street Lights
Installations	200+	80+	180+	25+

Table 5.4 : Comparison of Indicative Prices

System	Purchase	Support (per yr)	Training (per day)	Data Conversion (per day)	Custom- isation (per day)
Exor Highways	€ 45,000	€7,700	€ 1465	€ 1465	€ 1465
Insight Pavement Manager	€ 43,000	€ 8,600	€ 1,000	€ 1,000	€ 800
dTIMS	€ 45,000	€ 4,300	€ 1,000	€ 800	€ 800
Confirm Pavement Manager	€46,700	€ 5,800	€ 900	€ 900	€ 900
WDM	-	€ 44,000	€ 1,600	€ 1,500	€ 1,500
RoSy	€ 30,500	€ 4,000	€ 900	€ 1,000	€ 900
MARCH	€ 600	€ 9,300	€ 600	€ 510	€ 510
STREETSAVER	€ 2,500	€ 500	-	-	-
MicroPAVER	€ 850	-	-	-	-
HIMS	€ 3,500	€ 500	-	-	-

These costings are for a five-user system, as this represents the most likely user profile, where access to the system would be provided to one or two persons within the authority head office, plus to each of the Area offices. Prices for a single user system may be lower than those given.

5.3.6 Discussion

Taking the above information into consideration, the following points can be made:

- The interpreted requirement of the road authorities is for a PMS system that will be adequate for their current needs, and that can be expanded / upgraded as additional needs are identified.
- Local authorities in Rep. of Ireland have, at this stage, not set any standards for pavement condition evaluation, or for processing of condition information, and therefore any system or systems adopted must be capable of adaptation to future standards that may be set.
- Several commercially available pavement management systems have been evaluated, against the requirements identified in Section 4 above, and at least four systems have been shown to provide the required functionality. These systems are: Exor Highways, Insight Pavement Manager, dTIMS and Confirm Pavement Manager.
- Each of these four systems is open, in that they offer very good options for users to define their road networks, attributes, and inventory, according to their requirements. They also provide for future growth through addition of modules, and by providing tools that enable users to build additional modules.

- Pavement Condition evaluation is well catered for by each of the four systems. Condition parameters can be user defined, as can the methods of processing the data to produce condition indices. Further tools are provided for deciding on appropriate treatments based on condition values and / or indices, and for estimating the costs of these treatments.
- Each of the four systems provide modules for the projection of current condition into the future, taking into account historic data, and the results of this projection can be used in optimisation models that assist in determining the optimum strategies and treatments to be used. These analyses can be carried out on the whole network, or portions thereof, and can be used to examine the impact on the network of different funding scenarios, or to determine the levels of funding required to maintain the network adequately. One could for, example, examine the impact of different intervention levels on funding and network condition.
- Each of the four systems has a good track record of successful implementation, which gives one a sense of the quality of the products, and their ability to be adapted for various situations. Exor and dTIMS in particular have been implemented in numerous countries around the world, with around 200 installations reported for each. Insight has fewer installations (80+), mainly in the UK, whilst Confirm has 25+ installations reported, also mainly in the UK. On this basis, therefore, Exor and dTIMS stand out ahead of Insight and Confirm.
- Confirm is also rated slightly lower than the other systems in terms of its functionality, primarily because of its need for supplier intervention in changing condition evaluation parameters.
- The evaluation indicates that dTIMS falls down slightly in relation to its GIS functionality, compared to the other systems, which results in a marginally lower rating score.
- When reviewing expected costs, there is little to choose between the top-rated systems on the basis of initial cost, as all have similar costs of around €45,000. Ongoing support costs for each system range between € 4,300 and € 8,660 per annum so are of the same order of magnitude.
- When it comes to expandability, it can be seen that Exor and Insight offer very similar packages of additional modules, as indicated in Table 5.3. The modules offered by Confirm are more limited in scope. dTIMS takes a slightly different approach by providing all the tools needed to build additional modules, with complete flexibility provided to the user. This approach may or may not prove attractive, depending upon the degree of expertise available to the authority.
- dTIMS main strengths are its well-established tools for economic prioritisation, combined with a very strong user base around the world.
- Having regard to all these factors, it considered that there is very little to choose between the top rated systems as they all provide excellent features and functionality.

5.3.7 Evaluation Conclusions

The evaluation exercise has shown that four commercially available Pavement Management Systems out of the several examined, stand out from the others. These are:

- Exor Highways
- Insight Pavement Manager
- dTIMS
- Confirm Pavement Manager

These four systems are all recommended for final consideration, subject to decisions on implementation strategy, discussed below.

6 EVALUATION OF MAPROAD

6.1 INTRODUCTION

As previously mentioned, an alternative to purchasing and implementing a commercially available PMS is to develop an in-house system to supply the functionality required by the road authorities.

In Republic of Ireland, MapRoad, an existing GIS-based road management information system has been installed in many local authorities in Ireland, and is being used to provide basic pavement management functionality by some of these authorities. It is also being used to facilitate databases of other road-related data such as that for Accidents, Traffic and Bridges.

It is possible that this system could be developed into a system that closely matches the needs of the authorities, without incurring the direct costs of a commercially supplied system, and this aspect is addressed in the following paragraphs.

6.2 EXISTING MAPROAD FUNCTIONALITY

MapRoad is an “integrated, Geographic Information System (GIS) enabled, Roads Management Information System”, modular in nature, comprising a core road network module displaying the road network. Additional modules such as “Road Accident” and “Road Management” run in parallel with the road network module. The Road Management module allows for management of road survey data per road segment including inputting, editing, spatial analysis, reporting and costing of the data.

The current overall functionality of MapRoad was assessed against the same PMS requirements as the commercially available systems, with the outcome summarised in Table 6.1.

Table 6.1: MapRoad Evaluation Results

	RATING SCORE
Institutional Requirements	26
Information Technology Requirements	29
Functional Requirements	32
Future Expansion	5
Support and Training	19
Total	111

MapRoad’s overall current performance is significantly poorer than the top-rated commercial systems, as it scored 111 points compared to around 160 points for the top-rated systems. This lower rating is primarily as a result of its low evaluation scores under the “Functional” requirements, where MapRoad scored 32 points, compared to around 70 points for the top-rated systems.

This existing lack reflects the fact that this aspect of MapRoad has not been developed due to local authorities not yet requesting this PMS functionality.

6.3 MAPROAD UPGRADING

Can MapRoad be enhanced to become a system that closely matches the needs of the road authorities?

This question was addressed through discussions held with the Local Government Computer Services Board (LGCSB) on this issue to ensure they had a good understanding of the system requirements as detailed in Chapter 4, and the “gaps” in MapRoad functionality that would need to be addressed in order to comply with the requirements. Their responses to each of the requirements were recorded and are provided in the following paragraphs, together with conclusions drawn by the study team. Table 6.2 provides commentary by LGCSB on the enhancement of MapRoad to improve its conformance to the PMS requirements identified in this study.

The LGCSB proposed Architecture description for a MapRoad PMS module states as follows:

“The LGCSB envisage that a PMS module can be created to manage pavement management data. This module would come under the umbrella of MapRoad products and would be a module in itself. As with all MapRoad Modules, it would utilize the core network module “Road Network” and the MapRoad expandable core repository of road related data. A detailed specification of such a module needs to be defined by an expert team. The MapRoad PMS module core functionality could include the following:

- *Condition Data of the Pavement*
- *Condition Evaluation*
- *Prioritisation Facility based on specified decision tools*
- *Treatment Selection and Work Categorisation*
- *Work Programme Creation*
- *Expenditure Tracking*
- *Standardized and Flexible Reporting on each section*
- *Project Identification”*

Table 6.2 : MapRoad Enhancement : LGCSB Comments

	SYSTEM REQUIREMENTS	GAPS	COMMENTS BY LGCSB
INSTITUTIONAL REQUIREMENTS			
	Organisation		
1	System operation by one person, if required.		
2	A networked system must accommodate at least 5 simultaneous users.		Since the creation of the report, MapRoad has been rolled out in SQL Server Format. The database used has changed from MS Access Database (DB) to SQL Server DB, allowing multiple users accessing and editing the data simultaneously. Thus satisfying this requirement completely.
	Simplicity		
3	System must be customisable to suit user requirements		LGCSB can customise MapRoad to suit user requirements in terms of "look and feel", "data" recorded and the "processing" required, as set out by a detailed specification. The most effective approach to achieve this is to have two sets of fields available. One nationally agreed standardised set of fields and one customisable set of fields. MapRoad can accommodate this through expansion of the database.
4	Standard reports must be available and permit customisation	User should be able to produce a range of reports without having to export data to Excel or similar.	LGCSB can delivery the facility to allow report customization as they have done in the accident module. In this module the user selects the required fields to report on.
	Quick Implementation		
5	Initial setup not more than 2 days		
6	Tools for import of existing data must be provided	Should be standard interfaces for basic file transfer. Need to be able to handle various types of surveillance data.	This is easily accommodated and MapRoad has shown the ability to do this with the creation of the MapRoad Import Tool. This allows the import of network data from the 3 available formats that were present at the time of creation of the import tool. A similar procedure can be repeated for any formats required. A generic data exchange standard can be agreed upon to facilitate future data exchange requirements.
INFORMATION TECHNOLOGY REQUIREMENTS			
	Windows NT Network / MS-Office Environment		
7	System must operate in Windows NT network environment		
	Networkable		
8	System must be network-enabled		
	Databases		
9	System database must be expandable to accommodate future data requirements	Important in context of increased number of users as additional modules are added.	The move to SQL server satisfies this requirement as per pg 13 of report on requirements "4.2.2.3 Databases" (Chap. 4)

	SYSTEM REQUIREMENTS	GAPS	COMMENTS BY LGCSB
	Modularity		
10	System must be modular with user-selectable modules for implementation		As outlined in the MapRoad "Existing Functionality Section", MapRoad is based on a modular approach, whereby users can launch or close modules as required. MapRoad therefore meets the modular requirement. With its robust and well-organised database structure, various modules can be developed to extract and combine different sets of data. Various modules required from within a PMS system can also be similarly developed.
	GIS Compatibility		
11	System must be compatible with MapInfo GIS	Ideally the system should be accessible without the GIS interface for functions that don't require visualisation.	
12	System must link to Arcinfo / Arcview GIS	System should be able to generate data in form that can be exported to other GIS.	Functionality already exists in MapInfo to export the MapInfo file type into Arcinfo and Arcview type files. The geographical object "link id" will also export with the geographical data, allowing the geographical object to be relinked to the same or a different type of database.
	FUNCTIONAL REQUIREMENTS		
	Network Referencing Systems		
13	Can the system utilise a link and node network referencing system	Possible need for reference markers to assist accurate position determination.	
14	Does the system accommodate multiple network referencing systems	Alternative referencing systems are important to allow for road info to be used together with other spatial and usage data. (e.g. routes, jurisdictions, traffic)	There is no reason that the programming and that the additions to the Database structure required cannot be completed to accommodate this functionality. Multiple Network Referencing systems are already being proposed by the LGCSB. The following items are being planned for programming into MapRoad : 2 way direction flow on a road, multiple lanes per road direction, dynamic segmentation and locating objects by GPS or chainage and offset and translation between the two methods. The MapRoad Routing module does allow for the definition of routes spanning multiple segments
	Network Maintenance Tools		
15	Does system provide network maintenance tools?		
16	Does system maintain network history?	Important for network history to be retained by the system to allow for roll back in time.	History on network data, other Pavement Data and condition data with time stamps on each function can be accommodated in the system, allowing a user to re-invoke the network details as it stood at a previous date. MapRoad presently has a unique identifier for each road segment which is necessary for this type of functionality. The facility to reload a picture /snap shot of the network from the past is also available as required.

	SYSTEM REQUIREMENTS	GAPS	COMMENTS BY LGCSB
	Flexible Inventory and Attributes		
17	Does the system allow users to define their own inventory and attributes?	Need to allow user to define inventory items for items that may be part of the roadway, or associated with the roadway. (e.g. Drains, pipes, cables, verges, footpaths, fences, hedges, road studs, pavement layers, surfacing, etc.)	This is can be added, however as with item 3 above, it is recommended that the system should have as a priority, a nationally defined inventory and attributes. And if the flexibility is still required after the initial priorities are dealt with, then they should be programmed at that time. This is envisaged as a second phase of implementation.
	Condition Monitoring		
18	Does the system permit definition of condition attributes?	Need to allow for current condition attributes and for maintaining history of conditions. Possible projection of condition to allow for gaps in data. What happens if key data is missing?	<i>as above</i>
19	Does the system permit definition and use of alternate "rules and parameters"?	Need to allow users to develop their own rules and parameters for their own purposes. Often need for more than one rule set.	<i>as above</i>
	Prioritisation Tools		
20	Does the system permit user definition of prioritisation criteria?	User should be able to choose priority criteria, to suit different objectives.	Again there is no programming or Database structure issue with accomplishing this.
21	Are tools for grouping of condition sections provided?	Basic PMS need is to combine condition sections into longer segments for reporting and further analysis. This requires tools for averaging, combining, etc.	This is functionality is scheduled for introduction into MapRoad. The PMS Grouping tools required need to be clearly defined to enable effective programming. Once user requirements are specified we do not foresee any problems with this functionality.
22	Are effective tools for economic analysis and optimisation provided?	This includes prediction of future condition. Need to allow for this type of analysis through "black box" or external analysis system.	A module can be created in MapRoad to accommodate this or MapRoad could talk externally to another off the shelf product to perform this function. This type of amalgamation of products has been used by the LGCSB in the water modelling section
	Work Programming and Budgeting		
23	Does the system allow for generation of treatment options and costs?	Need to allow for alternative treatment options, and override of system generated treatments.	There is an element of this already contained in MapRoad, whereby in the Road Mgt module, user defined unit costs per work programme category per engineering area per km can be applied to cost a job. This functionality can be expanded as required.
24	Does the system offer programming and budgeting tools?	Need to generate "projects" that can be prioritised and inserted into annual programmes, with user intervention allowed to modify costs to take account of issues such as drainage, road widening, etc.	Prioritisation of Projects with user intervention is again implementable by an expansion of the current system. The software allows for the easy export and import of the data so that budgeting can be done outside of MapRoad, if so required. Integration of Agresso with MapRoad can be accommodated.

	SYSTEM REQUIREMENTS	GAPS	COMMENTS BY LGCSB
25	Does the system allow for multi-year programming?	Multi-year programmes are ideally the product of strategic analysis and optimisation to meet pre-defined objectives.	MapRoad currently allows for the generation of multi-annual work programs. Producing different scenarios to determine the optimum allocation of money using budgeting tools can be added modularly. Or the functionality could be bought as an external tool.
	Reporting and Viewing of data		
26	Does the system provide in-built reporting tools?		Yes, Each module has reporting facility and these can be expanded.
27	Are reports customisable to suit user requirements?	System should allow the user to select report items, order columns, sort rows, etc. Ad-hoc queries also.	As above in section on "Simplicity", "Standard reports must be available and permit customisation". The reporting tools presently used facilitate the provision of chart/graph reports.
28	Can reports be exported to other systems or software?	Should be easy to select data / parameters for export.	This is accommodated for in MapRoad at present, where reports can be exported as txt, doc or xls format. Further exchange formats can be agreed and implemented.
	FUTURE EXPANSION		
	Expandability		
29	Does the system offer modular upgrading options?		Yes
30	What additional modules are offered?		As stated in the MapRoad "Existing Functionality Section", MapRoad is Modular with modules; Accidents, Bridges, Traffic, Hazards, Routes, Roadworks
	Compatibility with other systems		
31	Can external interfaces be set up with the system?	Should be standard interfaces for basic file transfer.	This can be done. Standards need to be agreed for data exchange before an interface can be incorporated.
	Support and Training		
32	Does the vendor offer ongoing software support, including upgrades?		Yes
33	Does the vendor provide initial training?		Yes
34	Does the vendor provide on-going training?		Yes
35	Does the vendor provide a Helpdesk?		MapRoad currently has a full time support team of four and this is being expanded to an n-tier support helpdesk
36	Does support include user groups?		Yes
	COST		
37	Indicative system purchase price?	€ 14,705	LGCSB is a non-profit organisation and the cost of implementation would directly relate to the programming cost. The requirements specification would define the cost and time and it is difficult to make a judgment before knowing exactly what is required from the module. Any estimate on time and cost is a ball park figure and would have to be re-assessed after a detailed specification. The time to deliver a PMS module based on MapRoad is guessed at approx. 10mths (programming- 7/8 mths, testing- 6wks and piloting- 6 wks) after a detailed specification was agreed on. We estimate the cost to be €500,000 (including the cost to the LGCSB of 2 programmers for the time period@ €1200/day). It would be recommended to also have one temp. Grade 7

	SYSTEM REQUIREMENTS	GAPS	COMMENTS BY LGCSB
			LGCSB person fully dedicated to supporting the project, supporting L.A. introduction and providing training at a salary of €50160/year for 12 to 24 months.
38	Indicative Annual Support costs?		
39	Indicative training costs		
40	Consultancy Costs for Data conversion		Included in module development
41	Consultancy Costs for System changes		

6.4 STUDY TEAM COMMENTS

1. There is no doubt that the current version of MapRoad has significant deficiencies that limit its usefulness as a fully-fledged pavement management system, and that these deficiencies must be addressed and rectified if the system can be considered for adoption by road authorities.
2. MapRoad, as previously stated, is supported by LGCSB, a well-resourced Information Technology organisation whose primary purpose is to provide IT and software development services to local government bodies. An existing team within LGCSB is dedicated to maintaining and enhancing MapRoad to meet the identified needs of authorities. This team can be expanded as necessary to provide particular services demanded by authorities, albeit at additional cost. The availability of dedicated resources to carry out system enhancements is a big plus factor for any system.
3. LGCSB has indicated that many of the deficiencies of the existing MapRoad software can be relatively easily rectified, and form part of their existing architecture plan for the system. They appear to be committed to this objective.
4. The recent upgrading of the MapRoad database from MS-Access to MS-SQL Server satisfies a number of the IT and multi-user requirements, as this database is robust and can cater for future system expansion. It allows for multi-user access, and can accommodate remote user access.
5. Network history (Item 16), an item of importance to Local Authorities, can be maintained within the MS-SQL Server database, and can be implemented through enhancing MapRoad.
6. A number of the PMS requirements identify flexibility and customisability as being important PMS attributes, since the system recommended for use in Ireland must be capable of adaptation to suit the unique conditions that exist in this country. Typical requirements are:
 - System must be customisable to suit user requirements.
 - Standard reports must be available and permit customisation.
 - The system should allow users to define their own inventory and attributes.
 - The system must permit definition of condition attributes.
 - The system must permit definition and use of alternate "rules and parameters".
 - Reports must be customisable to suit user requirements.

- The system should offer modular upgrading options.

Systems that provided this flexibility were rated highly.

Enhancement of MapRoad to meet the defined needs and requirements of road authorities in Ireland would mean that it effectively becomes a “bespoke” or tailor-made system, which would satisfy the above requirements, and in this respect be on a par with other commercial systems.

7. A “bespoke” system should, as a priority, conform to nationally agreed standards for data, data processing and outputs. Provision of the capability for users to add additional data fields and adapt processing to suit local requirements is of lower priority, but is still considered to be of value in the medium term, as there will be a tendency for users to want to add requirements as their PMS experience grows. This aspect should be considered during database and system design.
8. The availability of effective tools for economic analysis and optimisation (Item 22 above) is a valuable system attribute. This capability is of a lower priority than many other PMS requirements, but should be planned for during the implementation stage. In-house development of these tools may prove problematic due to the specialised nature of the analyses, and LGCSB’s suggestion that an external software product (such as HDM-4) be used for this purpose is supported as a realistic option.
9. Enhancement of MapRoad will require LGCSB to take on additional resources, and the cost of these resources will have to be carried by someone. Their estimate of the additional cost is probably realistic, based on their estimate of the time involved. It should be borne in mind that the extent of the work involved in each software module has not yet been defined, and this could have a significant effect on the ultimate cost of the system.
10. In conclusion, it appears that there are no serious architecture or system development obstacles to enhancing MapRoad to meet the defined requirements of the road authorities, provided sufficient time and resources are available to carry out the work involved.

7 PMS IMPLEMENTATION ISSUES

To ensure successful implementation and operation of a pavement management system in any organisation, it is important that institutional and organisational factors be considered in detail along with the technical components of the system. These factors should be addressed by the authorities prior to the implementation of the system, even before some of the technical issues are addressed.

The environment within which a PMS operates is dynamic. Therefore the implementation of a PMS should be a dynamic and interactive process that will address these facets methodically to ensure adaptation to the changing needs of the authority, bearing in mind that full implementation can take a number of years.

7.1 IMPLEMENTATION PROCESS

The road authority needs to recognise that there is a need to change the whole or parts of the existing pavement management process. To do this it is important to identify and examine deficiencies in the present procedures and standards, as well as the decision needs, and hence the PMS information needs. If there is no apparent need for change, change should not be forced.

After identifying a need to change, PMS is then placed on the agenda for decision on implementation and funding. It is often at this point useful to identify a PMS champion to drive the implementation. The decision to proceed may be based on a trial implementation, with the final implementation decision following later.

The successful implementation of a PMS depends on management's commitment to implementation at all levels. Consequently all levels of staff that will be end-users should be involved in the development of the system from an early stage, and the system should comply with the needs of the end-users in order to promote its ultimate usage.

7.2 IMPLEMENTATION FACTORS

Factors that must be considered during implementation include:

- Funding and sources of funding – the requirements of the funding authority or authorities should be taken into account in the structuring of the database, outputs and operations of the PMS. The PMS should be able to provide the information required by the funding agencies, and data should be available in time for preparation of budget schedules.
- Compatibility of pavement management systems – It may be a requirement of a controlling / funding agency that information provided by the various authorities under its control should be compatible or even uniform. These authorities should then use uniform data collection and data processing procedures.
- Communication – unless the results obtained from a PMS are effectively communicated to all levels within and outside the road authority, the full potential of the system may never be

realised. Limited maintenance funds may be diverted to projects with higher public visibility. Using effective communication channels to provide reliable and understandable information to decision-makers can enhance support for maintenance programmes.

- The position and function of the PMS section / operation must be properly defined within the organisational structure. The head of the PMS section should have adequate authority within the organisation, which will facilitate communication with those affected by the system, including both top and lower management.
- A separate section dedicated to PMS functions is desirable so that there can be accountability for the collection and processing of data and the distribution of information.
- The role of the Information Technology department in the PMS implementation should be advisory and supportive, but not controlling. There should however, be strong reciprocal information links between the two.
- Identification of PMS needs – pavement management needs should be defined during the implementation phase, and these needs must be classified into short- or long-term needs. This is important as most PMS are implemented in stages. Short-term needs include items such as inventory, present pavement condition, unconstrained maintenance and rehabilitation needs, prioritised project schedules, current budget needs. Long-term needs include the ability to predict future pavement performance and should include life-cycle costing and optimisation procedures.
- Phased Implementation – may be conducted in a step-by-step process, whereby short- and long-term needs are addressed in a planned manner as part of an overall programme.
- Cost implications – Funds will be required to implement and operate a PMS. It is therefore important to identify the factors that will have significant cost implications so they can be motivated and budgeted for. The cost-effectiveness of additional features should be considered during a phased implementation process.
- Factors that influence the cost of implementation include:
 - Implementation process
 - Phased implementation can spread costs over a number of years
 - Selecting and adapting existing software instead of developing from scratch
 - Using in-house or external development teams.
 - Level of sophistication of the system (comprehensive or simple)
 - Range of application of the system (project or network level)
 - Amount of information collected
 - Reporting requirements
 - Matching PMS processes with existing methods and procedures
 - Availability of data, level of detail, and frequency of update
 - Use of in-house or external resources
 - Training of personnel

7.3 IMPLEMENTATION STRATEGY

Does one aim for a quick implementation, or go for an incremental approach?

It seems attractive to obtain a new system, ready to go, that can be up and running almost immediately, however it is certain that if the data, organisational and procedural issues are not dealt with, the system will not become functional for some time.

Whatever system is adopted, time will have to be spent by authorities in defining their exact data requirements, taking into account both current and future needs, in order to ensure successful system implementation. They will also have to decide on data collection and processing standards that will ensure reliable and consistent information.

Then data collection must take place, both inventory and condition data, before any processing can take place. Typically, it can take one to three years, depending on the size of road network, amount of existing information, availability of resources, training of personnel, etc. to get a PMS up and running.

With this in mind, it may make sense to enhance existing PMS software, or develop in-house software, using a structured approach, to meet the defined requirements, instead of purchasing a new PMS. Authorities must, however, have confidence that their software developers will produce the required system modules when they are needed, and that the developed system will in fact meet their long term needs.

It is recommended that PMS implementation follow a structured approach, taking into account the factors mentioned earlier in this section, to ensure that PMS is put onto a sound footing within road authorities in Ireland. Time will be needed to carry out the various activities needed to define data and system requirements in detail and to translate these into working systems.

7.4 NETWORK DATA

During the condition study part of this project a number of deficiencies were observed in the definition of road networks. This indicated that the rules for defining these networks might need to be revisited to address any ambiguities or anomalies.

It is extremely important that this aspect of road management is dealt with carefully, so that all desired features of the road network can be properly referenced in the network database. Aspects that are of importance include:

- Road Numbers
- Road Sections
- Descriptions
- Location referencing systems
- Lanes
- Direction
- Junctions
- Slip Roads

- Roundabouts
- Spurs and cul-de-sacs
- Start and end points

It is recommended that GIS-T (geographic information systems for transportation agencies) database design principles be used when setting up database structures for the storage of road networks.

7.5 PMS AWARENESS

An early step in the PMS implementation process is to raise the profile and awareness of PMS and pavement management principles within road authorities, especially amongst personnel that may be involved in PMS operations, or that will make use of PMS information.

It is therefore recommended that road authorities take steps to implement an awareness / education programme, that will bring the fundamental aspects and benefits of pavement management to personnel and decision makers.

7.6 SUCCESSION PLANNING

It is common amongst agencies involved in pavement management to fail to properly address the issue of succession planning. The approach is almost invariably ad hoc response to crisis, which occurs when people resign or retire, or the data is inadequate, or the new people don't know how to apply the technology, or the "corporate memory" has disappeared.

Key ingredients in succession planning include:

- Recognizing the need and obtaining top level commitment
- Developing a plan which involves timing of replacements, training and overlap, contingencies, and contains mentoring responsibilities
- Making the necessary investments
- Keeping the plan dynamic by periodic updating and periodic assessment of its effectiveness
- Documenting the plan and procedures

A related issue is that of good system documentation and documented operational procedures to enable new incumbents to become productive more quickly.

8 CONCLUSIONS AND RECOMMENDATIONS

The review of Pavement Management Systems carried out for this project involved the following steps:

- Gathering of information from the client and road authorities in order to determine needs and requirements for PMS, and to gain a picture of their current organisational and operating arrangements. This information was used to develop criteria for the assessment of systems.
- Gathering of information on the current status of pavement management worldwide, and on available Pavement Management Systems. Vendors of pavement management system software were contacted for product details and information.
- Assessment criteria were used to measure the adequacy and suitability of available PMS software, which led to formulation of recommendations.

Conclusions and recommendations arising from this process are as follows:

8.1 CONCLUSIONS

1. Most road authorities have existing Road Management Software installed, in the form of MapRoad, but at present less than 40% make use of the pavement management modules. The level of implementation of the PMS modules is generally low, and there is generally a fairly low level of knowledge amongst staff on PMS issues. No standard methods have been defined for the collection, processing and utilisation of pavement condition data, which is a stumbling block for those interested in making better use of their systems.
2. Most road authorities indicated that they plan to implement PMS in the future. PMS is not always the highest priority.
3. The priorities of PMS objectives, as reported by road authorities, indicate that the short-term focus should be on having accurate road network and attribute information, on describing current condition of the road network, and on identifying and prioritising current projects and budget needs. Longer-term objectives should focus on network performance and forecasting of future needs.
4. These short- and long-term objectives are reflected in the high priority set by authorities on collecting good data describing their networks and on recording pavement construction and surface details.
5. Road authorities generally have good information technology infrastructure, including local and wide area networks serving their offices. These are supported by IT components within the authorities. This means that there should be few IT-related problems in installing new systems.
6. GIS is installed in most road authorities, with Mapinfo being the dominant GIS software. MapRoad is built as a Mapinfo add-on and requires it in order to function.

7. System requirements, based on the findings of the first part of the study, taken together with requirements dictated by good practice in the implementation of road management systems fell into five areas:
- Institutional
 - Information Technology
 - Functional
 - Future Expansion
 - Support and Training
8. Ten commercially available pavement management systems were evaluated against these requirements, using a numeric rating system, which yielded rating scores as shown in Table 8.1.

Table 8.1 : Evaluation Scores

System	Overall Rating Score	Functional Rating Score
Exor Highways	163	75
INSIGHT for Pavement Management	161	73
DTIMS CT	157	75
Confirm Pavement Manager	151	65
WDM PMS	141	58
RoSy	134	62
MARCH PMS	114	44
STREETSAVER	102	35
Micro PAVER	101	42
HIMS	101	36

9. Each of the four top rated systems (Exor, Insight, dTIMS and Confirm) provide excellent features and functionality, with the required degree of openness to allow for customisation to suit Irish conditions. Systems that generated high scores tended to be those that allowed for significant adaptation and customisation. Systems that generated intermediate scores provided good PMS functionality, but with limited flexibility for adaptation or customisation. The lower scoring systems provided reasonable PMS functionality, but cannot be easily adapted for use outside their design parameters.
10. The indicative costs for the various systems vary substantially, however the four top-rated systems have costs that are comparable, around €45,000 initial cost for a typical installation.
11. A possible alternative to purchasing a commercial PMS is to develop an in-house system that is designed to provide the functionality required by road authorities in Ireland. This alternative was explored through evaluation of MapRoad, an existing GIS-enabled Road Management Information System.
12. MapRoad is in a special position, because it is provided by the LGCSB and is currently installed in most road authorities. Road authorities use it to maintain their road network information and to record information related to pavements, and other elements such as accidents, bridges and

traffic. Its PMS features are currently limited, but it is backed by a strong development team, who are prepared to add additional functions as they are identified by authorities.

13. An evaluation of the possible enhancement of MapRoad to produce a tailor-made pavement management system indicated that no significant obstacles exist to doing this. The present system can be relatively easily modified and improved within a year to provide the majority of the PMS functionality that is required. Further enhancements can be undertaken over time. The LGCSB anticipate that they will require additional resources to undertake this work, with a total cost of around €500,000 or €14,700 per local authority.
14. Implementation of a PMS should follow a structured, stepwise process that will ensure proper definition of data, data processing, and system requirements before full implementation can take place. This structured process could take more than a year to bear fruit, but is essential to the success of implementation.
15. If an in-house system development process is adopted, authorities must have confidence that their software developers will produce the required system modules when they are needed, and that the developed system will in fact meet their long term needs.
16. Road network definition rules should be revisited as part of the system and data definition process to ensure that all desired features of the road network can be properly referenced in the network database. The data structures for the network should ideally be set up using GIS-T database design principles.
17. The profile and awareness of PMS and pavement management principles must be raised within road authorities as an early step in the PMS implementation process.

8.2 RECOMMENDATIONS

8.2.1 Selection of Pavement Management System

8.2.1.1 Alternative 1

The evaluation of systems indicates that the commercial systems that provide the best range of features and functionality with the required degree of openness to allow for customisation to suit Irish conditions are Exor Highways (Exor Corporation Ltd.); Insight Pavement Manager (Symology Ltd.); dTIMS (Deighton Associates) and Confirm (Southbank Systems plc). Any one of these systems would be suitable for adoption, and all four are therefore recommended.

The final selection should be based on a tender process, which will ensure the most advantageous pricing of the system, bearing in mind that suppliers are likely to discount their prices where a large number of installations are envisaged.

8.2.1.2 Alternative 2

A feasible alternative to the selection of a new PMS is to significantly enhance MapRoad to produce a tailor-made PMS for Irish conditions. This system enhancement would be part of the structured process that is recommended for implementation of a PMS to meet the evolving requirements of the road authorities.

An evaluation of the possible enhancement of MapRoad indicates that this could be achieved within a reasonable time and at a reasonable cost, provided appropriate resources are made available for system development.

8.2.1.3 PMS Recommendation

It is recommended that Alternative 2, the enhancement of MapRoad, be adopted.

This alternative is recommended taking cognisance of the following factors:

- The need for an incremental, structured approach towards implementation
- The timescale required to implement PMS in Ireland
- The need to properly define data and processing requirements before system implementation
- The availability of a strong, dedicated, system development team to enhance MapRoad
- The anticipated reasonable cost of MapRoad system development compared to commercial systems

This alternative, if implemented correctly, will ensure that road authorities remain involved in the definition of requirements and the system development process, and will be able to ensure that the ultimate system will meet both their short- and long-term needs.

8.2.2 Implementation Process

- **It is recommended that implementation of the PMS follow a carefully structured process, taking into account, *inter alia*, the implementation factors identified in this report, to ensure the initiative is a success.**
- **It is recommended that external expert assistance should be brought in to help guide the implementation process.**
- **It is recommended that a steering group be instituted to oversee and coordinate the implementation process, with working groups as needed to focus on specific data and processing issues.**
- **The implementation process should include a review of network definition rules and should ensure that the network definition system can accommodate all the anticipated data needs of the road authorities.**
- **The implementation process should also allow for raising the profile and awareness of PMS within local authorities, as this will pay dividends in obtaining participation in the process and in ultimately using the system.**

Table 5.3 : Comparison of Systems - Summary

PMS REQUIREMENTS	Exor	INSIGHT	DTIMS CT	Confirm	WDM	RoSy	MARCH	Maproad	STREET SAVER	Micro PAVER	HIMS
Institutional Requirements											
Organisation											
System operation by one person, if required.	5	5	5	5	5	5	5	5	5	5	5
A networked system must accommodate at least 5 simultaneous users.	5	5	5	5	5	5	5	5	5	5	5
Simplicity											
System must be customisable to suit user requirements	5	5	5	4	3	3	3	4	2	3	5
Standard reports must be available and permit customisation	5	5	4	5	4	4	4	3	4	4	5
Quick Implementation											
Initial setup not more than 2 days	5	5	5	5	5	5	5	5	5	5	5
Tools for import of existing data must be provided	4	5	4	4	4	2	4	4	2	2	5
Subtotal	29	30	28	28	26	24	26	26	23	24	30
Information Technology Requirements											
Windows NT Network / MS-Office Environment											
System must operate in Windows NT network environment	5	5	5	5	5	5	5	5	5	5	5
Networkable											
System must be network-enabled	5	5	5	5	5	5	5	5	5	5	3
Databases											
System database must be expandable to accommodate future data requirements	5	5	5	4	4	4	3	5	5	3	3
Modularity											
System must be modular with user-selectable modules for implementation	5	4	5	4	4	3	2	4	3	2	3
GIS Compatibility											
System must be compatible with Mapinfo GIS	4	5	3	4	3	3	2	5	3	2	4
System must link to Arcinfo / Arcview GIS	5	5	3	5	3	3	2	5	3	5	4
Subtotal	29	29	26	27	24	23	19	29	24	22	22
Functional Requirements											
Network Referencing Systems											
Can the system utilise a link and node network referencing system	5	5	5	5	5	5	5	5	2	2	5
Does the system accommodate multiple network referencing systems	5	5	4	4	5	0	0	0	0	0	0
Network Maintenance Tools											
Does system provide network maintenance tools?	5	5	5	5	5	5	5	5	4	5	5
Does system maintain network history?	5	5	3	4	4	3	0	0	0	0	0
Flexible Inventory and Attributes											
Does the system allow users to define their own inventory and attributes?	5	5	5	4	4	4	2	1	1	2	5
Condition Monitoring											
Does the system permit definition of condition attributes?	5	5	5	5	2	3	2	2	0	3	5
Does the system permit definition and use of alternate "rules and parameters"?	5	5	5	4	2	4	2	2	0	1	0
Prioritisation Tools											
Does the system permit user definition of prioritisation criteria?	4	4	5	2	2	3	2	2	2	2	0
Are tools for grouping of condition sections provided?	4	4	5	4	4	5	2	1	0	5	4
Are effective tools for economic analysis and optimisation provided?	4	4	5	3	3	4	2	1	5	4	0
Work Programming and Budgeting											
Does the system allow for generation of treatment options and costs?	5	4	5	4	4	4	2	3	4	2	0
Does the system offer programming and budgeting tools?	5	4	5	4	3	5	3	2	4	2	0
Does the system allow for multi-year programming?	4	4	5	3	3	5	3	2	4	2	0
Reporting and Viewing of data											
Does the system provide in-built reporting tools?	5	5	4	5	5	5	5	2	3	5	4
Are reports customisable to suit user requirements?	5	5	4	5	4	4	5	1	3	4	4
Can reports be exported to other systems or software?	4	4	5	4	3	3	4	3	3	3	4
Subtotal	75	73	75	65	58	62	44	32	35	42	36
Future Expansion											
Expandability											
Does the system offer modular upgrading options?	5	5	5	5	5	4	0	3	2	0	3
What additional modules are offered?	0	0	0	0	0	0	0	0	0	0	0
Compatibility with other systems											
Can external interfaces be set up with the system?	4	4	4	3	4	3	3	2	2	2	3
Subtotal	9	9	9	8	9	7	3	5	4	2	6
Support and Training											
Does the vendor offer ongoing software support, including upgrades?	5	5	5	5	5	5	5	5	5	5	3
Does the vendor provide initial training?	5	5	4	5	5	4	3	5	5	1	1
Does the vendor provide on-going training?	3	3	3	3	4	3	4	5	3	1	1
Does the vendor provide a Helpdesk?	4	4	3	5	5	3	5	1	3	0	1
Does support include user groups?	4	3	4	5	5	3	5	3	3	4	1
Subtotal	21	20	19	23	24	18	22	19	16	11	7
Total	163	161	157	151	141	134	114	111	102	101	101
Cost											
Indicative system purchase price?	€ 45,000	€ 43,300	€ 45,000	€ 46,700	-	€ 30,500	€ 600	€ 14,700	€ 2,500	€ 850	€ 3,500
Indicative Annual Support costs?	€ 7,700	€ 8,660	€ 4,300	€ 5,800	€ 44,000	€ 4,000	€ 9,300	€ 0	€ 0	€ 0	€ 0
Indicative training costs	€ 1,465	€ 1,000	€ 1,000	€ 900	€ 1,600	€ 900	€ 600	€ 0	?	?	?
Consultancy Costs for Data conversion	€ 1,465	€ 1,100	€ 800	€ 900	€ 1,500	€ 1,000	€ 510	€ 0	?	?	?
Consultancy Costs for System changes	€ 1,465	€ 800	€ 800	€ 900	€ 1,500	€ 900	€ 510	€ 0	?	?	?

APPENDIX A

PAVEMENT MANAGEMENT REVIEW QUESTIONNAIRE AND FINDINGS

PART 1

1 INTRODUCTION

The first stage of gathering information for the Pavement Management System review was through a questionnaire, circulated to road authorities in Ireland.

The questionnaire was designed to elicit information about the current status of Pavement Management implementation within road authorities, and covered the following topics:

- Information Technology Environment
- Road Network Information
- Geographic Information Systems
- Existing and proposed Pavement Management Systems
- Personnel involved in Pavement Management
- Pavement Management objectives
- Pavement Management responsibilities
- Time spent on PMS activities
- Data recorded in existing Pavement management Systems
- Existing and proposed road management systems

This Appendix presents details of the information gathered from the questionnaire, in two parts; the first being a summary of the findings with interpretation and commentary where appropriate, and the second being the tabulated survey results.

2 SURVEY FINDINGS

2.1 INFORMATION TECHNOLOGY ENVIRONMENT

2.1.1 Background

This portion of the questionnaire obtained outline details of the computers and computer networks existing at and proposed by local authorities, together with indications of their capabilities in relation to IT system development.

This information was intended to establish their general level of IT development, deployment, and support as this can affect the choice and implementation of any new systems.

2.1.2 Details of IT environment in organisations

The majority (25) of authorities reported the existence of Local Area Network infrastructure in their head offices, together with wide area networks connecting their area and other offices. Not all outside offices are currently networked.

It was subsequently established that most networks are based on the Windows NT network operating system.

In local offices, a number of authorities reported the existence of stand-alone PC's (i.e. not connected to the networks)

Twelve authorities reported having mainframes with terminals in their organisations.

See Table A1 in PART 2 for details.

2.1.3 Facilities / Personnel used for IT systems development

Authorities were asked whether they used in-house facilities and personnel for systems development, and if not, whether they made use of external resources such as LGCSB or contractors.

Responses were mixed, in that most authorities reported using both in-house and external resources for both new systems and enhancements to existing systems. This implies that they have some in-house personnel for systems development.

Where external resources were used, most indicated that they utilised LGCSB for the development of new and enhancements to existing systems. A smaller number reported making use of external contractors for this purpose.

See Table A2 in PART 2 for details.

2.2 ROAD NETWORK AND GIS (GEOGRAPHIC INFORMATION SYSTEM)

2.2.1 Background

This part of the questionnaire focussed on the existence of geographic information systems within authorities, and on details of the ways in which authorities kept details of the road networks.

Well-structured and well-defined road network information is a fundamental requirement for any road management system, so it was important to establish what is being done at present. A GIS is a very useful tool for local authorities, as it enables information to be stored spatially, which enables production of map-based presentations much easier. In the context of pavement management, the system chosen should ideally be integrated, and should at least be compatible with the local authority GIS.

2.2.2 Existing GIS

The vast majority of local authorities reported having existing GIS in their organisations. Twenty-five said that they made use of MAPINFO GIS, two reported using Arcview GIS and one reported using Autodesk Map GIS.

2.2.3 Road Network and GIS

Most authorities (23) indicated that they had recorded details of their road network in their GIS. This has generally been done using an external database connected to the GIS, as is done in Maproad, where the network data is held in an underlying MS-Access or MS-SQL Server database.

The responses to questions about location-referencing systems yielded a mixed response, with eleven authorities reporting use of a node-link system and nine reporting use of a GIS-based system. Two authorities reported use of a Route km-post referencing system.

These responses perhaps indicated some lack of understanding about referencing systems, as one would have expected most to report a node and link system, as used in Maproad.

Fewer authorities responded to the question on road segmentation system, with the majority of those responding indicating use of a fixed segmentation system.

See Table A3 in PART 2 for details.

2.3 PAVEMENT MANAGEMENT SYSTEMS

2.3.1 Background

The remainder of the questionnaire concentrated on obtaining broad details of existing Pavement Management Systems and their utilisation, with questions relating to operational aspects, objectives, data and responsibilities. The priorities of PMS and other road management systems were also explored.

This part was aimed at gaining an understanding of the current state of PMS implementation amongst road authorities and of the importance that authorities placed on various aspects of PMS usage. All these were to be used to help define the requirements for any new pavement management system.

2.3.2 Existing or Planned Pavement Management Systems

Of the respondents, only nine (out of twenty-eight) reported having an existing pavement management system.

A majority (15) of those that did not have an existing system however indicated their intention to implement PMS within the next five years. Some planned for implementation within a year, with most foreseeing implementation between two and five years hence.

Systems currently in use were:

Maproad	7
MicroPAVER	1
RoSY	1

See Table A3 in PART 2 for details.

Authorities were asked to indicate what facilities / personnel they used / anticipated using for PMS operations. The results are shown below:

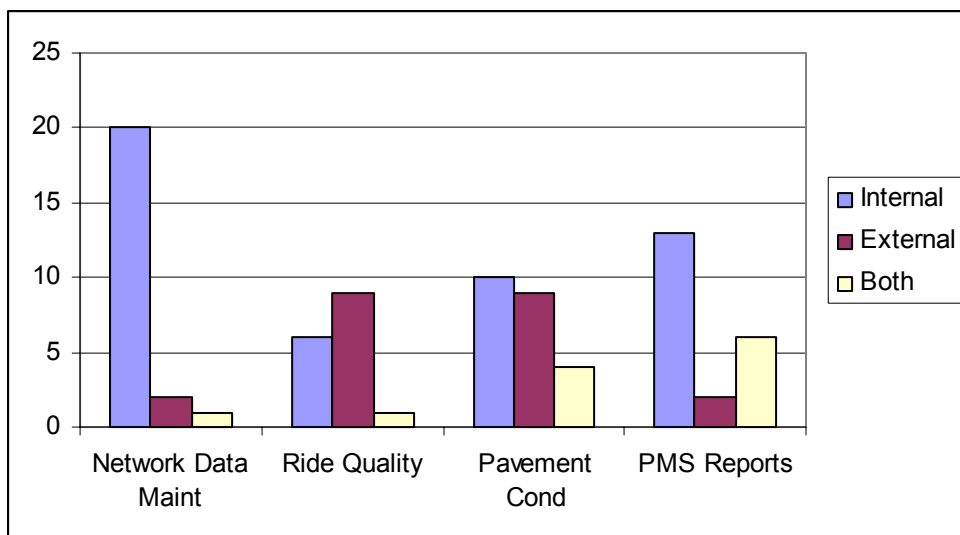


Figure 2.3: Personnel / Facilities for PMS Operations

Clearly most authorities would prefer to do network data maintenance and PMS reporting in-house. Measurement of Ride Quality is seen as being done mainly using external resources, which is understandable as this is a mechanical measurement done using specially equipped vehicles. Authority responses are more evenly balanced about Pavement Condition Assessments, which are a significant element of a PMS, and could be done by trained in-house personnel, or by contractors.

See Table A4 in PART 2 for details.

2.3.3 Pavement Management Objectives

This question related to the priority or importance ascribed to various PMS objectives by different management levels. Respondents were asked to indicate High, Medium or Low Priority ratings for the management levels Director of Services, Roads Engineer and Area Engineer.

The number of High, Medium, Low responses were recorded for each management level and “High” responses totalled to get overall priority ratings for each of the PMS Objectives. The results are summarised below:

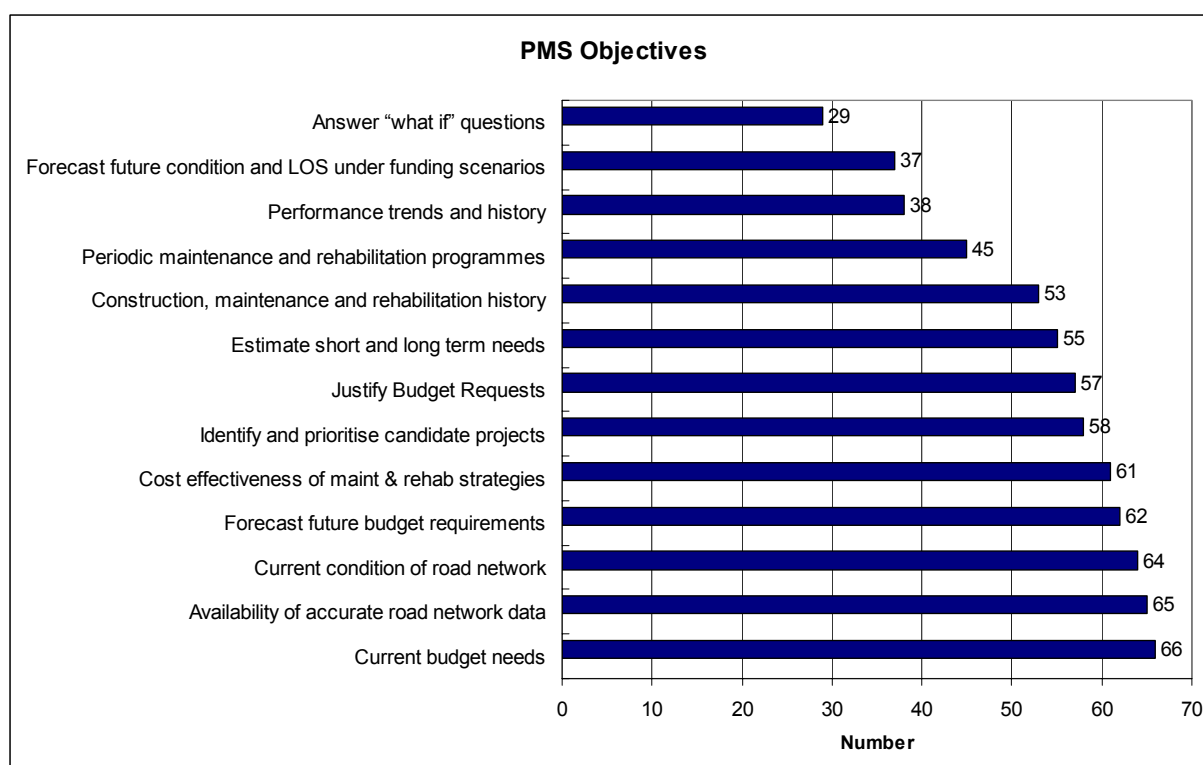


Figure 2.4: Priority of PMS Objectives

These results indicate that respondents place generally higher priority on short-term PMS objectives such as current budget needs and having good network data, and generally lower priority on longer-term objectives such as forecasting of future conditions and scenario planning. This is understandable given the current relatively low level of PMS implementation within authorities.

See Table A5 in PART 2 for further details.

2.3.4 Pavement Management Responsibilities

This portion of the questionnaire attempted to obtain a picture of how authorities felt that PMS should be implemented within their organisations. Given that relatively few authorities currently have PMS systems in operation, the results indicate preferences rather than existing practices.

The results are summarised below in respect of the responsibilities of the following personnel, namely Director of Services, Senior Roads Engineer, Roads Engineer, Area Engineer.

Clearly, the Director of Services takes primary responsibility, together with the Senior Roads Engineer, for PMS Policies, with some involvement in Annual Reports, Programming and Budgeting.

The Senior Roads Engineer is seen as taking responsibility for management of the PMS, and takes the lead in Programming and Budgeting of Projects and Project Selection and Ranking. He retains some responsibility for most other aspects of PMS operation.

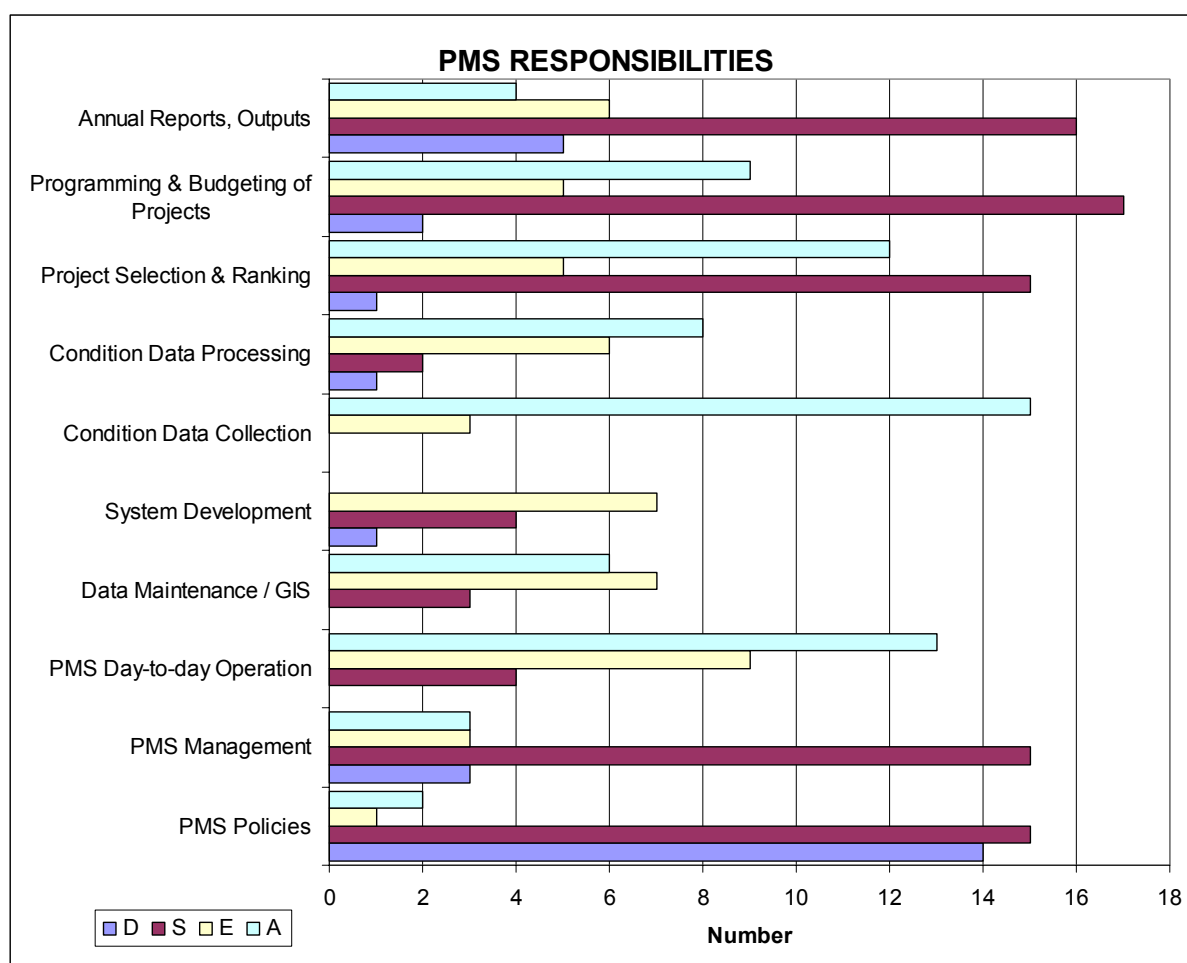


Figure 2.5: PMS Responsibilities

The Roads Engineer and Area Engineer are seen as taking responsibility for most other aspects of PMS operation, including day-to-day operation, with the Area Engineer taking greater responsibility for area-related aspects such as Condition Data Collection and Project Selection and Ranking

The Roads Engineer takes greater responsibility for Data Maintenance and System Development.

The ultimate assignment of responsibilities for operations within an organisation is a function of a number of factors, including staff availability, organisational structure, delegated authority, and individual aptitudes.

See Table A6 in PART 2 for further details.

2.3.5 Time Spent on PMS Activities

The approximate time spent on PMS activities, as a percentage of total hours was requested, as another indicator of where authorities perceived the main workload for the PMS to reside.

The averages are given below:

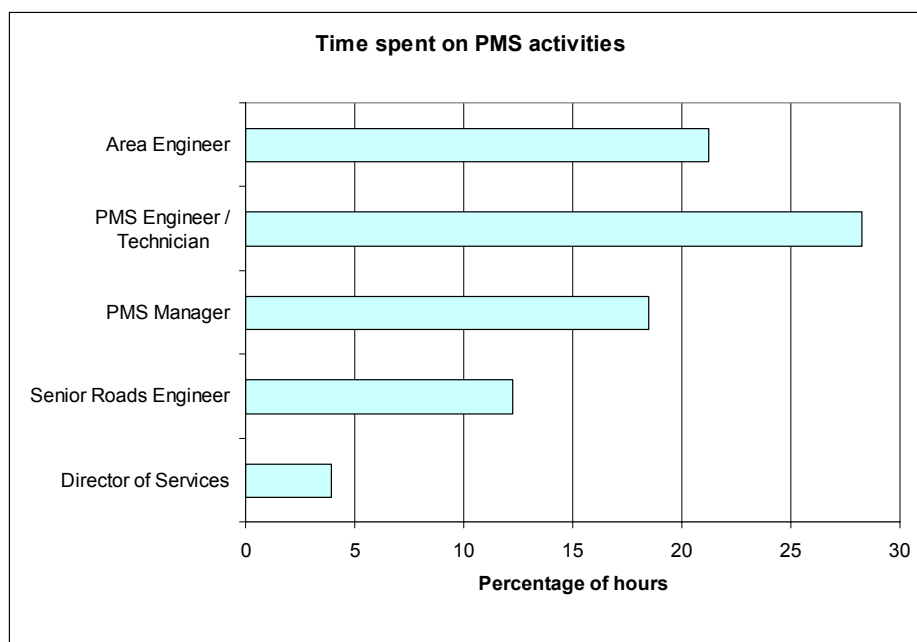


Figure: 2.5: Time Spent on PMS Activities

These results are logical, and indicate that PMS operations will occupy a significant portion of the time available to the various personnel involved.

See Table A7 in PART 2 for further details.

2.3.6 Existing and Desired PMS Information

These responses gave an indication of both the desired situation regarding PMS information. Results are summarised below:

It is clear that authorities give greater priority at this stage to defining their networks and obtaining accurate inventory information about their networks than to evaluation of network condition. This is perhaps understandable, as good network information is a prerequisite to carrying out any reliable analysis of network condition.

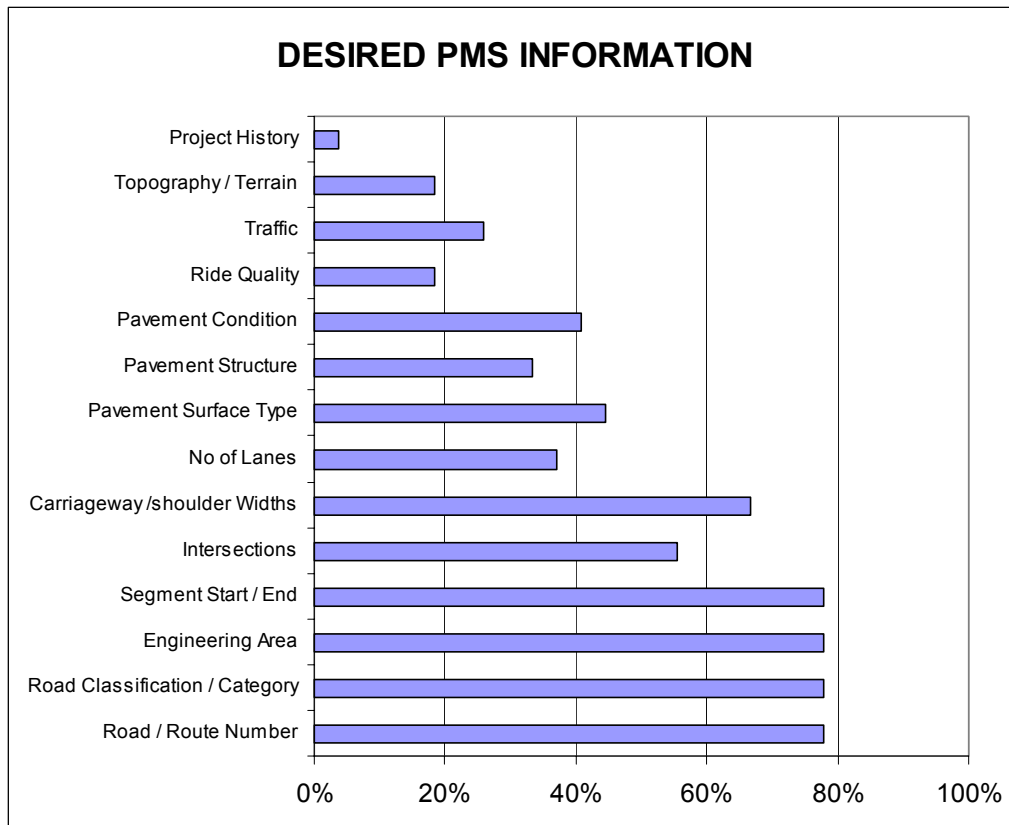


Figure 3.6: Desired PMS Information

See Table A8 in PART 2 for further details.

2.4 ROAD MANAGEMENT SYSTEMS

2.4.1 Background

This portion of the questionnaire asked respondents to indicate, from a list, each road management system that is existing or proposed in their authority. They were also requested to indicate the priority of the proposed system.

The purpose of this was to ascertain the relative priority of elements of road management, and in particular, the priority accorded to pavement management, compared to other possible systems.

Pavement Management can be seen as just one of the possible components of an overall road management system. Road Management encompasses both management of the physical assets such as pavements, bridges, as well as human resources, equipment and materials, and other items of value such as finances, CPO, data, computer systems, methods, technologies and partners.

2.4.2 Existing Management Systems

Management Systems reported as being in existence in road authorities are detailed below:

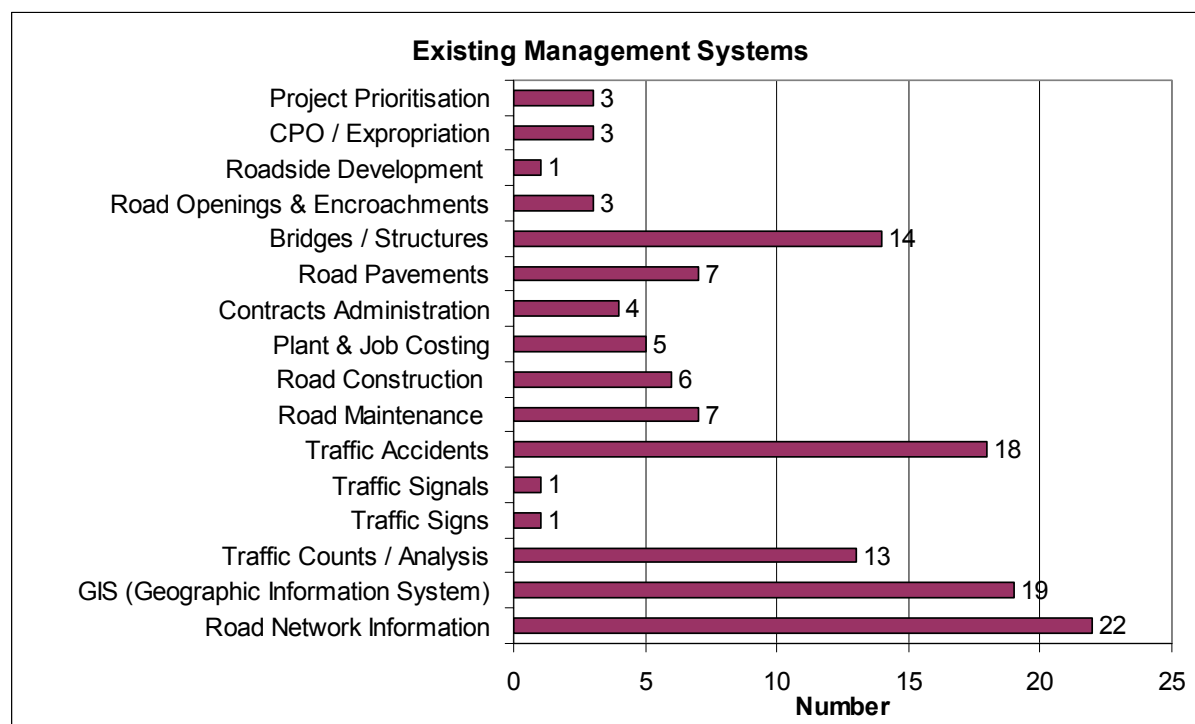


Figure 4.1: Existing Management Systems

The status of these systems is not clear, and some of them may be local databases keeping records of information related to the particular element, rather than formal systems.

It is likely that the systems that show high numbers are mainly those where Maproad provides modules for the particular element. In some cases data may be collected on National Roads only.

See Table A9 in PART 2 for details.

2.4.3 Proposed Management Systems

The priorities accorded to the various management systems by respondents are given below.

It is interesting to note that pavement management is not considered the highest priority, with systems to manage traffic signs, road openings & encroachments, and road maintenance, receiving higher scores.

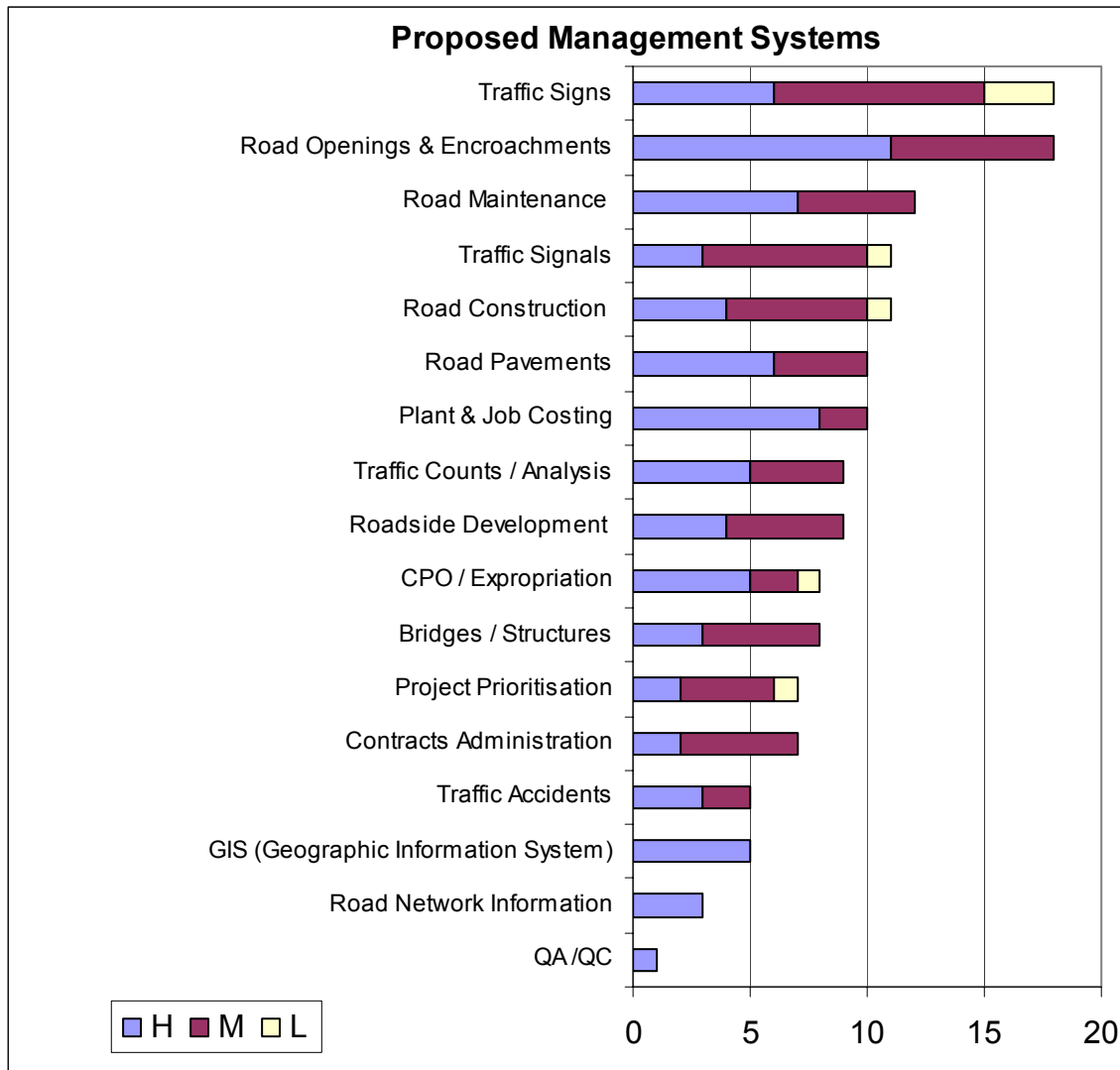


Figure 4.2: Proposed Management Systems

See Table A10 in Part 2 for details.

PART 2

PAVEMENT MANAGEMENT REVIEW QUESTIONNAIRE

PART 1: INFORMATION TECHNOLOGY ENVIRONMENT

Please provide details of the IT environment in your organization: (✓)

Computers and Networks		
HEAD OFFICE	Existing	Proposed
Mainframe with terminals / workstations		
Local Network with networked PC's		
Stand-Alone PC's		
Wide Area Network (between offices)		
AREA OFFICES	Existing	Proposed
Wide Area Network (to head office)		
Local Network with networked PC's		
Stand-Alone PC's		
Comments:		

What Facilities/Personnel Do You Use For Developing And Maintaining IT Systems? (✓)

Facilities for IT Systems Development		
	New Systems	Existing Systems
In-house		
External (e.g. LGCSB)		
Contractors		
Comments:		

PART 2: ROAD NETWORK AND GIS (GEOGRAPHIC INFORMATION SYSTEM)

Do you have a Geographic Information System?

YES	NO
-----	----

What Geographic Information System is used?
(e.g. MAPINFO, ARC/INFO, etc.)

Are details of your road network recorded in the GIS?

YES	NO
-----	----

Do you have a separate database of road network information?

YES	NO
-----	----

What data base system is used for road network data?
(e.g. Excel, MS-Access, Oracle, SQL-Server, etc.)

Is this data base connected to your GIS?

YES	NO
-----	----

What Location-Reference System do you use?

Route	Node-Link	GIS
-------	-----------	-----

What Road Segmentation System do you use?

Dynamic	Fixed	Other
---------	-------	-------

PART 3: PAVEMENT MANAGEMENT SYSTEMS

Do you have an existing Pavement Management System?

YES

NO

Do you plan to implement Pavement Management in the future?

YES

NO

When do you anticipate implementation?

1 YR

2 yr

3-5 yr

Please Provide The Following Information About Existing or Planned Pvmnt Mgt Systems:

PMS Details	
System Name	
Supplier (<i>Name</i>)	
Date of implementation	
Name of PMS Manager	
Budget allocation for PMS activities (<i>approx</i>)	

What Facilities/Personnel Do You Use / Anticipate Using For PMS Operations? (✓)

PMS Operations		
	In-house	External (e.g. Consultants / contractors)
Network Data Maintenance		
Ride Quality		
Pavement Condition Assessments		
PMS Reports		
Comments:		

PAVEMENT MANAGEMENT OBJECTIVES

Priority / importance of PMS objectives to each management level: (H–High, M–Med, L–Low)

Objectives	Director of Services	Roads Engineer	Area Engineer
Availability of accurate road network data			
Construction, maintenance and rehabilitation history			
Current condition of road network			
Identify and prioritise candidate projects			
Current budget needs			
Periodic maintenance and rehabilitation programmes			
Estimate short and long term needs			
Justify Budget Requests			
Answer “what if” questions			
Performance trends and history			
Forecast future budget requirements			
Forecast future condition and level of service under different funding scenarios			
Cost effectiveness of maintenance and rehabilitation strategies			

PAVEMENT MANAGEMENT RESPONSIBILITIES

Indicate the person / persons responsible for the Pavement Management activities listed below: (e.g. Dir. of Services, Sen. Eng (Roads), Engineer, Technician, IT, GIS, Area Eng)

Activity	Person(s)
PMS Policies	
PMS Management	
PMS Day-to-day Operation	
Data Maintenance / GIS	
System Development	
Condition Data Collection	
Condition Data Processing	
Project Selection & Ranking	
Programming & Budgeting of Projects	
Annual Reports, Outputs	

TIME SPENT ON PMS ACTIVITIES

Approximate time spent on PMS activities (% of total hours), by the persons listed

Person	Percentage Time
Director of Services	
Senior Roads Engineer	
PMS Manager	
PMS Engineer / Technician	
Area Engineer	

What road / pavement information is recorded in your PMS?

Inventory Data	Yes / No
Road / Route Number	
Road Classification / Category	
Engineering Area	
Segment Start / End	
Intersections	
Carriageway /shoulder Widths	
No of Lanes	
Pavement Surface Type	
Pavement Structure	
Pavement Condition	
Ride Quality	
Traffic	
Topography / Terrain	
(Other)	

Frequency of routine pavement condition evaluation?

6 MTH

1 yr

>1 yr

PART 4: ROAD MANAGEMENT SYSTEMS

Please indicate each management system that is existing or proposed. If not envisaged, leave blank. Also indicate the priority of the proposed system. (L = Low, M = Medium, H = High)

System	Existing (√)	Proposed (√)	Priority (L / M / H)
Road Network Information			
GIS (Geographic Information System)			
Traffic Counts / Analysis			
Traffic Signs			
Traffic Signals			
Traffic Accidents			
Road Maintenance			
Road Construction			
Plant & Job Costing			
Contracts Administration			
Road Pavements			
Bridges / Structures			
Road Openings & Encroachments			
Roadside Development (eg advertising, accesses, structures, buildings, planning)			
CPO / Expropriation			
Project Prioritisation			
(other)			

Thank You

INFORMATION TECHNOLOGY ENVIRONMENT

Table A1

Computers and Networks	HEAD OFFICE								AREA OFFICES						IT SYSTEMS DEVELOPMENT					
	Mainframe with terminals / workstations		Local Network with networked PC's		Stand-Alone PC's		Wide Area Network (between offices)		Wide Area Network (to head office)		Local Network with networked PC's		Stand-Alone PC's		In-house		External (e.g. LGCSB)		Contractors	
	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	New	Exist	New	Exist	New	Exist
Carlow							X		X						X					
Cavan			X						X						X	X	X			
Clare			X				X		X						X	X	X	X	X	X
Cork			X		X		X			X	X		X		X	X	X	X	X	X
Cork City			X				X		X								X	X	X	
Donegal			X		X		X		X		X		X		X	X				
Dublin City	X		X		X		X		X		X		X		X					
Dun-Rath			X				X		X							X		X		X
Fingal	X		X		X		X		X		X		X		X			X	X	
Galway	X						X		X						X		X			
Galway City			X				X									X	X		X	
Kerry	X		X				X		X						X		X		X	
Kildare	X		X		X		X		X		X		X		X	X	X	X	X	X
Kilkenny			X				X		X						X	X	X	X		
Laois																				
Leitrim	X		X				X		X						X	X	X	X		
Limerick			X				X		X		X		X		X	X	X	X		
Limerick City																				
Longford																				
Louth			X				X		X		X				X	X	X	X	X	X
Mayo			X				X		X						X	X	X	X		
Meath	X		X				X		X		X				X	X	X			
Monahan			X		X		X		X		X		X			X	X			
N Tipperary	X		X				X		X						X	X	X		X	
Offaly																				
Roscommon			X				X		X						X	X			X	
Sligo	X		X				X		X							X	X			
Sth Dublin																				
South Tipperary			X				X		X		X				X					
Waterford	X		X		X		X		X		X		X		X		X			
Waterfd Cty			X								X				X	X	X	X	X	X
Westmeath	X		X				X		X		X				X	X	X	X		
Wexford	X								X						X		X		X	
Wicklow																				
SUMMARY	12	0	25	0	7	0	25	0	25	1	13	0	8	0	23	19	21	13	12	6

ROAD NETWORK AND GIS

Table A2

ROAD NETWORK AND GIS (GEOGRAPHIC INFORMATION SYSTEM)	Do you have a Geographic Information System?	What Geographic Information System is used? MAPINFO (MI), ARCVIEW (AV), AUTODESK (AD)	Are details of your road network recorded in the GIS?	Separate database of road network information?	What data base system is used for road network data? Excel (X), MS-Access (A), Oracle (O), SQL-Server (Q)	What Location-Reference System do you use? Route km (R), Node-Link (N), GIS (G)	What Road Segmentation System is used? Dynamic (D), Fixed (F), Other (O)
Carlow	Y	MI	Y	Y	?	?	?
Cavan	Y	MI	Y	Y	A	N	F
Clare	Y	MI	Y	Y	A	?	?
Cork	Y	MI	Y	Y	A	N	F
Cork City	Y	AV	Y	Y	Rosy	N	F
Donegal	Y	MI	Y	N	A	G	F
Dublin City	Y	MI	N	Y	X	G	?
Dunlaoghaire-Rathdown	Y	MI	Y	Y	A	?	O
Fingal	Y	AV	N	Y	X	?	?
Galway	Y	MI	Y	N	A	G	?
Galway City	Y	MI	N	N	?	R	?
Kerry	Y	MI	Y	Y	A	?	F
Kildare	Y	AD	Y	Y	Q	N	D
Kilkenny	Y	MI	Y	Y	A	N	?
Laois							
Leitrim	Y	MI	Y	Y	A	N	?
Limerick	Y	MI	Y	Y	A	N	F
Limerick City							
Longford							
Louth	Y	MI	N	N	?	G	?
Mayo	Y	MI	Y	Y	A	G	F
Meath	Y	MI	Y	Y	A	N	F
Monahan	Y	MI	Y	N	Q	R	F
North Tipperary	Y	MI	Y	Y	A	N	?
Offaly							
Roscommon	Y	MI	Y	N	A	N	
Sligo	Y	MI	Y	N	X	G	F
South Dublin							
South Tipperary	Y	MI	Y	Y	A	G	F
Waterford	Y	MI	Y	Y	A	G	O
Waterford City	N	MI	N	N	?	?	?
Westmeath	Y	MI	Y	Y	A	G	?
Wexford	Y	MI	Y	Y	A	N	F
Wicklow							

SUMMARY

Y = 27	MI = 25	Y = 23	Y = 20	A = 18	R = 2	D = 1
N = 1	AV = 2	N = 5	N = 8	X = 3	N = 11	F = 12
	AD = 1			Q = 2	G = 9	O = 2
				R = 1		

Table A3

SUMMARY	Y =	9	Y =	15	1 yr	5
	N =	19	N =	2	2 yr	1
			U =	2	3-5 yr	9

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FACILITIES / PERSONNEL USED FOR PMS OPERATIONS

Table A4

Facilities/personnel used / anticipate using for PMS operations	Network Data Maintenance	Ride Quality	Pavement Condition Assessments	PMS Reports
	I = In-House, X = External			
Carlow	I		I	I
Cavan	I	I	I	I
Clare	I	X	I	I
Cork	I	X	IX	IX
Cork City	I	X	X	IX
Donegal	I	X	IX	I
Dublin City	I		I	I
Dunlaoghaire-Rathdown	I	I	I	I
Fingal	I	I	X	I
Galway				
Galway City				
Kerry	I	I	I	I
Kildare	I	I	I	I
Kilkenny	I		I	I
Laois				
Leitrim	I	I	I	I
Limerick	I			I
Limerick City				
Longford				
Louth	I	X	X	IX
Mayo	X		IX	IX
Meath	X	X	X	X
Monahan				
North Tipperary	?	?	?	?
Offaly				
Roscommon	I	X	X	I
Sligo	I	X	X	X
South Dublin				
South Tipperary	I		I	
Waterford	I	X	X	IX
Waterford City	IX	IX	IX	IX
Westmeath			X	
Wexford	I		X	
Wicklow				
SUMMARY	I = 20 X = 2 IX = 1	I = 6 X = 9 IX = 1	I = 10 X = 9 IX = 4	I = 13 X = 2 IX = 6

PAVEMENT MANAGEMENT OBJECTIVES

Table A5

Priority / importance of PMS objectives to each management level: (H=High, M=Med, L=Low)	Director of Services													
	Availability of accurate road network data	Construction, maintenance and rehabilitation history	Current condition of road network	Identify and prioritise candidate projects	Current budget needs	Periodic maintenance and rehabilitation programmes	Estimate short and long term needs	Justify Budget Requests	Answer "what if" questions	Performance trends and history	Forecast future budget requirements	Forecast future condition and LOS under funding scenarios	Cost effectiveness of maint & rehab strategies	
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Carlow	H				H			H	H		H	H		
Cavan	H	H	H	H	H	H	H	H	H	H	H	H	H	
Clare	H	H	M	L	M	M	M	H	M	H	H	H	M	
Cork	L	L	M	M	H	M	H	H	M	H	H	H	H	
Cork City														
Donegal	M	M	H	H	H	L	H	H	H	H	H	H	M	
Dublin City	H	M	H	H	H	L	H	H	M	M	H	M	H	
Dunlaoghaire-Rathdown	M	M	H	H	H	H	H	H	H	H	L	H		
Fingal	H	M	M	L	H	M	H	M	L	H	M	H		
Galway	M	M	M	M	H	M	H	L	M	H	M	M		
Galway City	H	H	M	H	H	M	H	H	M	M	H	M	H	
Kerry	H	H	H	H	H	H	H	M	L	M	H	M	H	
Kildare	H	L	H	H	L	H	H	M	M	H	H	H	H	
Kilkenny	H	H	H	M	H	L	H	H	M	M	H	H	M	
Laois														
Leitrim	M	M	H	H	H	M	H	M	M	L	H	H	H	
Limerick	H	L	H	L	H	H	H	H	L	H	H	M	H	
Limerick City														
Longford														
Louth	H	H	H	H	H	H	H	H	M	H	M	M	H	
Mayo	M	M	M	L	M	M	M	M	M	M	H	H	H	
Meath	H	M	H	H	H	M	M	H	H	H	H	H	H	
Monahan	H	L	L	H	H	H	H	H	H	H	H	H	H	
North Tipperary	L	L	M	H	H	M	H	H		M	H	M	H	
Offaly														
Roscommon	H	H	H	L	H	L	H	H	H	H	H	H	H	
Sligo														
South Dublin														
South Tipperary	H	H	H	M	M	M	H	M	M	H	H	H	H	
Waterford	H	M	H	H	H	M	H	H	M	L	H	M	M	
Waterford City	H	H	H	H	H	H	H	H	H	H	H	H	H	
Westmeath														
Wexford	M	M	M	M	H	M	M	H	M	M	H	M	M	
Wicklow														
SUMMARY	H	17	9	15	14	21	8	20	21	9	12	24	15	18
	M	6	10	8	5	3	12	4	4	12	9	1	9	6
	L	2	5	1	5	1	4	0	0	3	3	0	1	0

Roads Engineer													
Availability of accurate road network data	Construction, maintenance and rehabilitation history	Current condition of road network	Identify and prioritise candidate projects	Current budget needs	Periodic maintenance and rehabilitation programmes	Estimate short and long term needs	Justify Budget Requests	Answer "what if" questions	Performance trends and history	Forecast future budget requirements	Forecast future condition and LOS under funding scenarios	Cost effectiveness of maint & rehab strategies	
1	2	3	4	5	6	7	8	9	10	11	12	13	
H	H	H		H	H	H	H		H	H	H		
H	H	H	H	H	H	H	H	H	H	H	H	H	
H	H	H	H	H	H	H	M	M	H	H	H	M	
H	H	H	H	H	H	H	H	M	H	H	H	H	
H	M	M	H	M	L	M	M	L	L	H	M	M	
H	M	H	H	H	M	H	H	H	H	H	M	H	
H	H	H	H	H	H	H	H	H	H	H	M	H	
M	H	H	H	H	M	M	H	H	M	H	H	H	
H	H	H	H	H	H	H	H	L	M	M	M	H	
H	H	H	H	H	H	H	H	L	M	H	M	H	
H	H	H	H	H	H	H	H	H	H	H	H	H	
H	H	H	H	H	H	H	H	H	H	H	H	H	
H	H	H	M	H	M	H	H	H	H	H	H	H	
M	M	H	H	H	M	H	M	M	M	H	H	H	
H	H	H	H	H	M	M	H	M	H	H	H	H	
H	H	H	H	H	H	H	H	L	H	H	H	H	
H	H	H	M	M	M	M	M	M	M	H	M	M	
H	H	H	H	H	M	M	H	M	H	H	H	H	
H	H	H	H	H	H	H	H	M	M	M	M	H	
H	H	H	H	H	H	H	H	H	H	H	H	H	
H	M	M	H	H	M	M	H	M	M	H	M	H	
H	25	21	24	24	25	17	20	20	12	15	23	14	23
M	2	6	3	2	2	8	7	6	9	10	4	13	3
L	0	0	0	0	0	2	0	1	4	2	0	0	0

Area Engineer												
Availability of accurate road network data	Construction, maintenance and rehabilitation history	Current condition of road network	Identify and prioritise candidate projects	Current budget needs	Periodic maintenance and rehabilitation programmes	Estimate short and long term needs	Justify Budget Requests	Answer "what if" questions	Performance trends and history	Forecast future budget requirements	Forecast future condition and LOS under funding scenarios	Cost effectiveness of maint & rehab strategies
1	2	3	4	5	6	7	8	9	10	11	12	13
H	H	H	H		H	H						H
H	H	H	M	H	M	M	H	M	M	H	M	H
H	H	H	H	H	H	H	M	M	H	H	H	H
H	H	H	H	H	H	H	H	M	M	H	M	H
M	H	H	M	M	H	L	M	M	L	M	L	M
H	H	H	L	H	H	L	M	M	M	M	L	M
H	H	H	H	H	H	L	H	H	L	H	L	M
H	H	H	M	M	M	M	M	L	M	L	L	H
H	H	H	H	H	M	M	H	L	M	M	L	H
H	H	H	M	M	H	M	H	H	M	H	M	H
H	H	H	H	H	H	H	H	L	M	H	M	H
H	H	H	H	H	M	H	H	H	H	H	H	H
M	M	H	H	H	M	H	M	M	M	H	H	H
H	H	H	H	H	H	H	H	H	H	H	H	H
H	H	H	H	H	M	M	L	L	H	L	L	H
H	H	H	H	H	H	H	H	H	H	H	H	H
H	M	H	H	H	H	H	H	M	M	M	H	H
H	H	H	H	H	H	H	H	M	L	L	L	H
H	H	H	H	L	H	L	L	L	L	L	L	H
H	H	H	H	H	M	M	H	H	H	M	M	M
H	H	H	H	H	H	M	M	L	M	M	L	M
H	H	H	H	H	H	H	H	L	M	H	M	H
H	H	H	H	H	H	H	H	H	M	H	M	H
H	23	23	25	20	20	15	16	8	11	15	8	20
I	2	2	0	4	3	5	6	7	10	3	8	5
L	0	0	0	1	1	4	4	2	8	3	6	8

PAVEMENT MANAGEMENT RESPONSIBILITIES

Table A6

Activity	PMS Policies	PMS Management	PMS Day-to-day Operation	Data Maintenance / GIS	System Development	Condition Data Collection	Condition Data Processing	Project Selection & Ranking	Programming & Budgeting of Projects	Annual Reports, Outputs
	D = Dir. Of Services S = Sen. Eng E = Eng. T = Technician I = IT G = GIS A =Area Eng									
Carlow	S,A	I	T	I	I	A	D,S,A	S,A	S,A	S
Cavan	D	D	E	E	I	E	E	S	S	S
Clare	S	E	E,A	E	E	A,G	?	?	?	E
Cork	S	S,E,A	S,E,A	S,E,A	S,E	A	A,E	S,E,A	S,E,A	S,E,A
Cork City	D	S	E	E	E	E	E	S	S	S
Donegal	S	S	A	A	D	A	A	D	S	D
Dublin City	S	E	T	T	E	T	T	S	S	S
Dunlaoghaire-Rathdown	S	S	S	S	I	A	A	A	S	S
Fingal	D	S	A	T	I	T	T	A	S,A	S
Galway	D	S	A	A	G	A	A	S	S	S
Galway City	?	?	?	?	?	?	?	?	?	?
Kerry	D	S	A	A,T	E,G	A,T	A,T	S	A,E	E
Kildare	D,S	A	A,T,G	T,G	G	A,T,G	G	S,A	S,A	S,A
Kilkenny	D,S,E,A	S,I,G	E,A,T	S,E,I,G	S,E,I,G	A,T	E,T,G	S,E,A	S,E,A	D,S,E,G
Laois										
Leitrim	D	S	E	E	S	T	T	A	S	D
Limerick	E	T	T	T,I,G	I	A	A	A	A	T
Limerick City										
Longford										
Louth	D,S	?	S	A,T	?	A,T	E	E,A	E,A	E,A
Mayo	D,S	D,S	E,A	G	I	E,A	E,A	S	S	S
Meath	D,S	D,S	E,T	E,T	S,E,T	?	?	S,E	D,S	S,E
Monahan	?	?	?	?	?	?	?	?	?	?
North Tipperary	S	S,A	A	T,G	I	T	T	S	S	D,S
Offaly										
Roscommon										
Sligo	D	S	E	T	G	A,T	T	E	E	S
South Dublin										
South Tipperary	D,S	S	A	G	G	A	G	S,A	S,A	S,A
Waterford	D,S	S,G	S,A,G	A,G	I,G	A	G,I	S,A	D,S	D,S
Waterford City	?	?	?	?	?	?	?	?	?	?
Westmeath	S	?	A	S	?	?	S	S,A	?	?
Wexford	?	?	?	?	?	?	?	?	?	?
Wicklow										
D	14	3	0	0	1	0	1	1	2	5
S	15	15	4	3	4	0	2	15	17	16
E	1	3	9	7	7	3	6	5	5	6
A	2	3	13	6	0	15	8	12	9	4
I		2		3	8	0	1	0	0	0
T		1	6	9	1	9	6	0	0	1
G		2	2	7	7	2	4	0	0	1

TIME SPENT ON PMS ACTIVITIES

Table A7

Approx time spent on PMS activities	Director of Services	Senior Roads Engineer	PMS Manager	PMS Engineer / Technician	Area Engineer
Carlow	1	5	5	10	5
Cavan	5	10	15	10	10
Clare	1	5	15	35	5
Cork	5	70	0	80	60
Cork City	?	?	?	?	?
Donegal	0	0	50	0	0
Dublin City	10	10	50	80	20
Dunlaoghaire-Rathdown	10	20	?	?	40
Fingal	5	10	?	30	20
Galway	5	20	20	10	50
Galway City	?	?	?	?	?
Kerry	5	10	?	30	20
Kildare	10	25	?	?	70
Kilkenny	?	?	?	?	?
Laois					
Leitrim	5	5	?	?	?
Limerick	0	0	5	?	5
Limerick City					
Longford					
Louth	?	?	?	?	?
Mayo	0.5	2	5	25	5
Meath	5	7	?	25	?
Monahan	?	?	?	?	?
North Tipperary	?	?	?	?	?
Offaly					
Roscommon					
Sligo	?	?	?	?	?
South Dublin					
South Tipperary	2	2	20	30	20
Waterford	1	5	?	?	7.5
Waterford City	?	?	?	?	?
Westmeath	0	2	?	2	2
Wexford	?	?	?	?	?
Wicklow					
<10%	10	9	4	1	7
10-20%	3	4	2	3	1
>20%		4	4	8	8
Averages	3.9	12.2	18.5	28.2	21.2

Road / pavement information recorded in PMS?
Table A8

DESIRED PMS INFORMATION	Road / Route Number	Road Classification / Category	Engineering Area	Segment Start / End	Intersections	Carriageway / shoulder Widths	No of Lanes	Pavement Surface Type	Pavement Structure	Pavement Condition	Ride Quality	Traffic	Topography / Terrain	Project History
Carlow	Y	Y	Y	Y	Y									Maproad
Cavan	Y	Y	Y	Y	Y	Y	Y	Y		Y				Maproad
Clare	Y	Y	Y	Y	Y	Y		Y	Y					Maproad
Cork	Y	Y	Y	Y	Y	Y								Maproad
Cork City	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				Rosy
Donegal	Y	Y	Y	Y	Y	Y		Y	Y			Y		
Dublin City	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Dunlaoghaire-Rathdown	Y	Y	Y	Y		Y								
Fingal	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Galway	Y	Y	Y	Y	Y	Y							Y	
Galway City	?	?	?	?	?	?	?	?	?	?	?	?	?	
Kerry	Y	Y	Y	Y		Y	Y			Y			Y	Maproad
Kildare	Y	Y	Y	Y	Y	Y	Y			Y		Y		
Kilkenny	Y	Y	Y	Y	?	Y								
Laois														
Leitrim	Y	Y	Y	Y	Y	Y	Y	Y		Y				Maproad
Limerick	Y	Y	Y	Y										
Limerick City														
Longford														
Louth	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Mayo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Meath	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Monahan	?	?	?	?	?	?	?	?	?	?	?	?	?	
North Tipperary	?	?	?	?	?	?	?	?	?	?	?	?	?	
Offaly														
Roscommon														
Sligo	Y	Y	Y	Y	Y			Y	Y	Y				
South Dublin														
South Tipperary	Y	Y	Y	Y	Y	Y								
Waterford	?	?	?	?	?	?	?	?	?	?	?	?	?	
Waterford City	?	?	?	?	?	?	?	?	?	?	?	?	?	
Westmeath	?	?	?	?	?	?	?	?	?	?	?	?	?	
Wexford	Y	Y	Y	Y		Y		Y						
Wicklow														
	21	21	21	21	15	18	10	12	9	11	5	7	5	1
	78%	78%	78%	78%	56%	67%	37%	44%	33%	41%	19%	26%	19%	4%

COUNTIES WITH EXISTING PMS INCLUDING MAPROAD

EXISTING PMS INFORMATION	Road / Route Number	Road Classification / Category	Engineering Area	Segment Start / End	Intersections	Carriageway / shoulder Widths	No of Lanes	Pavement Surface Type	Pavement Structure	Pavement Condition	Ride Quality	Traffic	Topography / Terrain	Project History
Carlow	Y	Y	Y	Y	Y									
Cavan	Y	Y	Y	Y	Y	Y	Y	Y		Y				
Clare	Y	Y	Y	Y	Y	Y		Y	Y					
Cork	Y	Y	Y	Y	Y	Y								
Cork City	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y				
Donegal														
Dublin City														
Dunlaoghaire-Rathdown														
Fingal														
Galway														
Galway City														
Kerry	Y	Y	Y	Y		Y	Y			Y			Y	
Kildare														
Kilkenny														
Laois														
Leitrim	Y	Y	Y	Y	Y	Y	Y	Y		Y				
Limerick														
Limerick City														
Longford														
Louth														
Mayo	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Meath														
Monahan														
North Tipperary														
Offaly														
Roscommon														
Sligo														
South Dublin														
South Tipperary														
Waterford														
Waterford City														
Westmeath														
Wexford														
Wicklow														
	8	8	8	8	6	7	5	5	3	5	2	1	2	0
	100%	100%	100%	100%	75%	88%	63%	63%	38%	63%	25%	13%	25%	0%

EXISTING ROAD MANAGEMENT SYSTEMS

Table A9

Existing Systems	Road Network Information	GIS (Geographic Information System)	Traffic Counts / Analysis	Traffic Signs	Traffic Signals	Traffic Accidents	Road Maintenance	Road Construction	Plant & Job Costing	Contracts Administration	Road Pavements	Bridges / Structures	Road Openings & Encroachments	Roadside Development	CPO / Expropriation	Project Prioritisation	(other)
Carlow	X		X					X	X			X					
Cavan	X	X				X	X					X					
Clare	X					X	X	X									
Cork	X	X	X			X	X	X	X			X	X				
Cork City	X	X					X					X	X				
Donegal	X	X	X			X			X			X					
Dublin City	X	X					X	X	X		X					X	
Dunlaoghaire-Rathdown																	
Fingal	X	X	X		X	X		X				X					
Galway	X	X	X			X				X	X	X					
Galway City																	
Kerry	X	X														X	
Kildare	X		X			X				X	X	X				X	
Kilkenny	X	X	X			X											
Laois																	
Leitrim	X	X				X					X						
Limerick	X	X	X			X						X		X			
Limerick City																	
Longford																	
Louth																	
Mayo	X	X	X			X			X	X	X	X			X		
Meath	X	X	X	X		X	X				X	X			X		
Monaghan																	
North Tipperary	X	X				X						X	X				
Offaly																	
Roscommon																	
Sligo	X	X	X			X				X	X	X			X		
South Dublin																	
South Tipperary	X	X	X			X	X	X									
Waterford	X	X	X			X											
Waterford City																	
Westmeath	X	X				X											
Wexford	X	X				X						X					
Wicklow																	

SUMMARY

22 19 13 1 1 18 7 6 5 4 7 14 3 1 3 3

PROPOSED ROAD MANAGEMENT SYSTEMS

Table A10

Proposed Systems	Road Network Information	GIS (Geographic Information System)	Traffic Counts / Analysis	Traffic Signs	Traffic Signals	Traffic Accidents	Road Maintenance	Road Construction	Plant & Job Costing	Contracts Administration	Road Pavements	Bridges / Structures	Road Openings & Encroachments	Roadside Development	CPO / Expropriation	Project Prioritisation	QA /QC
	Priority H =High M = Medium L = Low																
Carlow			M	M	M	M	M			M	M	M	M		M	M	
Cavan			H	H				M	H	M			H	M			
Clare		H	H										H				
Cork				M	M												
Cork City																	
Donegal				L	L						H		H	M			
Dublin City																	
Dunlaoghaire-Rathdown																	
Fingal				M			H		M		H		M	M	L	M	
Galway													H				
Galway City																	
Kerry			M	L		M	M	M	H		M	M	M		H		H
Kildare		H		H	H		H	H	H				H	H	H		
Kilkenny				M	M		M					M	H				
Laois																	
Leitrim			M	M													
Limerick				H	M		H	M	H	M	H		H		H	M	
Limerick City																	
Longford																	
Louth	H	H	H	M	M	H	H	M	H		M	H	M	M		M	
Mayo				M	M		M	L					H	H			
Meath				M				H	M	M			M	M			
Monahan	H	H	H	L	H	H	M	H	H	M	H	H	H	H	H	H	
North Tipperary																	
Offaly																	
Roscommon																	
Sligo													H				
South Dublin																	
South Tipperary				M	M						M	M	M		M		
Waterford				H			H	M	H	H	H	M				L	
Waterford City	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
Westmeath																	
Wexford			M	H			H	M					M				
Wicklow																	
H	3	5	5	6	3	3	7	4	8	2	6	3	11	4	5	2	1
M	0	0	4	9	7	2	5	6	2	5	4	5	7	5	2	4	0
L	0	0	0	3	1	0	0	1	0	0	0	0	0	0	1	1	0

APPENDIX B

EVALUATION OF PAVEMENT MANAGEMENT SYSTEMS

Assessment Sheet

Micro PAVER

Supplier: US Army Corps of Engineers, CERL

Distributed by: APWA (American Public Works Association)

PO Box 802296 • Kansas City, MO • 64180-2296 USA

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	3	
Standard reports must be available and permit customisation	4	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	2	Tools for import of other Micropaver data only
Subtotal	24	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	Database can reside on server. Limited no. of users.
Databases		
System database must be expandable to accommodate future data requirements	3	MS-Access only.
Modularity		
System must be modular with user-selectable modules for implementation	2	No additional modules
GIS Compatibility		
System must be compatible with Mapinfo GIS	2	System uses Arcview Shapefiles for internal GIS
System must link to Arcinfo / Arcview GIS	5	
Subtotal	22	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	2	Uses Network, Branch, Section system i.e. no nodes
Does the system accommodate multiple network referencing systems	0	No additional systems
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	0	No history.
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	2	Limited additional inventory items
Condition Monitoring		
Does the system permit definition of condition attributes?	3	PCI plus limited additional attributes
Does the system permit definition and use of alternate "rules and parameters"?	1	Allows alternate indices based on cond attributes.
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	2	Limited predefined options
Are tools for grouping of condition sections provided?	5	
Are effective tools for economic analysis and optimisation provided?	4	Predefined options provided
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	2	Predefined M&R treatments
Does the system offer programming and budgeting tools?	2	Limited
Does the system allow for multi-year programming?	2	Limited
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	5	
Are reports customisable to suit user requirements?	4	
Can reports be exported to other systems or software?	3	Export report to file.
Subtotal	42	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	0	
What additional modules are offered?	0	
Compatibility with other systems		
Can external interfaces be set up with the system?	2	Import export of database only.
Subtotal	2	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	1	Third party trainers
Does the vendor provide on-going training?	1	
Does the vendor provide a Helpdesk?	0	
Does support include user groups?	4	USA based
Subtotal	11	
Total	101	
Cost		
Indicative system purchase price?	€ 850	
Indicative Annual Support costs?	€ 0	
Indicative training costs	?	
Consultancy Costs for Data conversion	?	
Consultancy Costs for System changes	?	

Assessment Sheet

Maproad

Supplier: Local Government Computer Services Board

Phoenix House Conyngham Road Dublin 8

Telephone 01 645 7000 Fax 01 645 7001 E-mail Info@lgcsb.ie

	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	Each user requires Mapinfo.
Simplicity		
System must be customisable to suit user requirements	4	Customisation by LGCSB
Standard reports must be available and permit customisation	3	No user customisation possible.
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	4	Tools added by LGCSB as required.
Subtotal	26	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	Database can reside on server
Databases		
System database must be expandable to accommodate future data requirements	5	MS-Access / Expandable according to User Group needs
Modularity		
System must be modular with user-selectable modules for implementation	4	Some Road Mgt modules available
GIS Compatibility		
System must be compatible with Mapinfo GIS	5	GIS-based system / Requires Mapinfo to function
System must link to Arcinfo / Arcview GIS	5	Mapinfo can export to Arcview
Subtotal	29	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	0	No alternative referencing systems
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	0	No history
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	1	Not user definable.
Condition Monitoring		
Does the system permit definition of condition attributes?	2	Not user definable. LGCSB can add if needed
Does the system permit definition and use of alternate "rules and parameters"?	2	Not user definable. LGCSB can add if needed
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	2	Not user definable. LGCSB can add if needed
Are tools for grouping of condition sections provided?	1	No section grouping tools
Are effective tools for economic analysis and optimisation provided?	1	No economic analysis tools
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	3	Treatments and costs calculated based on CI
Does the system offer programming and budgeting tools?	2	Limited
Does the system allow for multi-year programming?	2	Limited Multi-year tools
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	2	
Are reports customisable to suit user requirements?	1	Standard reports only
Can reports be exported to other systems or software?	3	Print to file for external applications
Subtotal	32	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	3	Other road management modules available
What additional modules are offered?	0	Accidents, Bridges, Traffic, Hazards, Routes, Roadworks
Compatibility with other systems		
Can external interfaces be set up with the system?	2	LGCSB can develop as required
Subtotal	5	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	5	
Does the vendor provide on-going training?	5	
Does the vendor provide a Helpdesk?	1	
Does support include user groups?	3	
Subtotal	19	
Total	111	
Cost		
Indicative system purchase price?	€ 14,700	
Indicative Annual Support costs?	€ 0	
Indicative training costs	€ 0	
Consultancy Costs for Data conversion	€ 0	
Consultancy Costs for System changes	€ 0	

Assessment Sheet

CONFIRM Pavement Manager

Supplier: Southbank Systems plc / TRL
 Compass Centre North Pembroke, Chatham Marine, Kent ME4 4YG
 Telephone: +44 (0)1634 880141 Fax: +44 (0) 1634 880383
 E mail: sales@southbanksystems.com

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	4	
Standard reports must be available and permit customisation	5	User definable reports available (Query tool)
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	4	Consultancy for more complex transformations
Subtotal	28	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	Platform independent
Networkable		
System must be network-enabled	5	Dependent on database platform
Databases		
System database must be expandable to accommodate future data requirements	4	
Modularity		
System must be modular with user-selectable modules for implementation	4	Modular system
GIS Compatibility		
System must be compatible with Mapinfo GIS	4	Slight modification needed (1 week)
System must link to Arcinfo / Arcview GIS	5	
Subtotal	27	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	4	Yes alternative systems
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	4	Network history maintained.
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	4	
Condition Monitoring		
Does the system permit definition of condition attributes?	5	
Does the system permit definition and use of alternate "rules and parameters"?	4	Users will need assistance
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	2	Limited options / Can provide others
Are tools for grouping of condition sections provided?	4	
Are effective tools for economic analysis and optimisation provided?	3	Economic analysis using UKPS algorithms
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	4	
Does the system offer programming and budgeting tools?	4	
Does the system allow for multi-year programming?	3	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	5	
Are reports customisable to suit user requirements?	5	
Can reports be exported to other systems or software?	4	
Subtotal	65	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	5	
What additional modules are offered?	0	Safety inspections, Works Orders, Customer Services, Works Management, Performance Monitoring, Street Lights
Compatibility with other systems		
Can external interfaces be set up with the system?	3	Requires consultancy
Subtotal	8	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	5	
Does the vendor provide on-going training?	3	If required
Does the vendor provide a Helpdesk?	5	
Does support include user groups?	5	
Subtotal	23	
Total	151	
Cost		
Indicative system purchase price?	€ 46,700	
Indicative Annual Support costs?	€ 5,800	
Indicative training costs	€ 900	
Consultancy Costs for Data conversion	€ 900	
Consultancy Costs for System changes	€ 900	

Assessment Sheet

MARCH PMS

Supplier: Faber Maunsell Ltd

3rd Floor, Wellington House, 29 Albion Street, Leicester, LE 1 6GD

Tel: 0116 254 2502 Fax: 0116 254 2518 email: march@fabermaunsell.com

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	3	
Standard reports must be available and permit customisation	4	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	4	
Subtotal	26	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	MS-SQL Server available for UKPMS Version
Databases		
System database must be expandable to accommodate future data requirements	3	Non-UKPMS version is MS-Access based only
Modularity		
System must be modular with user-selectable modules for implementation	2	No optional modules
GIS Compatibility		
System must be compatible with Mapinfo GIS	2	No internal GIS. Can export data to GIS
System must link to Arcinfo / Arcview GIS	2	No internal GIS. Can export data to GIS
Subtotal	19	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	0	No multiple referencing systems
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	0	No network history retained
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	2	Limited additional fields. (Can be added via consultancy)
Condition Monitoring		
Does the system permit definition of condition attributes?	2	Limited
Does the system permit definition and use of alternate "rules and parameters"?	2	Limited
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	2	Limited
Are tools for grouping of condition sections provided?	2	Limited
Are effective tools for economic analysis and optimisation provided?	2	UKPMS methods only
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	2	
Does the system offer programming and budgeting tools?	3	
Does the system allow for multi-year programming?	3	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	5	
Are reports customisable to suit user requirements?	5	
Can reports be exported to other systems or software?	4	
Subtotal	44	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	0	
What additional modules are offered?	0	
Compatibility with other systems		
Can external interfaces be set up with the system?	3	
Subtotal	3	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	3	
Does the vendor provide on-going training?	4	
Does the vendor provide a Helpdesk?	5	
Does support include user groups?	5	
Subtotal	22	
Total	114	
Cost		
Indicative system purchase price?	€ 600	
Indicative Annual Support costs?	€ 9,300	
Indicative training costs	€ 600	
Consultancy Costs for Data conversion	€ 510	
Consultancy Costs for System changes	€ 510	

Assessment Sheet

WDM PMS

Supplier: WDM Ltd.

Staple Hill, Bristol BS16 4NX, UK

Telephone: + 44 (0) 117 9567233 Facsimile: + 44 (0) 117 9570351

Email: info@wdm.co.uk

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	3	
Standard reports must be available and permit customisation	4	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	4	
Subtotal	26	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	Web version available also
Databases		
System database must be expandable to accommodate future data requirements	4	
Modularity		
System must be modular with user-selectable modules for implementation	4	
GIS Compatibility		
System must be compatible with Mapinfo GIS	3	In-built GIS capability with export to other GIS
System must link to Arcinfo / Arcview GIS	3	
Subtotal	24	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	5	
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	4	
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	4	Limited
Condition Monitoring		
Does the system permit definition of condition attributes?	2	UKPMS plus limited other
Does the system permit definition and use of alternate "rules and parameters"?	2	UKPMS rules but changes are possible
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	2	UKPMS plus limited additional
Are tools for grouping of condition sections provided?	4	Manual grouping tools + automatic pass
Are effective tools for economic analysis and optimisation provided?	3	UKPMS algorithms
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	4	
Does the system offer programming and budgeting tools?	3	UKPMS standards
Does the system allow for multi-year programming?	3	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	5	Good reporting
Are reports customisable to suit user requirements?	4	Good reporting
Can reports be exported to other systems or software?	3	
Subtotal	58	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	5	Other RMS modules offered.
What additional modules are offered?	0	Routine maint, Structures Mgt, Lighting Mgt, Works orders, customer services, accidents, inspections
Compatibility with other systems		
Can external interfaces be set up with the system?	4	
Subtotal	9	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	5	
Does the vendor provide on-going training?	4	
Does the vendor provide a Helpdesk?	5	
Does support include user groups?	5	UK based
Subtotal	24	
Total	141	
Cost		
Indicative system purchase price?	-	
Indicative Annual Support costs?	€ 44,000	
Indicative training costs	1600	
Consultancy Costs for Data conversion	1500	
Consultancy Costs for System changes	1500	

Assessment Sheet

Insight Pavement Manager

Supplier: Symology Ltd

Vanguard House, Cotswold Park, Millfield Lane, Caddington, Luton,
Bedfordshire LU1 4AJ, United Kingdom

Tel: +44 (0)1582 842626

E-mail: sales@symology.co.uk

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	5	
Standard reports must be available and permit customisation	5	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	5	
Subtotal	30	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	
Databases		
System database must be expandable to accommodate future data requirements	5	
Modularity		
System must be modular with user-selectable modules for implementation	4	Basic system comprises full PMS functions
GIS Compatibility		
System must be compatible with Mapinfo GIS	5	Requires GIS modules
System must link to Arcinfo / Arcview GIS	5	
Subtotal	29	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	5	
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	5	
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	5	
Condition Monitoring		
Does the system permit definition of condition attributes?	5	
Does the system permit definition and use of alternate "rules and parameters"?	5	
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	4	
Are tools for grouping of condition sections provided?	4	
Are effective tools for economic analysis and optimisation provided?	4	
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	4	
Does the system offer programming and budgeting tools?	4	
Does the system allow for multi-year programming?	4	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	5	
Are reports customisable to suit user requirements?	5	
Can reports be exported to other systems or software?	4	
Subtotal	73	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	5	
What additional modules are offered?	0	Bridges, Public Lighting, Maintenance, customer service, Contracts, Works Orders, Inspections
Compatibility with other systems		
Can external interfaces be set up with the system?	4	
Subtotal	9	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	5	
Does the vendor provide on-going training?	3	
Does the vendor provide a Helpdesk?	4	
Does support include user groups?	3	
Subtotal	20	
Total	161	
Cost		
Indicative system purchase price?	€ 43,300	
Indicative Annual Support costs?	€ 8,660	
Indicative training costs	1000	
Consultancy Costs for Data conversion	1100	
Consultancy Costs for System changes	800	

Assessment Sheet

Exor Highways

Supplier: Exor Corporation Ltd

Clifton Heights, Clifton, Bristol BS8 1EJ, United Kingdom

Telephone +44 (0) 117 900 6200, Fax +44 (0) 117 900 6222

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	5	
Standard reports must be available and permit customisation	5	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	4	
Subtotal	29	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	Oracle RDMS included with system
Networkable		
System must be network-enabled	5	Internet-based option available also
Databases		
System database must be expandable to accommodate future data requirements	5	
Modularity		
System must be modular with user-selectable modules for implementation	5	
GIS Compatibility		
System must be compatible with Mapinfo GIS	4	
System must link to Arcinfo / Arcview GIS	5	
Subtotal	29	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	5	
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	5	
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	5	
Condition Monitoring		
Does the system permit definition of condition attributes?	5	
Does the system permit definition and use of alternate "rules and parameters"?	5	
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	4	
Are tools for grouping of condition sections provided?	4	
Are effective tools for economic analysis and optimisation provided?	4	
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	5	
Does the system offer programming and budgeting tools?	5	
Does the system allow for multi-year programming?	4	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	5	
Are reports customisable to suit user requirements?	5	
Can reports be exported to other systems or software?	4	
Subtotal	75	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	5	
What additional modules are offered?	0	Maintenance, Planning, Lighting, Structures, Accidents, Traffic, Utilities, Scheduling
Compatibility with other systems		
Can external interfaces be set up with the system?	4	
Subtotal	9	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	5	
Does the vendor provide on-going training?	3	
Does the vendor provide a Helpdesk?	4	
Does support include user groups?	4	UK-based
Subtotal	21	
Total	163	
Cost		
Indicative system purchase price?	€ 45,000	
Indicative Annual Support costs?	€ 7,700	
Indicative training costs	1465	
Consultancy Costs for Data conversion	1465	
Consultancy Costs for System changes	1465	

Assessment Sheet

DTIMS CT

Supplier: Deighton Associates Ltd

Viagroup SA, Technoramastrasse 8, CH-8404 Winterthur, Switzerland

Telephone: +41 52 245 1001 Fax: +41 52 245 1015

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	5	
Standard reports must be available and permit customisation	4	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	4	
Subtotal	28	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	
Databases		
System database must be expandable to accommodate future data requirements	5	MS-Access / MS-SQL Server version available
Modularity		
System must be modular with user-selectable modules for implementation	5	
GIS Compatibility		
System must be compatible with Mapinfo GIS	3	Requires additional module €13,000
System must link to Arcinfo / Arcview GIS	3	
Subtotal	26	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	4	
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	3	Incomplete History facility
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	5	
Condition Monitoring		
Does the system permit definition of condition attributes?	5	
Does the system permit definition and use of alternate "rules and parameters"?	5	
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	5	
Are tools for grouping of condition sections provided?	5	
Are effective tools for economic analysis and optimisation provided?	5	Well established and effective tools
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	5	
Does the system offer programming and budgeting tools?	5	Powerful tools
Does the system allow for multi-year programming?	5	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	4	
Are reports customisable to suit user requirements?	4	
Can reports be exported to other systems or software?	5	
Subtotal	75	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	5	
What additional modules are offered?	0	User can build own modules.
Compatibility with other systems		
Can external interfaces be set up with the system?	4	
Subtotal	9	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	4	
Does the vendor provide on-going training?	3	
Does the vendor provide a Helpdesk?	3	
Does support include user groups?	4	
Subtotal	19	
Total	157	
Cost		
Indicative system purchase price?	€ 45,000	5 users, 1 with management capabilities.
Indicative Annual Support costs?	€ 4,300	
Indicative training costs	1000	
Consultancy Costs for Data conversion	800	
Consultancy Costs for System changes	800	

Assessment Sheet

RoSY

Supplier: Carl Bro Pavement Consultants
Fuglesangsall. 16 DK-6600 Vejle Denmark
Tel: +45 76 34 73 73 Fax: +45 76 34 73 74
e-mail: cbpc@carlbro.dk

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.	5	
Simplicity		
System must be customisable to suit user requirements	3	
Standard reports must be available and permit customisation	4	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	2	
Subtotal	24	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	
Databases		
System database must be expandable to accommodate future data requirements	4	MS-Access database
Modularity		
System must be modular with user-selectable modules for implementation	3	
GIS Compatibility		
System must be compatible with Mapinfo GIS	3	
System must link to Arcinfo / Arcview GIS	3	
Subtotal	23	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	0	No multiple networks
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	3	To be advised
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	4	Requires system changes
Condition Monitoring		
Does the system permit definition of condition attributes?	3	limited changes possible
Does the system permit definition and use of alternate "rules and parameters"?	4	Standard relationships
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	3	
Are tools for grouping of condition sections provided?	5	
Are effective tools for economic analysis and optimisation provided?	4	Rosy deterioration and economic models
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	4	
Does the system offer programming and budgeting tools?	5	
Does the system allow for multi-year programming?	5	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	5	
Are reports customisable to suit user requirements?	4	
Can reports be exported to other systems or software?	3	
Subtotal	62	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	4	
What additional modules are offered?	0	RosyDig, Rosy Design, RosyGIS, Rosy Service, Accident, Memo
Compatibility with other systems		
Can external interfaces be set up with the system?	3	
Subtotal	7	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	4	
Does the vendor provide on-going training?	3	As required
Does the vendor provide a Helpdesk?	3	
Does support include user groups?	3	
Subtotal	18	
Total	134	
Cost		
Indicative system purchase price?	€ 30,500	
Indicative Annual Support costs?	€ 4,000	
Indicative training costs	900	
Consultancy Costs for Data conversion	1000	
Consultancy Costs for System changes	900	

Assessment Form

HDM 4

Supplier: PIARC / World Bank
 World Road Association (PIARC)
 La Grande Arche, Parol Nord (niv 8)
 92055 La Defense cedex FRANCE
 Tel: +(33) 1 47 96 81 86 Fax: +(33) 1 49 00 02 02

Distributor:
 McTrans Center, PO Box 116585, Gainesville, FL 32611-6585
 Phone: +1 (352) 392-0378 Fax: +1 (352) 392-6629

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		System is not a PMS, but is complementary to one.
Organisation		
System operation by one person, if required.	5	
A networked system must accommodate at least 5 simultaneous users.		Not networked
Simplicity		
System must be customisable to suit user requirements		
Standard reports must be available and permit customisation		
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	4	
Subtotal	14	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	0	Not networked
Databases		
System database must be expandable to accommodate future data requirements		
Modularity		
System must be modular with user-selectable modules for implementation	0	No expansion modules
GIS Compatibility		
System must be compatible with Mapinfo GIS	0	Not GIS linked
System must link to Arcinfo / Arcview GIS	0	Not GIS linked
Subtotal	5	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	0	
Does the system accommodate multiple network referencing systems	0	
Network Maintenance Tools		
Does system provide network maintenance tools?	0	
Does system maintain network history?	0	
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	0	
Condition Monitoring		
Does the system permit definition of condition attributes?	0	
Does the system permit definition and use of alternate "rules and parameters"?	3	
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	3	
Are tools for grouping of condition sections provided?	0	
Are effective tools for economic analysis and optimisation provided?	5	
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	5	
Does the system offer programming and budgeting tools?	5	
Does the system allow for multi-year programming?	5	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	3	
Are reports customisable to suit user requirements?	3	
Can reports be exported to other systems or software?	5	
Subtotal	37	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	0	
What additional modules are offered?	0	
Compatibility with other systems		
Can external interfaces be set up with the system?	3	
Subtotal	3	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	3	
Does the vendor provide on-going training?	3	
Does the vendor provide a Helpdesk?	4	
Does support include user groups?	5	
Subtotal	20	
Total	79	
Cost		
Indicative system purchase price?	€ 1,380	
Indicative Annual Support costs?	€ 0	
Indicative training costs	1000	
Consultancy Costs for Data conversion	?	
Consultancy Costs for System changes	?	

Assessment Sheet

ROMDAS PMS

Supplier: Romdas / Data Collection Ltd (DCL)
 PO Box 348, Motueka, 7161, New Zealand
 Telephone: +64 9 820 2475 Fax: +64 9 820 2495
 Email: info@romdas.com

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.		
A networked system must accommodate at least 5 simultaneous users.		Not a PMS - This system is for storing and viewing of ROMDAS Condition Data
Simplicity		
System must be customisable to suit user requirements		
Standard reports must be available and permit customisation		
Quick Implementation		
Initial setup not more than 2 days		
Tools for import of existing data must be provided		
Subtotal	0	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment		
Networkable		
System must be network-enabled		
Databases		
System database must be expandable to accommodate future data requirements		
Modularity		
System must be modular with user-selectable modules for implementation		
GIS Compatibility		
System must be compatible with Mapinfo GIS		
System must link to Arcinfo / Arcview GIS		
Subtotal	0	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system		
Does the system accommodate multiple network referencing systems		
Network Maintenance Tools		
Does system provide network maintenance tools?		
Does system maintain network history?		
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?		
Condition Monitoring		
Does the system permit definition of condition attributes?		
Does the system permit definition and use of alternate "rules and parameters"?		
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?		
Are tools for grouping of condition sections provided?		
Are effective tools for economic analysis and optimisation provided?		
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?		
Does the system offer programming and budgeting tools?		
Does the system allow for multi-year programming?		
Reporting and Viewing of data		
Does the system provide in-built reporting tools?		
Are reports customisable to suit user requirements?		
Can reports be exported to other systems or software?		
Subtotal	0	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?		
What additional modules are offered?		
Compatibility with other systems		
Can external interfaces be set up with the system?		
Subtotal	0	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?		
Does the vendor provide initial training?		
Does the vendor provide on-going training?		
Does the vendor provide a Helpdesk?		
Does support include user groups?		
Subtotal	0	
Total	0	
Cost		
Indicative system purchase price?	€ 0	
Indicative Annual Support costs?	€ 0	
Indicative training costs	?	
Consultancy Costs for Data conversion	?	
Consultancy Costs for System changes	?	

Assessment Sheet

HIMS

Supplier: Romdas / Data Collection Ltd (DCL)
 PO Box 348, Motueka, 7161, New Zealand
 Telephone: +64 9 820 2475 Fax: +64 9 820 2495
 Email: info@romdas.com

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	Not a complete PMS
A networked system must accommodate at least 5 simultaneous users.	5	Used with external analysis modules such as
Simplicity	5	Dtims and HDM-4
System must be customisable to suit user requirements	5	Good flexible database system for whatever purpose.
Standard reports must be available and permit customisation	5	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	5	
Subtotal	30	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	3	Limited - Access database
Databases		
System database must be expandable to accommodate future data requirements	3	
Modularity		
System must be modular with user-selectable modules for implementation	3	Not modular
GIS Compatibility		
System must be compatible with Mapinfo GIS	4	Can import from Mapinfo to internal GIS
System must link to Arcinfo / Arcview GIS	4	Can import from Arcview to internal GIS
Subtotal	22	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	5	
Does the system accommodate multiple network referencing systems	0	
Network Maintenance Tools		
Does system provide network maintenance tools?	5	
Does system maintain network history?	0	
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	5	
Condition Monitoring		
Does the system permit definition of condition attributes?	5	
Does the system permit definition and use of alternate "rules and parameters"?	0	Uses external analysis systems
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	0	
Are tools for grouping of condition sections provided?	4	
Are effective tools for economic analysis and optimisation provided?	0	External use of Dtims, HDM-4
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	0	
Does the system offer programming and budgeting tools?	0	
Does the system allow for multi-year programming?	0	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	4	
Are reports customisable to suit user requirements?	4	
Can reports be exported to other systems or software?	4	
Subtotal	36	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	3	User definable additional modules
What additional modules are offered?	0	
Compatibility with other systems		
Can external interfaces be set up with the system?	3	
Subtotal	6	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	3	
Does the vendor provide initial training?	1	
Does the vendor provide on-going training?	1	
Does the vendor provide a Helpdesk?	1	
Does support include user groups?	1	
Subtotal	7	
Total	101	
Cost		
Indicative system purchase price?	€ 3,500	
Indicative Annual Support costs?	€ 0	
Indicative training costs	?	
Consultancy Costs for Data conversion	?	
Consultancy Costs for System changes	?	

Assessment Sheet

STREETSAVER PMS

Supplier: Metropolitan Transport Commission

Joseph P. Bort Metrocenter, 101 Eighth Street, Oakland, CA 94607-4700, USA

Telephone: +1 510 817 3299 Fax +1 510 817 3250

PMS REQUIREMENTS	RATING	COMMENTS
Institutional Requirements		
Organisation		
System operation by one person, if required.	5	Developed for use by cities and counties in California. Used primarily by small authorities.
A networked system must accommodate at least 5 simultaneous users.	5	Good analysis tools provided.
Simplicity		
System must be customisable to suit user requirements	2	Based on PCI system. No customisation.
Standard reports must be available and permit customisation	4	
Quick Implementation		
Initial setup not more than 2 days	5	
Tools for import of existing data must be provided	2	
Subtotal	23	
Information Technology Requirements		
Windows NT Network / MS-Office Environment		
System must operate in Windows NT network environment	5	
Networkable		
System must be network-enabled	5	
Databases		
System database must be expandable to accommodate future data requirements	5	MS-SQL Server
Modularity		
System must be modular with user-selectable modules for implementation	3	
GIS Compatibility		
System must be compatible with Mapinfo GIS	3	External linkages
System must link to Arcinfo / Arcview GIS	3	External linkages
Subtotal	24	
Functional Requirements		
Network Referencing Systems		
Can the system utilise a link and node network referencing system	2	Street-based system (no nodes)
Does the system accommodate multiple network referencing systems	0	
Network Maintenance Tools		
Does system provide network maintenance tools?	4	
Does system maintain network history?	0	
Flexible Inventory and Attributes		
Does the system allow users to define their own inventory and attributes?	1	Limited additional fields
Condition Monitoring		
Does the system permit definition of condition attributes?	0	Uses PCI only
Does the system permit definition and use of alternate "rules and parameters"?	0	Uses PCI only
Prioritisation Tools		
Does the system permit user definition of prioritisation criteria?	2	Limited
Are tools for grouping of condition sections provided?		
Are effective tools for economic analysis and optimisation provided?	5	Good tools within limits of set parameters.
Work Programming and Budgeting		
Does the system allow for generation of treatment options and costs?	4	
Does the system offer programming and budgeting tools?	4	
Does the system allow for multi-year programming?	4	
Reporting and Viewing of data		
Does the system provide in-built reporting tools?	3	Standard reports plus report writer
Are reports customisable to suit user requirements?	3	
Can reports be exported to other systems or software?	3	
Subtotal	35	
Future Expansion		
Expandability		
Does the system offer modular upgrading options?	2	Third party add-ons.
What additional modules are offered?	0	
Compatibility with other systems		
Can external interfaces be set up with the system?	2	
Subtotal	4	
Support and Training		
Does the vendor offer ongoing software support, including upgrades?	5	
Does the vendor provide initial training?	5	
Does the vendor provide on-going training?	3	Third party trainers
Does the vendor provide a Helpdesk?	3	limited for foreign owners
Does support include user groups?	0	
Subtotal	16	
Total	102	
Cost		
Indicative system purchase price?	€ 2,500	
Indicative Annual Support costs?	€ 0	
Indicative training costs	?	
Consultancy Costs for Data conversion	?	
Consultancy Costs for System changes	?	