

DEVELOPING LEVELS OF SERVICE

**A BEST PRACTICE BY THE NATIONAL GUIDE
TO SUSTAINABLE MUNICIPAL INFRASTRUCTURE**

National Guide
to Sustainable
Municipal
Infrastructure



Guide national pour
des infrastructures
municipales
durables

Canada

NRC - CNRC



Developing Levels of Service

Issue No. 1.1

Publication Date: April 2003

© 2002 Federation of Canadian Municipalities and National Research Council

The contents of this publication are presented in good faith and are intended as general guidance on matters of interest only. The publisher, the authors and the organizations to which the authors belong make no representations or warranties, either express or implied, as to the completeness or accuracy of the contents. All information is presented on the condition that the persons receiving it will make their own determinations as to the suitability of using the information for their own purposes and on the understanding that the information is not a substitute for specific technical or professional advice or services. In no event will the publisher, the authors or the organizations to which the authors belong, be responsible or liable for damages of any nature or kind whatsoever resulting from the use of, or reliance on, the contents of this publication.

TABLE OF CONTENTS

Foreword	v
Acknowledgements	vii
1. General	1
1.1 Introduction.....	1
1.2 Levels of Service.....	1
1.3 Glossary	1
2. Rationale	3
3. Work Description	5
3.1 Delivery of Levels of Service	5
3.1.1 Asset Understanding	5
3.1.2 Consultation/Communication	6
3.1.3 Strategic Alignment	7
3.1.4 Risk Tolerance	7
3.1.5 Financial Considerations.....	8
3.1.6 Summary	8
3.2 Establishing Levels of Service.....	9
3.2.1 Define the Asset.....	10
3.2.2 Determine Replacement Value/Condition/Utilization	10
3.2.3 Describe the Current Reinvestment in Existing Infrastructure Assets.....	10
3.2.4 Panel to Evaluate Levels of Service.....	10
3.2.5 Define Range of Levels of Service	10
3.2.6 Forecast Costs to Provide a Long-Term Level of Service	10
3.2.7 Financial/Risk of Reducing Levels of Service.....	10
3.2.8 Levels of Service Established	11
Appendix A: Case Studies	13
A.1: EPCOR Water Services	13
A.2: City of Lethbridge	13
A.3: City of Laval.....	14
References	17

FIGURES

Figure 3–1: Delivery of Levels of Service/Linkages	5
Figure 3–2: Developing Levels of Service	9

FOREWORD

In spite of recent increases in public infrastructure investments, municipal infrastructure is decaying faster than it is being renewed. Factors such as low funding, population growth, tighter health and environmental requirements, poor quality control leading to inferior installation, inadequate inspection and maintenance, and lack of consistency and uniformity in design, construction and operation practices have impacted on municipal infrastructure. At the same time, an increased burden on infrastructure due to significant growth in some sectors tends to quicken the ageing process while increasing the social and monetary cost of service disruptions due to maintenance, repairs or replacement.

With the intention of facing these challenges and opportunities, the Federation of Canadian Municipalities (FCM) and the National Research Council (NRC) have joined forces to deliver the *National Guide to Sustainable Municipal Infrastructure: Innovations and Best Practices*. The Guide project, funded by the Infrastructure Canada program, NRC, and through in-kind contributions from public and private municipal infrastructure stakeholders, aims to provide a decision-making and investment planning tool as well as a compendium of technical best practices. It provides a road map to the best available knowledge and solutions for addressing infrastructure issues. It is also a focal point for the Canadian network of practitioners, researchers and municipal governments focused on infrastructure operations and maintenance.

The *National Guide to Sustainable Municipal Infrastructure* offers the opportunity to consolidate the vast body of existing knowledge and shape it into best practices that can be used by decision-makers and technical personnel in the public and private sectors. It provides instruments to help municipalities identify needs, evaluate solutions, and plan long-term, sustainable strategies for improved infrastructure performance at the best available cost with the least environmental impact. The five initial target areas of the Guide are: potable water systems (production and distribution), storm and wastewater systems (collection, treatment, disposal), municipal roads and sidewalks, environmental protocols and decision making and investment planning.

Part A of the *National Guide to Sustainable Municipal Infrastructure* focuses on Decision-Making and Investment Planning issues related to municipal infrastructure and therefore is qualitatively distinct from Part B. Among the most significant of its distinctions is the group of practitioners for which it is intended. Part A, or the DMIP component of the Guide, is intended to support the practices and efforts of elected officials and senior administrative and management staff in municipalities throughout Canada.

As previously discussed, current funding levels are insufficient to meet infrastructure needs. Municipal infrastructure tends to be taken for granted, so

much so that the fundamental role it plays relative to both our standard and quality of life is marginalized. Infrastructure competes with corporate priorities such as police, fire, social services, parks, recreation and libraries which often tend to receive higher priority for funding. The net effect of this situation is a chronic deficiency in capital budgets for infrastructure to the point that infrastructure, both current and new is rapidly deteriorating. In an attempt to mitigate this situation, Part A of the Guide has identified specific best practices.

These best practices are intended to articulate the relevance and fundamental importance of municipal infrastructure by simplifying complex and technical material into “non-technical” decision-making concepts and principles. By doing so, it is anticipated that the need for adequate sustainable funding can be understood and ultimately realized. However, Part A best practices should not be construed as definitive ‘best’ practices, rather they should be interpreted as guidelines and concepts. Furthermore, Part A best practices are not normative and as such are not intended to usurp the discretion of those most knowledgeable about the local municipality. Quite the contrary, it is hoped that the best practices will inspire decision makers to optimize their municipal infrastructure management practices by providing high level, simple, easy to understand approaches and concepts for representing municipal infrastructure issues. In this way, the gulf between the non-technical community and the technical community of engineers and public works officials may be bridged.

It is expected that the Guide will expand and evolve over time. To focus on the most urgent knowledge needs of infrastructure planners and practitioners, the committees solicited and received recommendations, comments and suggestions from various stakeholder groups, which shaped the enclosed document. Although the best practices are adapted, wherever possible, to reflect varying municipal needs, they remain guidelines based on the collective judgements of peer experts. Discretion must be exercised in applying these guidelines to account for specific local conditions (e.g. geographic location, municipality size, climatic condition).

For additional information or to provide comments and feedback, please visit the Guide Web site at www.infraguide.gc.ca or contact the Guide team at infraguide@nrc-cnrc.gc.ca.

ACKNOWLEDGEMENTS

The dedication of individuals who volunteered their time and expertise in the interest of the *National Guide to Sustainable Municipal Infrastructure* is acknowledged and much appreciated.

This best practice was developed by stakeholders from Canadian municipalities and specialists from across Canada, based on information from a scan of municipal practices and an extensive literature review. The following members of the National Guide's Decision Making and Investment Planning Technical Committee provided guidance and direction in the development of this best practice. They were assisted by the Guide Directorate staff and by UMA Engineering Ltd.

Umendra Mital, Chair	City of Surrey, British Columbia
Konrad Siu	City of Edmonton, Alberta
Betty Matthews-Malone	City of Hamilton, Ontario
Lynne Cowe Falls	University of Calgary, Alberta
George Trainor	City Councillor, Charlottetown, Prince Edward Island
Jean-Pierre Pierre	City of Clarence-Rockland, Ontario
Clarke Bellinger	CH2MHILL, Ottawa, Ontario
Luc Lahaie	City of Laval, Quebec
Greg Christenson	Canadian Home Builders' Association, Edmonton, Alberta
Nabil Asswad	City of Montréal, Quebec
Monique Marceau	Province of Quebec, Québec City, Quebec
Jeff B. Potkins	Technical Advisor, NRC

In addition, the Decision Making and Investment Planning Technical Committee would like to thank the following individuals for their participation in working groups and peer review:

Fernand Hamelin	City of Cornwall, Ontario
Osama Moselhi	Concordia University, Montréal, Quebec
Pierre Breau	City of Lunenburg, Nova Scotia
Beth Johnson	Former Mayor , Delta, British Columbia
Randy Garvey	City of Edmonton, Alberta
Phillip Brown	City Councillor, Charlottetown, Prince Edward Island

This and other best practices could not have been developed without the leadership and guidance of the Project Steering Committee and the Technical Steering Committee of *the National Guide to Sustainable Municipal Infrastructure*, whose memberships are as follows:

Project Steering Committee:

Mike Badham, Chair	City Councillor, Regina, Saskatchewan
Bill Crowther	City of Toronto, Ontario
Jim D’Orazio	Greater Toronto Sewer and Watermain Contractors Association, Ontario
Glen Everitt	Mayor, Dawson City, Yukon
Derm Flynn	Mayor, Appleton, Newfoundland
David General	Cambridge Bay, Nunavut
Ralph Haas	University of Waterloo, Ontario
Barb Harris	Whitehorse, Yukon
Robert Hilton	Office of Infrastructure, Ottawa, Ontario
Dwayne Kalynchuk	City of St. Albert, Alberta
René Morency	Régie des installations olympiques Montréal, Quebec
Saeed Mirza	McGill University, Montréal, Quebec
Lee Nauss	City Councillor, Lunenburg, Nova Scotia
Ric Robertshaw	Region of Halton, Ontario
Dave Rudberg	City of Vancouver, British Columbia
Van Simonson	City of Saskatoon, Saskatchewan
Basil Stewart	Mayor, Summerside, Prince Edward Island
Serge Thériault	Department of Environment and Local Government, Fredericton, New Brunswick
Alec Waters	Alberta Transportation, Edmonton, Alberta
Wally Wells	Dillon Consulting Ltd., Toronto, Ontario

Stakeholder Liaison:

Joan Lougheed	City Councillor, Burlington, Ontario
---------------	--------------------------------------

Technical Steering Committee:

Don Brynildsen	City of Vancouver, British Columbia
Al Cepas	City of Edmonton, Alberta
Andrew Cowan	City of Winnipeg, Manitoba
Tim Dennis	City of Toronto, Ontario
Kulvinder Dhillon	Province of Nova Scotia, Halifax, Nova Scotia
Wayne Green	City of Toronto, Ontario
John Hodgson	City of Edmonton, Alberta
Bob Lorimer	Lorimer & Associates, Whitehorse, Yukon
Betty Matthews-Malone	City of Hamilton, Ontario
Umendra Mital	City of Surrey, British Columbia
Anne-Marie Parent	City Councillor, City of Montréal, Quebec
Piero Salvo	WSA Trenchless Consultants Inc., Ottawa, Ontario
Mike Sheflin	Former CAO, Regional Municipality of Ottawa-Carleton, Ontario
Konrad Siu	City of Edmonton, Alberta
Carl Yates	Halifax Regional Water Commission, Nova Scotia

1. GENERAL

1.1 INTRODUCTION

This best practice deals with levels of service and is one of a number of best practices being developed under the auspices of the *National Guide to Sustainable Municipal Infrastructure*.

1.2 LEVELS OF SERVICE

Levels of service are a composite indicator that reflects the social and economic goals of the community and may include any of the following parameters: safety, customer satisfaction, quality, quantity, capacity, reliability, responsiveness, environmental acceptability, cost, and availability. Levels of service may also be legislated. The defined levels of service may be any combination of the above parameters deemed important by the municipality.

Best practices regarding levels of service need to answer four main questions.

- Why is the work described in the best practice needed?
- What is to be done?
- How will the work described in the best practice be done?
- When is the work described in the best practice to be done and when is it not to be done?

1.3 GLOSSARY

Asset — A physical component of a facility which has value, enables services to be provided, and has an economic life of greater than 12 months. Dynamic assets have some moving parts, while passive assets have none.

Best practices — State-of-the-art methodologies and technologies for municipal infrastructure planning, design, construction, management, assessment, maintenance, and rehabilitation that consider local economic, environmental, and social factors.

Capital cost — Expenditure used to create new assets, rehabilitate existing assets or increase the capacity of existing assets beyond their original design capacity or service potential.

Delphi approach — A group decision-making technique where a number of people are asked their opinions, which are then analyzed to produce a best fit result.

Focus group — A method of consulting with customers about the service provided. A focus group typically comprises six to eight people, invited to participate in a discussion about a specific topic, for two to three hours.

Levels of service — Levels of service reflect social and economic goals of the community and may include any of the following parameters: safety, customer satisfaction, quality, quantity, capacity, reliability, responsiveness, environmental acceptability, cost, and availability. The defined levels of service are any combination of the above parameters deemed important by the municipality.

Life cycle cost — The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation, and disposal costs.

Maintenance — All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal. Fixed-interval maintenance is used to express the maximum interval between maintenance tasks. With on-condition maintenance, the maintenance action depends on the item reaching some predetermined condition.

Operation — The active process of using an asset that will consume resources, such as manpower, energy, chemicals, and materials. Operation costs are part of the life cycle costs of an asset.

Performance indicator (PI) — A qualitative or quantitative measure of a service or activity used to compare actual performance against a standard or other target. Performance indicators commonly relate to statutory limits, safety, responsiveness, cost, comfort, asset performance, reliability, efficiency, environmental protection, and customer satisfaction.

Performance monitoring — Continuous or periodic quantitative and qualitative assessments of the actual performance compared with specific objectives, targets, or standards through the application of performance indicators.

Strategic plan — A plan containing the long-term goals and strategies of an organization. Strategic plans have a strong external focus, cover major portions of the organization and identify major targets, actions, and resource allocations relating to the long-term survival, value, and growth of the organization.

2. RATIONALE

Levels of service represent service-cost trade-offs, established in a flexible, rational, and transparent manner. They:

- assist and support decision making and investment planning related to planning, development, operation, maintenance, rehabilitation, and replacement of municipal infrastructure;
- promote good practice, sustainable development, and environmental stewardship; and
- facilitate community involvement and a public sense of ownership, and incorporate community values. (Customer satisfaction was implied in this reason for requiring levels of service.)

The obvious benefits in achieving and maintaining levels of service include health and safety, physical/natural development, economic/social development, quality of life/living standards and reducing life cycle cost. These benefits support the “why” of why we need levels of service.

3. WORK DESCRIPTION

3.1 DELIVERY OF LEVELS OF SERVICE

Best practices are a dynamic process that require ongoing linkage between the various activities while developing levels of service. The levels of service linkages/relationships can probably be best understood by referring to Figure 3–1, which illustrates that the focal point or the core of this best practice is to establish and deliver levels of service. This requires a series of activities that overlap one another, yet are linked to achieve levels of service.



Figure 3–1: Delivery of Levels of Service/Linkages

The supporting steps in this best practice might include the following elements, but not necessarily in the order presented.

3.1.1 ASSET UNDERSTANDING

- Identify existing assets (nature of, number, length, volume, location, etc.).
 - What is the current condition of the asset?
 - When was the asset constructed/rehabilitated/replaced?
 - What is the asset’s life expectancy (theoretically)?
 - What is the actual or projected life of the asset based on inspection?
 - What is the present and predicted deterioration?

- Can the asset be rehabilitated? What is the cost and impact on its life?
- What measurements are in place to monitor asset conditions?
- What are the impediments to measuring asset condition?
- Assess the asset's performance.
 - Is the asset performing and meeting user requirements?
 - What limitations exist with regards to safety, capacity, and the regulatory and environmental requirements?
 - What levels of service have been set for the asset?
 - Are assets ranked, based on a systematic evaluation (i.e., from inadequate to excellent)?
 - Are benchmarking indices available?

3.1.2 CONSULTATION/COMMUNICATION

Consultation with the users of the assets establishes perceptions of the acceptability of existing levels of service and user willingness to pay for either a higher or lower service level. This communication can occur on a formal basis for large municipalities or in smaller communities on an informal basis. There has been extensive work done on effective consultation and communication (*International Infrastructure Management Manual, 2000*).

Consultation/communication includes the identification of key stakeholders and the effectiveness of current methods of obtaining user assessments of levels of service. Methods are then implemented to monitor user expectations. This could include user surveys/customer satisfaction surveys and focus groups of selected stakeholders.

Key stakeholders might establish service criteria. For example:

- legislative requirements (mandated or desirable but not mandated, such as risk assessment);
- cost (initial capital cost, life cycle cost, service life);
- customer satisfaction/perception (e.g., the appearance of customer service facilities, a willingness to help customers, ease of communication, prompt service, the knowledge and courtesy of employees, and their ability to convey trust and confidence, and caring, individualized attention to the customer); and

- technical (quality, quantity/capacity, reliability, environmental implications, availability, safety, and maintainability).

A survey would gauge:

- expectations and perceptions of users;
- satisfaction with existing levels of service;
- the importance of modifying levels of service;
- user priorities;
- opportunities for improvement;
- user willingness to pay for upgraded service levels; and
- the development of evaluation criteria.

A survey would also:

- provide a basis for evaluating competing alternatives;
- establish priorities for expenditures;
- educate users/decision makers;
- help co-ordinate input from various agencies/stakeholders; and
- establish a customer charter of rights.

3.1.3 STRATEGIC ALIGNMENT

Corporate or community goals, as reflected in the direction provided by elected officials and the municipal administration, generally set the tone for the levels of service the community wants and is willing/able to support financially. These goals should reflect the values of the community, but may be directed by certain legislative/regulatory requirements.

3.1.4 RISK TOLERANCE

Risk tolerance is community/municipality dependent and needs to be understood when decisions on levels of service are taken. Finances or the lack of funding may require a compromise that could affect potable water systems, treatment facilities, and transportation systems, exposing the municipality to increased risk and certain legal liabilities. The community must be aware of this exposure to risk and determine its level of comfort and willingness to accept that risk.

3.1.5 FINANCIAL CONSIDERATIONS

In many instances, the levels of service are dictated by user willingness to pay. The exception might be a regulatory requirement that legally obligates the community to provide a certain minimum level of service (e.g., specific minimum water and wastewater treatment standards).

To deal with the financial realities, it is necessary to:

- know the cost associated with varying levels of service;
- understand the financial resources available to provide these levels of service;
- assess user willingness to pay;
- understand the implications of not achieving certain levels of service relative to corporate goals/strategic alignment; and
- understand long-term (life cycle) cost implications of implementing specific levels of service.

3.1.6 SUMMARY

The five steps for establishing levels of service, do not occur in a linear fashion (i.e., they may be concurrent activities).

- Consultation/communication can occur in an informal manner, particularly for the smaller municipalities. In the larger municipalities, the use of focus groups, customer open houses, and surveys is more likely to be the norm.
- There needs to be a clear understanding of corporate goals/strategic alignment and the municipality's mission objectives. This is essential and reflects whether elected officials and the administration clearly understand the community's expectations.
- Financial considerations are paramount in the decision-making process, necessitating the establishment of priorities in close consultation with stakeholders and representatives of the community.

3.2 ESTABLISHING LEVELS OF SERVICE

There are eight basic steps to develop levels of service. As indicated in Figure 3–2, the process tends to be iterative. The level of effort in each activity might vary considerably for municipalities/organizations with differing demographics and for different types of assets. For example, the process and emphasis for establishing levels of service for transportation systems might be quite different than for a wastewater treatment facility, but the basic activities identified in Figure 3–2 should still be an appropriate best practice process to be followed.

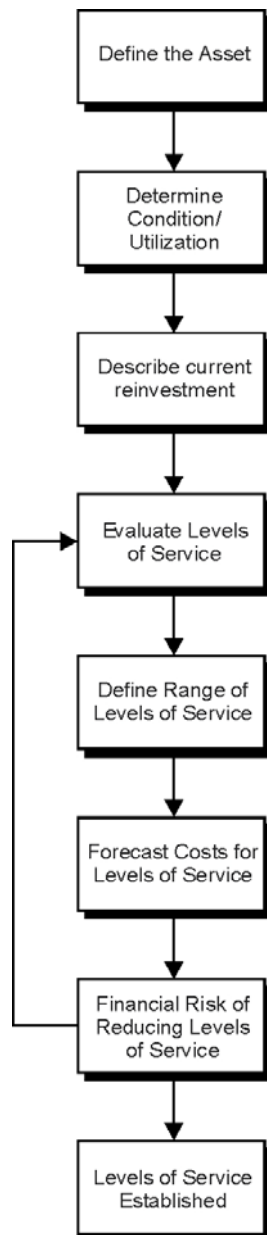


Figure 3–2: Developing Levels of Service

3.2.1 DEFINE THE ASSET

This includes an inventory of all pertinent infrastructure assets (i.e., number, length, volume, location, capacity, type, age, etc.).

3.2.2 DETERMINE REPLACEMENT VALUE/CONDITION/UTILIZATION

Establish the replacement cost, condition, and utilization of roads, water distribution systems, treatment plants, etc.

3.2.3 DESCRIBE THE CURRENT REINVESTMENT IN EXISTING INFRASTRUCTURE ASSETS

Assess the cost associated with maintaining certain levels of service and establish performance measures to monitor the extent to which levels of service are being maintained. Undertake a detailed assessment of assets indicating the percentage falling into categories ranging from very good to very poor.

Forecast the ongoing annual costs associated with maintaining a certain level of service for the present and for a predetermined period.

3.2.4 PANEL TO EVALUATE LEVELS OF SERVICE

Through the development of evaluation criteria and an evaluation of levels of service and financial and risk factors, a multidisciplinary committee can determine priority levels of service.

3.2.5 DEFINE RANGE OF LEVELS OF SERVICE

For various infrastructure, the costs associated with providing certain levels of service are defined so an informed decision can be made.

3.2.6 FORECAST COSTS TO PROVIDE A LONG-TERM LEVEL OF SERVICE

Determine the costs of providing continuity for levels of service, for each area of infrastructure. Assess the total capital and long-term operation and maintenance costs and rate payer willingness to pay.

3.2.7 FINANCIAL/RISK OF REDUCING LEVELS OF SERVICE

The financial resources needed for expected levels of service are not necessarily available. This means service levels are compromised. This increases risks, which may include safety, quality of life, health and increased future asset rehabilitation costs. It is essential that the inherent risks associated with decreasing levels of service be fully understood by the public, elected officials, and key stakeholders. Matters such as due diligence and legal risk must be considered. Should rate payers not be willing to accept the costs, then reduce the levels of service to the point where costs are acceptable. This is an iterative process that means returning to the Delphi panel until levels of service and willingness to pay are aligned.

3.2.8 LEVELS OF SERVICE ESTABLISHED

Council has endorsed the levels of service as being within its financial capability and aligned with the strategic vision for the community.

The established level of service may result in a reduction or an increase of existing infrastructure reinvestment and new infrastructure investment.

Finally, established levels of service promote the identification of alternative methods of service delivery. For example, while meeting legislative requirements may be a contractual requirement, staff are not precluded from delivering the highest standard possible given available funds.

APPENDIX A: CASE STUDIES

Technical best practices have been included for EPCOR Water and the cities of Lethbridge and Laval which, for the most part, incorporate the five activities identified in Figure 3–1. EPCOR Water also developed a customer charter of rights based on levels of service and incorporated performance measures to monitor compliance.

A.1: EPCOR WATER SERVICES

EPCOR has established levels of service to include system reliability, water quality, customer service, environmental factors, and safety. Essentially, rates have been established that are linked to the performance of EPCOR in all aspects of maintaining, supplying, and treating water. EPCOR warrants it will achieve a certain performance standard in the operation, management, maintenance, and water supply for its system. Should performance not be met, customers will receive a water rate rebate. This is essentially a charter of rights for customers and is covered by Waterworks Bylaw No. 12585 (accessed through the City of Edmonton's Web site). The by-law is a living document that is an integral tool to assist in managing, operating, and maintaining EPCOR's water system.

The levels of service and associated performance measures are monitored on a monthly basis to assess performance and, if necessary, take appropriate actions to ensure compliance. The information is also used in planning. Should levels of service not be achieved, then these are reviewed, and measures identified and implemented to achieve compliance. In addition, opportunities to improve levels of service are investigated and, if appropriate, incorporated into the performance measures.

A.2: CITY OF LETHBRIDGE

The City of Lethbridge recognized that levels of service must reflect the wishes of the key stakeholders, supported by the administration and elected officials. The administration had a thorough understanding of the existing environmental infrastructure assets, specifically storm, sanitary, and water. This enabled the City to educate the focus group on these elements of infrastructure, and to assess the implications of achieving certain levels of service.

Keeping its vision of an attractive, healthy, and economically viable community in mind, City Council implemented a focus group to establish levels of service for storm, sanitary, and water systems. The focus groups consisted of some 20 public representatives and a member of Council. Members met in eight workshops to learn about the storm, sanitary, and water systems, and assess customer satisfaction, levels of service expectations, and performance measures.

The Council representative provided information on how the budgeting process works with respect to achieving levels of service. The Council also provided political representation and backing for the focus group. It was clearly understood that the focus group role's was advisory and Council would have the final say in levels of service.

The focus group was also apprised of the cost of attempting to achieve certain levels of service and the risks associated with reducing levels of service or associated costs.

The end results of the focus group workshops were levels of service that reflect all aspects of the best practices process shown in Figure 3–1.

The City has used these results to:

- incorporate levels of service into its master plan;
- identify the financial implications of achieving levels of service and incorporating them into the 10-to-20 year plan;
- adopt an evaluation process for capital projects that reflects criteria developed by the focus group;
- identify restrictions to achieving levels of services associated with growth projections; and
- consider the public's perception as to the adequacy of current levels of service as part of the decision-making process.

A.3: CITY OF LAVAL

The City of Laval completed a comprehensive evaluation of some 570 kilometres of roads. This evaluation used a pavement management system to rate the pavement for structural condition and a quality-for-driving indices. The system helped senior administrative and elected officials in decision making related to:

- protecting and increasing the return on investment;
- prioritizing interventions;
- establishing levels of service; and
- formulating a strategic plan.

In particular, the pavement management system includes a network performance evaluation, the establishment of levels of service, detailed studies, and strategic planning.

The detailed studies include a global study of the network and the maintenance management of all 570 kilometres, and a detailed study at the project level of design and rehabilitation techniques for 20 kilometres. A vehicle specifically designed for the evaluation conducted the testing and data acquisition. The resulting data provided performance indicators and an assessment of the ability to undertake performance monitoring.

The performance indicator ranked roads from very bad (1) to very good (99) and categorized them into five condition ranges. The indicators consider performance and diagnostic factors. Performance factors included structural capacity and susceptibility to freezing, while diagnostic factors included degradation and running comfort.

The levels of service being provided were indicated by the relative percentage of roads in each category. The cost to maintain roads was then evaluated, together with the future cost of either improving, maintaining, or permitting deterioration to occur over the next 10 years. A strategic plan, with appropriate cost information, was developed to enable council members to decide if they wished to maintain, increase, or reduce the present level of service.

A long-term (10-year) strategic plan was developed, which aligned levels of service with financial capability.

REFERENCES

International Infrastructure Management Manual, 2000. Australia/New Zealand Edition.

Keehley, P. et al., 1996. *Benchmarking for Best Practices in the Public Sector*.