The Fredericton-Moncton Highway 5 Year Review

A Partnership in Progress

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Abstract

This paper provides an overview of the progress and status of the ongoing Fredericton-Moncton Highway Project. This project uses a Design, Build, Operate and Maintain, Alternate Service Delivery (ASD) approach between the Province of New Brunswick and Maritime Road Development Corporation.

Although portions of the highway facility have been operational prior to the signing of the agreements between the Province and Maritime Road Corporation (MRDC), the Highway has been fully operational since October 24th, 2001. Total completion of the construction of the Project was achieved late in the fall that same year.

The Highway is the primary ground transportation route between Fredericton and Moncton, New Brunswick. It consists of 195 km of four-lane divided highway (Route 2) and approximately 12 km of four lane divided highway (Routes 1, 7, & 8) that serve as connectors to the Fredericton-Moncton Highway facility. There are in total 21 interchanges and over 100 structures on the facility including 73 bridges and numerous large pipe arch culverts. Four maintenance depots located along the highway corridor serve as the bases of highway operations and were also constructed in conjunction with the Highway.

The Operation, Maintenance, Management, and Rehabilitation of the Highway are an integral part of the Project over the thirty-year term between 1998 and 2028.

This paper will provide a short background of the historical aspects of the project including the development, design and construction, with particular emphasis on the numerous safety features incorporated into the Highway. The paper will focus primarily on the operations and maintenance activities providing a status report.

The paper will also present aspects of the Quality Management System and numerous benefits as a result of the Project in terms of technology transfer and other economic benefits to the citizens of New Brunswick.

Background and History of the Trans-Canada Highway in New Brunswick

The Trans-Canada Highway in New Brunswick (designated as Route 2) is the vital highway transportation link that connects Newfoundland, Nova Scotia, Prince Edward Island and New Brunswick to Quebec and the north eastern United States.

As a result of increased traffic, especially heavy truck traffic, the Province of New Brunswick began to develop plans to twin Route 2 between the Nova Scotia and Quebec borders in the 1980's. The first section to be completed was the twinning of the existing highway between Nova Scotia and Moncton in the early 1990's. From there, the Province set out to provide a tolled 4-lane facility between Fredericton and Moncton. Because the existing 2-lane section of Route 2 between Fredericton and Moncton intersected many small communities, the new Fredericton-Moncton Highway (F-MH) required much of the facility to be located on a new alignment.

Construction was completed and the facility opened to traffic in October 2001. The success of this project between the Province and the private sector has led to the inception of another project. The Province has recently awarded a new project for the construction and maintenance of the Trans-Canada Highway between the Quebec border and Fredericton. Once the construction is complete in late 2007, the entire Trans-Canada Highway will be a 4-lane facility between the borders of Quebec and Nova Scotia.

Inception of the Fredericton – Moncton Highway Project

In 1996, the provincial government initiated the project in cooperation with the private sector by means of an alternative service delivery model to construct and finance the F-MH. In order to ensure quality on the part of the developer, the province decided to include the operation and maintenance of the new facility as part of the project. This would compel the developer to construct a quality infrastructure because it would be the responsibility of the developer to later operate, maintain and rehabilitate the facility for a concession period of 30 years.

The Province issued a Request for Qualifications ("RFQ") for the Design, Build, Financing Operations, Maintenance, Management and Rehabilitation of Route 2 between Fredericton and Moncton in December 1996. The RFQ was a call to industry for interested groups to respond and provide basic information on their abilities to conduct and finance the required work.

Following the receipt of five responses for the RFQ in early 1997, the Province performed an in-depth evaluation of each submission and short-listed three parties to proceed to the next phase, the Request for Proposals ("RFP"). The RFP contained the specific requirements, standards, and specifications that were necessary in order to complete the project.

The RFP for the F-MH Project was issued in 1997 to the three short-listed proponents and responses to the RFP were received in three stages from each proponent in the following order.

- Technical Proposals - that outlined the specifics of how each proponent intended to meet the technical terms of the RFP, (designs, operational plans etc.).
- Quality & Environmental - that outlined the Quality Management and Environmental Management Systems and Plans.
- Financial Proposals that outlined the financing arrangements and bid price from each Proponent in order to fund the construction portion of the Project.

The preferred proponent selected as a result of the process was Maritime Road Development Corporation ("MRDC"). The resulting documentation was the F-M Project Agreements.

The Province assigned responsibility for implementing the Project to the New Brunswick Highway Corporation ("NBHC") which was established under the New Brunswick Highway Corporation Act. NBHC created a subsidiary company named the New Brunswick (F-M) Project Company Inc. ("Project Company") to administer the Project Agreements on behalf of NBHC. The Project Company ultimately seconded resources from NBDOT to oversee the administration of the Project Agreements (F-MHP Group).

Parties to the Fredericton–Moncton Highway Project Agreements

The F-MH Project Agreements consist of ten (10) binders of documentation which contain the following:

- The Concession Agreement;
- The Development and Design-Build Agreement (DDB);
- The Operation, Maintenance, Management and Rehabilitation Agreement (OMM);
- The Partnering Agreement; and
- Various other agreements between the Project Company and the Lenders.

The primary agreements are the DDB during the construction phase and the OMM during the operational phase.

The F-MH Project Agreements were signed between MRDC, NBHC and the Project Company on January 22, 1998 in Fredericton, New Brunswick only 13 months following the issuance of the RFQ.

MRDC is a joint venture comprised of many companies with the following shareholders:

- Dragados FCC Canada Inc. (DFC)
- Vinci Concessions Canada Inc.
- Miller Paving Limited

Overview of the Completed Facility

The F-MH consists of 195 kilometres of four (4) lane divided mainline highway and 12 km of four (4) lane divided highway connectors. The main line highway is designated as Route 2 (TCH) from approximately 30 km west of Fredericton (Km Marker 256) to Moncton (Km Marker 451). It was officially opened on October 24, 2001 and to date well over 10 million vehicles have travelled the length of the Highway and over 40 million vehicles have travelled on various segments of the Highway since opening to traffic.

The Highway includes 73 bridges including the 4th and 5th longest structures in the province. There are 15 full and 3 partial interchanges along with 3 high-speed connecting interchanges to other major highways in New Brunswick. The Highway is maintained out of four maintenance facilities that are strategically located and constructed in proximity to the Highway.

The following will provide the reader with a concept of the project scope and magnitude:

- 19 million cubic metres of earthwork
- 8.5 million tonnes of granular Base & Sub base
- 1.5 million tonnes of asphalt
- 130 km of guide rail
- 395 crash attenuators

History of Construction

At the outset of the project, the entire F-MH was subdivided into 12 distinct Sections of highway of various lengths. These Sections were created based largely on geographic features and/or highway segment opening requirements. The various Sections of the Highway were constructed and opened with only minor timing differences from the original proposal as indicated in the following table:

Table A – Highway Section Openings

Road Section	Km Marker	Approx. Length 4 lane km	Year Constructed	Planned Opening Date	Actual Opening Date
1	256 - 278	22	1999	Oct 1, 99	Dec. 16, 99
2	279 - 282	3	1999	Oct 1, 99	Dec. 16, 99
WFHSC	0 - 3	5	1999	Oct 1, 99	Dec. 16, 99
3	282 - 296	14	1999	Oct 1, 99	Jul. 10, 00
EFHSC		4	1999	Oct 1, 99	Dec. 16, 99
4	296- 301	5	1980's	Oct 1, 99	Nov. 1, 99
5	301- 306	5	2000's	Oct 1, 99	Aug. 8, 00
Rte 7 intchg		0	1999	Oct 1, 99	Aug. 8, 00
6	306 - 332	26	2001	Nov 30, 01	Oct. 24, 01
7	332 - 339	7	2001	Nov 30, 01	Oct. 24, 01
8	339 - 349	10	1995/1999	Oct 1, 99	Oct. 22, 99
9	349 - 400	51	2001	Nov 30, 01	Oct. 24, 01
10	400 - 419	18	2001	Nov 30, 01	Aug. 23, 01
11	419 - 428	10	1999	Nov 30, 01	Oct. 29, 99
SJHSC	239 - 242	3	1999	Nov 30, 01	Oct. 29, 99
12	428 - 451	24	1997	April 15, 98	April 15, 98
Total		**207**			

The largest portions of the highway and structures were constructed between 1998 and 2001. A few road segments however, pre-existed the formation of the project. In total, approximately 16% of the total highway length consists of pre-existing road segments and structures which have been incorporated into the facility by MRDC.

From the table above, it should be noted that while the full highway is celebrating its fifth year of service in 2006, the oldest portions of the highway, Sections 4, and 12 have been in service in excess of 9 years.

While nearly all of the structures built on the facility were similarly constructed between 1999 and 2000, several of the existing structures incorporated into the facility predate the 1970's, with the oldest structure dating back to 1958.

During the peak construction season in the year 2000, nearly 1400 workers were directly involved in the construction of the Highway.

MRDC's operational responsibilities commenced in the spring of 1998 and grew exponentially as each segment of new highway was completed and opened to traffic. This staged opening process allowed a "phasing in" of the operational aspects of the project.

Toll Collection Removal

During the third construction season of the highway, a change in the provincial policy prompted the removal of toll collection on the F-MH.

The removal of toll collection involved significant consultation and discussion between all parties from which the result of this process was the Amended and Restated OMM and DDB Agreements.

Toll collection was replaced with monthly traffic volume payments by the Province to the toll-based debt lenders based on traffic counts. An elaborate traffic counting and classifying system has been installed at four locations along the facility to collect the required information.

The result of this process allows all users of the Highway to travel non stop from end to end.

Safety Audit

The F-MH was one of the first highway projects in Canada subject to a formalized Safety Audit process by independent safety experts from design through to opening of all segments of the completed highway to traffic. This Safety Audit process has been adopted on many other Design-Build Projects since.

During these Safety Audits potential hazards were identified, investigated and resolved prior to opening the various highway segments to traffic. Overall this process was considered a great success in forging a link between the operational and construction phases of the highway project and raising the overall level of safety to the users of the highway.

Safety Features

The F-MH was designed and constructed incorporating numerous safety features which have assisted in providing the highway with an exceptional traffic safety record which is discussed in more detail later in this report.

The following is a list of some of the various safety features/devices built into or used in the construction and operation of the F-MH:

- Guide Rail End Treatments
- Edge Line Rumble Strip
- Crash Attenuators
- Frangible Sign & Light Bases
- Wildlife Fences
- Flexible Left Edge Plow Markers
- 120 km/h Design Speed
- 10.0 m Clear Zone
- Safety Audits
- 6:1 foreslopes

Highway Maintenance Operations

As road segments were either transferred to MRDC from NBDOT, or completed after the construction phase, the operational phase of the Project commenced. As can be seen in the table above, each year the operational segments of the Highway roughly doubled in length from 1998 to 2001 providing a number of challenges for MRDC.

From the inception of the operational phase until the spring of 2003, MRDC provided maintenance services through subcontracted services. Since the spring of 2003, MRDC has provided most maintenance and operation services directly.

Summer Operations

With a relatively new highway, the summer seasons are typically slower periods of activity for MRDC; however there are still many challenges for MRDC staff during the spring, summer, and fall periods, the least of which is a threefold increase in traffic.

Summer operations include a much larger number of activities of more limited duration with the primary focus on repair and restoration of various infrastructure components. These activities commence with a detailed inspection of all the various infrastructure components, which inspections, are typically completed by late May.

Following these inspections, work schedules are developed to address the identified deficiencies and the work is either tendered to local contractors or scheduled for completion by MRDC forces. The decision to outsource work is largely dependent on the scope and magnitude of the identified workload and typically it is a combination of both.

Throughout the early summer and late fall periods significant resources are required for the transition periods into and out of winter operational mode.

Since the opening of the Highway, the summer activities which have proved the most challenging for MRDC have been the backslope and ditch maintenance requirements. The prolonged spring wet weather and rainy summers during a few of the past five years have created numerous backslope sloughs and have made mowing operations in ditches very difficult at times. These aesthetic issues are the primary areas to date of non-conformances identified in audits and inspections and have been a source of concern raised by the F-MHP Group.

Winter Operations

Winter road safety is a major challenge in New Brunswick; the public expects road authorities to provide clear and dry pavements in all conditions. MRDC is meeting this challenge through a multifaceted approach involving what has evolved to become recognized as many of the best practices of salt management and winter maintenance strategies, which include:

- RWIS systems to monitor and report on the air, road and sub-surface temperatures at multiple locations along the F-MH. This system is coupled with contracted weather forecasting services to provide up to date meteorological and pavement temperature forecasts to winter maintenance staff.
- An in-depth annual training program for all winter maintenance staff covering the annual winter operations plan in detail.
- A tactical salt management program which entails the use of different materials and application techniques according to the timing, intensity and duration of winter storms.
- A state of the art winter maintenance fleet including computerised spreading controls, tandem combination plow-spreader trucks, tandem snow plows, snow blowers, anti-icing spreader tanker trucks, loaders and patrol vehicles. All of which are ready to respond 24 hours a day, 7 days a week during the winter season.

Figure A

Typical MRDC Combo Plow/Spreader Truck

MRDC defines the 4Rs of winter salt management as: using the right *material*, in the right *amount*, at the right *time*, and in the right *place*. An example of this approach is the use of anti-icing, a preventative measure used under some winter storm conditions. Brine (liquid salt water with 20% - 23% salt concentration) is the preferred method of anti-icing early or in advance of a snowfall. Anti-icing with brine is an efficient and cost effective technique for anti-icing when pavement temperatures are above -6 degrees Celsius.

The purpose of anti-icing is to prevent the formation of an ice/pavement bond which is not only hazardous for travelers but which requires larger quantities of salt to subsequently remove. When temperatures drop below -6° C or as accumulations of snowfall require additional treatments maintenance staff switch from brine applications to pre-wetted rock salt to maintain a thin brine layer at the road surface. Salt begins to lose its effectiveness as a road de-icing agent below -10° C; sand abrasives are used at -12° C to alert traffic of the slippery conditions and to assist with traction.

MRDC is very proactive in salt management and continuously tracks and monitors salt and/or abrasive usage and effectiveness throughout the winter season. Salt and sand quantities are reported annually to Environment Canada and to the F-MHP Group. The following table indicates the annual usage by MRDC over the course of its winter operations.

Table B – Salt Usage

Winter Season	**Salt**	**Sand**
Tonnes/lane km 2005/06	8.83	2.19
Tonnes/lane km 2004/05	10.90	4.55
Tonnes/lane km 2003/04	8.75	3.11
Tonnes/lane km 2002/03	13.80	4.54
Tonnes/lane km 2001/02	8.90	2.23
Tonnes/lane km 2000/01	12.70	3.23
Tonnes/lane km 1999/00	12.50	5.41
Average	10.91	3.61

MRDC is continuously engaged in research and development, investigating the efficacy of new equipment designs and promising de-icing solutions. Current evaluations involve flexible plow blades and visual low temperature warning sensors.

MRDC also puts a priority on good housekeeping practices. Salt storage facilities are kept clean and dry; drainage is directed away from covered storage domes; spreader trucks are cleaned at designated areas; and unused salt is returned to storage promptly. Just-in-time brine production avoids storage problems and minimizes the risk of spills.

An annual ground water monitoring program at selected storage sites ensures that MRDC staff stay abreast of any potential concerns.

Auditing & Quality Management

The F-MH Audit Program has been jointly developed to assess MRDC's overall performance and adherence to the OMM Agreement. The program requires a documented Quality Management System and certification to ISO 9001: 2000 International Standard for Quality Management Systems.

The audit program is designed to determine confidence levels in the following areas:

- MRDC's Quarterly Certified Performance Report (CPR);
- MRDC's adherence to the Requirements of the OMM Agreements;
- MRDC's Quality Management System (QMS); and
- MRDC's observance of safe operating practices.

The audit program consists of audits, document reviews and site visits conducted by both MRDC and by F-MHP Group auditors on all MRDC activities or responsibilities.

MRDC's audits are reported to F-MHP Group in the form of a quarterly CPR. The CPR is based upon a minimum number of random audits on scheduled OMM activities according to seasonal work requirements. This seasonal audit schedule was jointly developed with F-MHP Group. All activities audited are scored on an agreed upon weighting system whereby Safety, Environment, Asset Longevity, and Aesthetic issues are considered. Cumulatively, the weighed scores from the audits are rolled together with the preceding three quarterly periods to provide an overall rolling 12 month CPR performance score. Because of the seasonal nature of the OMM work and the variability in activities and workloads between seasons, it was mutually agreed that the CPR reporting periods must be based on a moving 12-month period, and that the CPR score applies to the most recent quarterly period. A CPR performance score which falls below 95% will result in a payment reduction to MRDC for the reporting quarter.

Additionally, the F-MHP Group auditors perform additional audits on the following areas:

- MRDC's Quarterly Certified Performance Report (CPR);
- The requirements defined in the OMM standards;
- MRDC's Quality Management System (QMS); and
- Other related deliverables, requirements or measures defined in the OMM Agreements.

The MRDC audit program is analogous to quality control while the F-MHP Group audit program is analogous to Quality Assurance. Both programs are designed to provide a meaningful measure of compliance with the OMM Agreements.

F-MHP Group auditing frequency and levels of detail fall far below those of MRDC, however, the audit findings have an impact on sample size depending on confidence levels determined from previous audit periods.

In addition to scheduled audits, both or either the MRDC and F-MHP Group auditors may at any time:

- audit activities that are not identified in the audit schedules;
- increase the frequency of audits;
- perform document reviews; and
- conduct site visits.

The F-MHP Group auditors prepare a monthly audit schedule that reflects the number and nature of audits to be performed each month, which is forwarded to MRDC. The F-MHP Group auditor conducts audits against the standards contained in the OMM Agreements. Based on the evidence collected, either a defect notice or non-conformance notice is issued or on a monthly basis, MRDC is notified that no deficiencies were observed. Non-conformances notices are rated as major, minor or safety related depending on the evidence found. Major Non-conformances are issued for the following reasons:

- A situation or procedure that knowingly permits an unsatisfactory product/service.
- A situation that affects safety or fitness of use.
- A complete absence of policy or procedure.
- A total breakdown in the implementation of a procedure.
- A number of similar findings throughout the system.
- The MRDC has not met contractual requirements stipulated in the Operations, Maintenance and Rehabilitation Plans, Management Plans and other contractual documents.

At any time that an audit results in a non-conformance, MRDC is required to provide a disposition describing the corrective action that will be taken. The issuance of any non-conformance notice or deficiency notice also results in a follow-up audit by the F-MHP Group Auditor to ensure that the appropriate corrective action has been taken.

Non-conformance payment adjustments are made once a failure results from the following factors over a three-month period:

- Overall aggregate level of conformance of 95% or better.
- Failure to provide unbiased CPR's meeting the criteria of the Quality Management Plan.
- Failure to accurately document the on-going status of the operation, management, maintenance and rehabilitation effort.
- Failure to make field observations and evaluate infrastructure conditions and operations.
- Unsafe operational, maintenance and rehabilitation practices.

Under the current system, MRDC has not had a payment reduction since inception in 2000 and all identified non-conformances and deficiencies have been addressed.

Asset Management

Management of the various highway infrastructure components is a significant part of MRDC responsibilities under the OMM Agreements. These functions are managed under the following three main areas.

Pavement Management

The pavements of the F-MH represent one of the largest assets of the highway and a key part of the OMM Agreements deals with the maintenance, preservation, and rehabilitation of the pavements.

The OMM Agreements require continuous monitoring of the asphalt pavement surface distress, ride quality and strength and provides stipulated numerical indices as trigger values, below which, the pavement surfaces are to be rehabilitated. These NBDOT numerical indices are largely based on the past practices and measurement techniques of NBDOT.

Additionally, the OMM Agreements require MRDC to concurrently address all forms of asphalt pavement distress through various maintenance techniques such as patching or crack sealing within specific timeframes or on an annual or programmed periodic basis.

Early in the project, MRDC raised concerns over the practical implementation of the application of the OMM Standards dealing with asphalt pavements. The focus of these discussions was primarily on the level of acceptable distresses within an asphalt pavement prior to scheduled rehabilitative treatments. Numerous discussions with F-MHP Group staff on these standards have taken place and a number of modifications and clarifications to the Standards have been proposed. These review processes are anticipated to continue for the duration of the Agreements and this is viewed as a normal process for a contract with such an extensive timeframe.

MRDC contracted the services of Group Qualitas Inc. to develop and implement a Pavement Management System ("PMS") to meet the OMM Agreement criteria and intent, but at the same time which uses more advanced technology and techniques to measure and record the various pavement performance parameters.

The resulting PMS consists of basically three components, a Network level component, a Project level component and various analysis tools to review and analyze the pavement rating condition data. To date, Network level data has been collected and analyzed twice and previous deflection data has been used to augment the system. Network monitoring over time, provides MRDC with trend data to project and forecast future pavement conditions for planning and budgetary purposes.

The Network level PMS provides a synopsis of the overall condition of the pavement network at any point in time and identifies areas of concern or potential concern for further more detailed Project level assessments required to develop rehabilitation strategies.

Four parameters are analyzed to evaluate the Network pavement performance: Surface Distress, Roughness, Rutting, and Structural Adequacy. Surface Distress is a visual pavement surface evaluation of the highway is captured by photographic equipment mounted on the survey vehicle and subsequently analyzed under controlled conditions. Roughness and rut depth measurements are captured simultaneously by the same survey vehicle (see photo below) and Structural Adequacy is measured from deflection data collected by a Falling Weight Deflectometer (FWD) independently of the other data.

Figure B

CRCAC Multifunction PMS Survey Vehicle

The latest survey completed in 2005 when measured against the 2003 highway condition survey provides a frame of reference for the surface distress, roughness, and rutting; and for structural adequacy. When analyzed in conjunction with the OMM Contractual trigger levels and with the recorded traffic volumes, the PMS analysis tools provide MRDC staff with a highway condition projection based on the past performance and on the projected traffic loads.

Overall many sections of the pavements are performing better than anticipated. Drainage issues are suspected in poorer performing areas, which are under review.

Bridge Management

MRDC conducts biennial Structural Inspections of all bridges and structures on the F-MH, which exceed a span of 3.0m.

These inspections are primarily visual inspections completed between June 30th and October 31st annually. Inspectors are trained personnel and are provided with binoculars, cameras, tape measures, photo reference, and a copy of the previous inspection reports to assist them in the completion of their work.

The structural inspections are documented on standardized inspection forms which detail the overall condition of the structure and of the various structure components.

The inspection reports include:

- an introduction detailing any noted changes from the previous inspection;
- a narrative on the present condition of the structure and of the individual structural components;
- recommendations that identifies any required maintenance, monitoring, or repairs prior to the next scheduled inspection; and
- an appendix containing photographs of any relevant issues and any areas recommended for repair.

The inspection reports over time provide a historical frame of reference for future inspections, condition assessments, and maintenance or rehabilitation work.

Typically one half of the total number of bridges is inspected each year providing a two year inspection cycle. It should also be noted that nine structures along the Highway (the High Level Structures) require the use of a truck mounted bridge inspection lift device to deliver the inspector to some components of these bridges. During these inspections, an F-MHP Group representative is invited to attend and accompany the MRDC inspector due to the logistics of these inspections. Deficiencies identified from the inspections are referred to a Professional Engineer for analysis and recommended action.

To date, major rehabilitation has been conducted on structures at the following four locations:

- The eastbound overpass near Moncton had a complete deck and super structure replacement in 2004, this structure was the oldest on the facility (1958). The steel beams and concrete deck were replaced and new PL3 Barrier walls were installed.
- The superstructure of the Saint John River Bridge was lowered in 2005 to relieve stresses caused by anticipated but premature, settlement of the eastern abutment of the structure. The spread footings of the abutments at the Saint John and Jemseg River Bridges are monitored annually within the Grand Lake Meadows.
- The soil retaining wall systems at two locations were stabilized after frost displacements were identified during inspections. These repairs were completed in 2005.

Other Infrastructure Components

All other highway infrastructure components are monitored and inspected at least annually or more often as specified within the OMM Agreements. Inventories of the various assets (signs, luminaires, guide rails, barrier walls, catch basins, drainage systems, crash attenuators, etc.) are maintained and used to assist in completion of the various inspections.

Deficiencies noted during inspections are recorded in a computerized database, the Deficiency Management Tool (DMT), and closed after repairs have been scheduled and completed. In this manner the DMT serves as an active log of open deficiencies for audit purposes.

Worker Safety

MRDC places a high priority on the safety of staff and contracted forces working on the highway. Therefore, prior to commencement of any work on the Highway Right-of-Way, all staff and contracted forces are required to take a Safety, Quality and Environment training course provided by MRDC.

Additionally, all staff and workers must wear appropriate Personal Protective Equipment (PPE) such as, an approved hard hat, safety boots, and traffic safety vests at all times when working on the Highway Right-of-Way. Failure to comply with these requirements may result in discipline, financial penalties and/or termination.

MRDC has created a worker safety record that is simply outstanding and which has continued from construction through to the operational phase. Since the inception of MRDC's direct control of maintenance and operations there has been no "lost time" due to injury or accidents involving staff or contractors.

Traffic Accident History

Despite the numerous safety devices and design considerations built in to the Highway, accidents, of course, do occur on the Highway. Each quarter, all accidents are recorded, reviewed and reported on by MRDC staff in co-operation with local Police Authorities.

The following table provides a brief historical comparison of the past accident data on the facility.

Table C – Accident Data

Month	Incidents	Vehicle Accidents	Fatality	Bodily Injury	Property Damage	No Property Damage
Post Construction F-MH						
2005 Total	114	102	3	17	55	42
2004 Total	153	124	1	13	104	38
2003 Total	190	149	3	22	124	41
During Construction F-MH						
2002 Total	402	332	2	30	300	70
2001 Total	267	184	2	11	171	83
2000 Total	377	219	2	14	203	158
1999 Total	172	83	0	6	77	89
1998 Total	n/a	270	7	96	168	
Pre Construction F-MH						
1997 Total	n/a	263	17	80	175	n/a
1996 Total	n/a	220	4	77	139	n/a
1995 Total	n/a	330	10	99	225	n/a

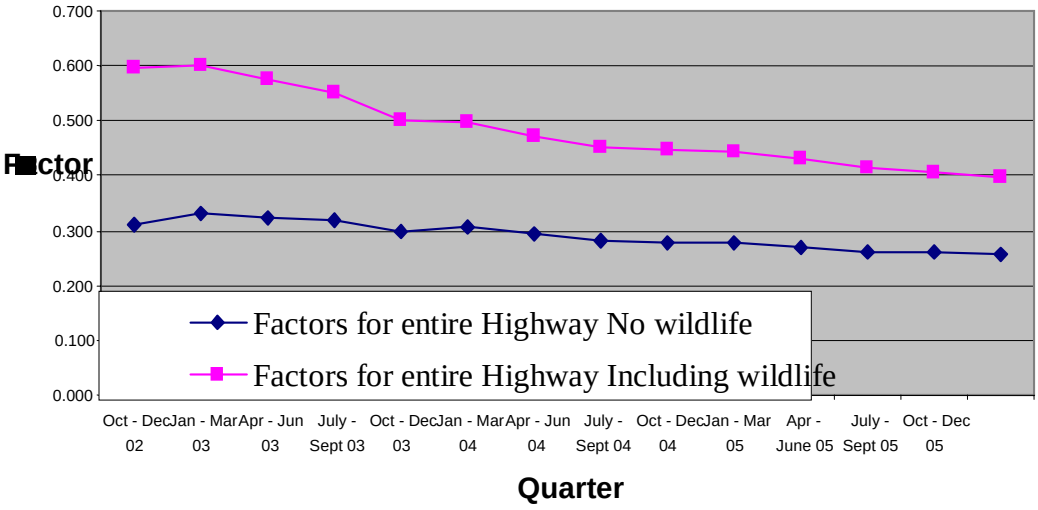
In reviewing the accident data above, caution must be used in comparisons during the construction phase, as each year includes portions of the old TCH and sections of the facility opened to traffic. They are provided here for completeness only.

It is clear from the detailed data that by far the largest numbers of accidents are single vehicles which leave the travelled roadway. Often these types of accidents are coupled with excessive speed and the more serious injuries involve either driver over correction or improper use of seatbelts. Only 10% of recorded accidents involve collisions, and most of these are rear end collisions in poor weather conditions.

The encouraging statistic that is obvious from the above data, which can be seen in the graph below, is that the frequency of accidents are dropping on the F-MH. The reasons for this drop are speculative, however it is understood that many drivers are now more familiar with four lane divided facilities in general and the F-MH in particular.

Figure C

Accident Factors for Entire Highway



Shows the number of accidents per million vehicle lane kilometres of travel on the Highway

The graph above also shows the impact of wildlife related accidents on the F-MH. Although the Highway has roughly 36 kilometres of wildlife fencing to restrict the movement of animals across the highway corridor, wildlife accidents involving deer and moose are a cause for concern at most other locations. The F-MH traverses large stretches of forested land within NB and wildlife sightings are common along the Highway. Since the full highway opening, 17 deer and/or moose crossing signage locations covering over 50% of the Highway have been erected on the facility to warn motorists of the dangers. Many of these wildlife crossings are seasonal in nature mirroring the animals' movements or flooding periods in adjacent rivers.

Travel speeds on the Highway are another cause for some concern, as can be seen from the data below. A significant number of accidents that occur on the facility appear to be attributable to, or related to, excessive speed. The following table shows the typical speeds recorded on the F-MH, this data is collected monthly from the Traffic Counting Systems and reported to the RCMP for advisory purposes.

Table D – Traffic Speeds

Traffic Speeds (kph) September 2005

	Average	85th%	99th%
Longs Creek	113	126	145
Coles Island	117	129	150
Canaan River	118	130	150
Riverglade	119	130	150

(Posted speed is 110kph)

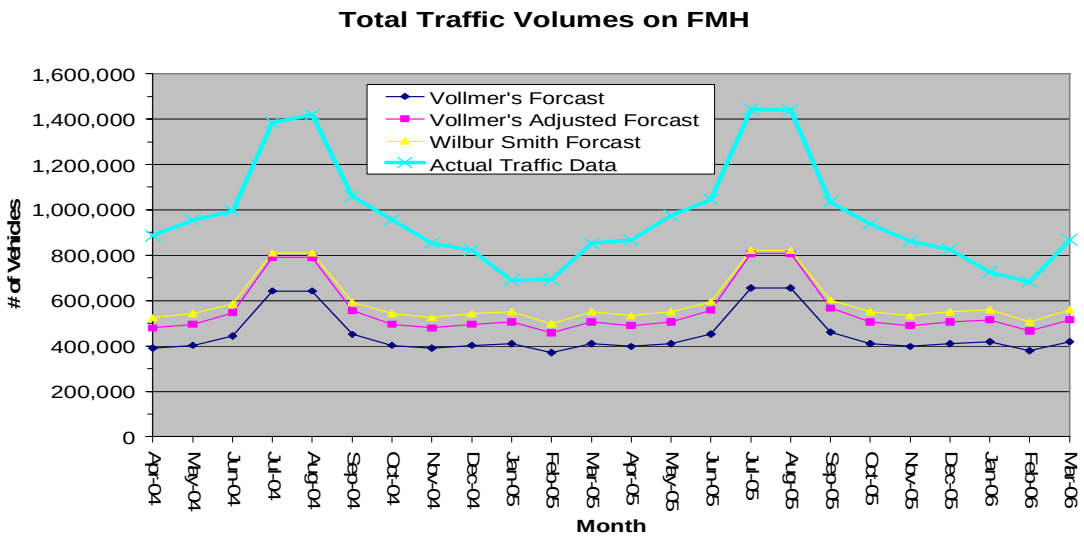
Of primary concern to MRDC staff is the vehicle speeds through construction zones. This is an ongoing safety issues for MRDC staff.

Traffic Volumes

From the outset of the completion of the F-MH, the traffic volumes on the facility have exceeded the expectations of the original traffic forecasts including those adjusted for the removal of toll collection. The graph below shows the cumulative total traffic volumes at four locations on the facility in relation to the forecast traffic volumes.

The average annual daily traffic volumes (AADT) vary along the length of the facility between 6,000 to 14,000 vpd. Peak summer traffic volumes can exceed 35,000 vpd. The percentage of commercial traffic using the facility is quite high at roughly 35%.

Figure D



Economic Industrial Benefits

Under the OMM Agreement, MRDC committed to provide Economic and Industrial Benefits (EIB); these benefits are essentially contributions to the citizens and economy of New Brunswick.

The EIB objectives cover the 30 year OMM Agreement term, and are separated into a number of distinct measurable categories which are evaluated over five (5) year periods against the stated target values. The next required EIB review is in 2007, and MRDC is well placed to meet all of its goals in the following specific EIB categories in areas of:

- Labour – in terms of the creation of NB based jobs;
- Rehabilitation – in attempting to maintain at least 73% of NB content, and 100% sourcing in NB;
- Indirect Benefits – in terms of providing training for staff, contracted forces, and/or others; and
- Community Relations - in terms of cash and in-kind contributions to charities, community related activities or functions, various research activities, or other such endeavours.

In meeting these challenges to date, MRDC has participated in various research programs at both UNB and U de M, with numerous contributions to charities and community service groups and organizations, and has provided numerous in-kind services to a variety of groups and individuals in New Brunswick

To date, MRDC has met or exceeded all of the targets of the EIB components.

Technology Transfer

Since the inception of the F-MH, numerous technological and innovative concepts and products have been introduced to New Brunswick though the F-MH. Many of these innovations and products have been adopted by NBDOT and/or other road authorities within the Province. The following are a few of these technological transfers that are attributable to, or stem from, the F-MH Project.

- Guide Rail End Treatments
- Edge Line Rumble Strips
- Truck Mounted Crash Attenuators
- Salt Brine, Anti-icing & Pre-wetting
- Road Weather Information Systems
- Safety Audits
- Frangible Sign & Light Bases
- Mobile Bridge Inspection
- In-place Guide Rail Straightening
- Kilometer Marker System

Lessons Learned

- **MRDC's Perspective:**

A retrospective review of any major project will nearly always provide opportunities for improvement and the F-MHP is no different; the following identify possible areas of improvement based on the experience of MRDC staff and management.

The Contract Maintenance Standards when coupled with the ISO Quality Management Requirements and Payment Penalties for Non – Conformances require strict compliance with the contract requirements. Early in the project, this led to interpretation difficulties due to the wording of many of the operational standards. This situation resulted in interpretation difficulties between MRDC and Project Company auditors. Most of these issues have since been resolved through joint discussion and clarification of the contract wording, although to date some issues are still being discussed.

The Insurance requirements of the Agreements are extensive and with the advent of the "911" era, the insurance market developments have resulted in a significant challenge for MRDC to deal with these costs as the contract provides no apparent ability for MRDC to address this issue.

Transitions in the staff of key positions within the parties have been difficult as numerous past issues once thought resolved have often re-emerged. This has demonstrated the ongoing necessity for documentation, open communication, and clarification between the parties and the evolving nature of such a contract.

The subgrade drainage provisions provided in the design requirements for superelevated curves provide increased opportunities for premature pavement deterioration as spring drainage from the high side of the superelevation is required to drain beneath the full pavement structure before reaching the low side shoulder foreslope. In a number of areas this has required the installation of shoulder subdrains and periodic cracksealing operations. This is particularly evident in multilane superelevated cross sections.

Deer fence gates installed with the openings perpendicular to the highway are not nearly as effective as those installed with the openings installed parallel to the highway.

The length of the contract (30 years) almost ensures that changes and alterations to the contract documents are necessary and desirable periodically. This change process should be facilitated within any future contract documents.

- **Province's Perspective**

In reflection, with the completion of the construction phase and 5 years into the operation and maintenance of the F-MH, the project is considered to be a success. MRDC has successfully assumed the responsibility for the Facility and performs their daily activities.

There is an advantage in looking back at the process experienced to date and identify some areas that can be considered as lessons learned. By identifying these issues, future projects can benefit from the experience, which will help improve the ASD process. Listed below are some of the issues identified by the F-MHP Group.

Use of Independent Agent (IA) for Auditing: The IA was hired to conduct audits as a neutral party during the construction phase of the F-MHP. However, being paid by the Project Company, the IA was not viewed as independent by MRDC.

Materiality of a Scope Change: The definition of what was considered as a "material" change to the project was not clearly defined in the definition of what constituted a scope change. By not clearly defining this term, significant disagreements between the F-MHP Group and MRDC have developed over various issues. A clearer and more quantified definition might have made the interpretation of a scope change much easier for all parties involved.

Transfer of Existing Highways to MRDC: Due to the timing involved, certain sections of the F-MH were to be completed by NBDOT after the signing of the Project Agreements. As a result, MRDC was granted the right to inspect the NBDOT built sections prior to its incorporation into the F-MH Facility. However, the resolution of many issues became a problem for both MRDC and the NBDOT. Completing any work performed by other parties prior to the signing of the Agreements would have allowed MRDC to appropriately assess and cost the take over of these sections.

Dispute Resolution Process: The dispute resolution process defined in the Project Agreements involves a multi-tiered process that starts out at the Project Manager level and moves ultimately to an independent arbitrator if the dispute cannot be resolved. However, to date both sides have resisted going to arbitration, which has resulted in ongoing disputes without resolution. Other approaches may have been better able to resolve issues in a timelier manner.

Introduction of Key Performance Indicators (KPI): Under the current system there is no mechanism to prevent the entire infrastructure from degrading to just above the minimum performance standards. By introducing a graduated scale for the operation, maintenance and rehabilitation requirements of the facility, the entire system would benefit from good asset management practices whereby the over all facility would be in good condition while recognizing certain section could be in poorer condition (still meeting the minimum requirements) in anticipation of planned rehabilitation work.

Operators Performance Measures (OPM): The initial OMM Operations and Performance Standards failed to provide clear and concise performance measures that could be easily interpreted and audited by F-MHP and MRDC auditors. As a result, the Standards have been going through a process of revision to establish measurements and timelines that can be easily monitored. This has been a slow process that requires an agreement by both parties prior to adaptation while at the same time any changes need to respect intent of the initial Standards that formed part of the Project Agreements. By introducing clear and concise OPMs with maximum response times (MRT) and minimum tolerable conditions (MTC) a measurable level of service can be defined and maintained on the Facility.

Closing Remarks

From the Province's perspective, the F-MHP continues to be viewed as a successful venture between NBHC, Project Company and MRDC. MRDC has assumed responsibility for the F-MH and works diligently with representatives of the Province to resolve any issues that arise. They have been able to quickly mobilize and implement their new ideas into highway maintenance and management practices. Projects of this nature also provide NBDOT with the opportunity to look at how they manage the remainder of the highway system and to benefit from MRDC's experiences. Overall, the process has proven to be feasible and an effective method of providing highway services to the motoring public.

From the MRDC perspective, the F-MH Project has been both a rewarding experience and a significant challenge that has been well met. The benefits to the province have been and continue to be of substantial value at a high level of service and safety. The construction of the highway was an enormous task, under tight time constraints and required intensive and responsive scheduling, flexibility and rapid decision processes.

The early stages of the operational phase of the contract proved no less challenging, and required exponential growth throughout the construction phase. After five full years of operations, many of the operational and maintenance processes have matured and are well in hand. The next operational phases of the project will clearly provide additional challenges requiring open communication in the application of new approaches, techniques, and innovations. The continuing success of the F-MH Project will depend upon ongoing cooperation between the contractual partners.