



Weymouth Cam Tue Aug 1 15:07:18 2006



Road Weather Information System

2006 Evaluation Report



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Executive Summary

Nova Scotia operates 37 sites of the Road Weather Information System (RWIS), plus two sites with cameras only. RWIS technology provides current pavement and atmospheric conditions and facilitates the provision of winter meteorological forecasts to field personnel who require decision supporting tools for the department's use on winter snow and ice control operations. These sites also have web cameras that are used extensively by the general public.

This project evaluates how staff are using and applying weather forecasts and current condition data collected and distributed through the RWIS network. It consists of a user opinion survey that was administered by Policy and Planning Division of the Department of Transportation and Public Works in April/May 2006. The questionnaire was distributed to staff who normally use weather information when conducting winter maintenance services. The study also includes information on public use of and satisfaction with the web cameras, and a review of e-mails received in the department about the web cameras

Overall, there was a high level of satisfaction with RWIS by both TPW users and the general public. The weather radar loops (Environment Canada) on the Department's Intranet were the number one source for weather information. This was followed by the site specific forecast information on the Intranet. Neither the pager nor the e-mailed forecasts were used by many respondents.

Respondents felt that RWIS resulted in safer driving conditions, and in improved winter maintenance operations and crew call-outs. Staff felt that RWIS provided the weather information needed, however, a number of other sources of weather information were used by staff.

The latest camera images, and the air temperature graphs and data were the most used features of RWIS. The image viewer was the least used feature, probably because staff is unfamiliar with this feature.

Training was the biggest area of concern for staff; they felt that they needed more of it. They felt that they needed more training about the features of RWIS and how to use them, and how to interpret the information.

1. Introduction

Nova Scotia operates 37 sites of the Road Weather Information System (RWIS), plus two sites with cameras only. RWIS technology provides winter meteorological forecasts and other data to field personnel who require decision supporting tools for the department's use on winter snow and ice control operations. These sites also have web cameras that can be used by the general public.

This project evaluates how staff are using and applying weather forecasts collected and distributed through the RWIS network. It consists of a user opinion survey that was administered by Policy and Planning Division of the Department of Transportation and Public Works in April/May 2006. The questionnaire was distributed to staff who normally used weather information when conducting winter maintenance services. The study also includes information on public use of and satisfaction with the web cameras, and a review of e-mails received in the department about the web cameras.

Background

The RWIS system was implemented in Nova Scotia through a phased process; five sites have been in operation since 1995 (replaced in August 2003), while the remainder have been installed since 2001. The department installed:



- ▶ 7 sites in 2001 (Amherst, Springhill, Kelly Lake, Truro, Milford, Bedford and Mt. Uniacke)
- ▶ 6 sites in 2002 (Westchester Mountain, Upper Mt. Thom, Mt. William Road, Marshy Hope, North Sydney, and Beechville)
- ▶ 6 sites in 2003 (Avonport, Coldbrook, Kingston, Trunk 12, Viewmount, and Yarmouth)
- ▶ 11 sites in 2004 (Canso Causeway, Sporting Mountain/River Bourgeois, Irish Cove, East Bay, Kelly's Mountain, Pictou Causeway, Monastery, Lequille, Cornwallis, Weymouth, and Meteghan), and Bridgetown (camera only)
- ▶ 5 sites in 2005 (Hubbards, Bucklaw, Pubnico, Waverley, and Lake Echo), and Bridgewater (camera only)
- ▶ 2 sites in 2006 (Trafalgar and Granite Village) — note that these two sites were added after the 2005-2006 winter maintenance season

The RWIS system is operational year-round, operating 24 hours a day, 7 days a week. Support is provided only when needed, either as a result of system generated messages or from calls from the field indicating the service is not available.

All roadside weather stations have web cameras on the towers. The images are collected when the road side station is polled for data and the images are updated on the Intranet site and are also made available on the department's Internet web site for access by the public. This information provides visible condition information so the public can manage their travel plans. Images and data are updated about every 20 minutes in the winter months; every 60 minutes from May 1 to October 1.

RWIS information is made available to all Transportation and Public Works (TPW) staff across the province. The data is available through three main channels: the TPW Intranet site, the automated issuance of e-mails to field staff, and the disposition of observation data to pagers held by field staff. The data is also transmitted to AMEC (the contracted supplier of forecasting services) to prepare atmospheric and pavement forecasts for all regions in Nova Scotia. TPW receives and distributes site specific atmospheric forecasts along with satellite images so staff can track storms visually as they cross the province.

2. Methodology and Evaluation Objectives

Evaluation Objectives

- ▶ To understand the educational and training needs of winter operators
- ▶ To determine how RWIS technology is being used
- ▶ To determine how RWIS aids in the management of time and human resources
- ▶ To determine how RWIS is being used by the general public

Methodology

RWIS is an asset for winter management operations in the Department. An evaluation of RWIS was primarily proposed by Highway Programs to determine how staff are using RWIS. For this evaluation, a questionnaire was distributed to the members of the winter maintenance operation team in April and May of 2006.

This project also measured the use of RWIS by the general public using data collected in the 2004 and 2005 Provincial Highway System Customer Satisfaction Survey. An analysis of the overall rate of public satisfaction with web cameras and the importance of the highway web cameras on our provincial highway system was included in the survey. We also reviewed e-mails concerning the web cameras that were received by the department from the public during the period of April 2005 to March 2006.

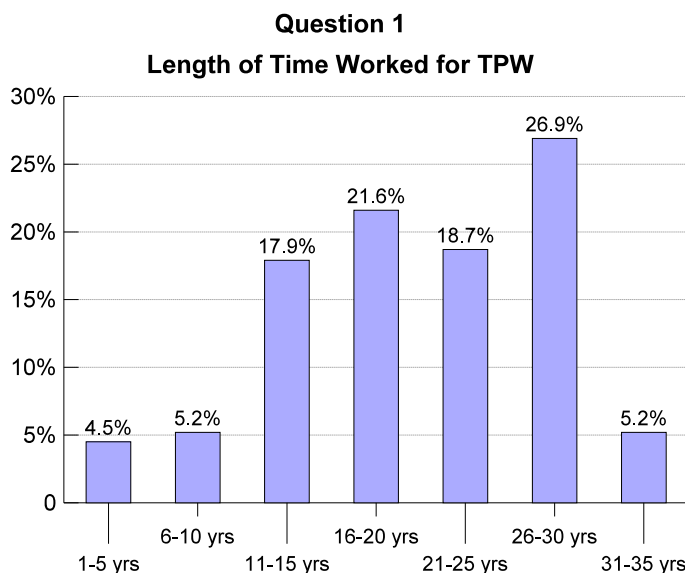
Based on the survey questionnaire, the number of RWIS stations accessed (Question 4) was not compiled due to reporting issues.

3. RWIS User Opinion Survey

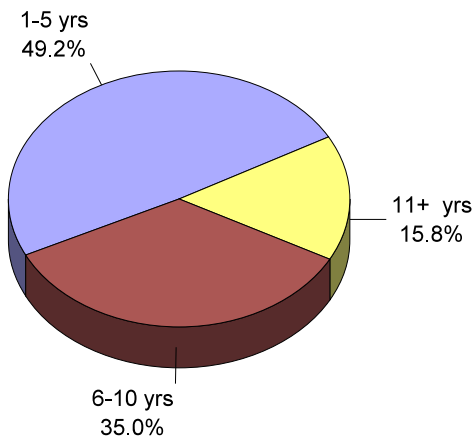
The user survey was distributed to base persons early in April 2006. As some of them had completed work the surveys were sent to their home address from their area managers. The supervisory group was surveyed at the TPW Maintenance Operations Spring Conference on April 21 and May 5, 2006. In total 140 TPW staff responded to the survey.

3.1 Respondent Demographics

Most (90.3%) respondents have been with the department for more than 10 years.



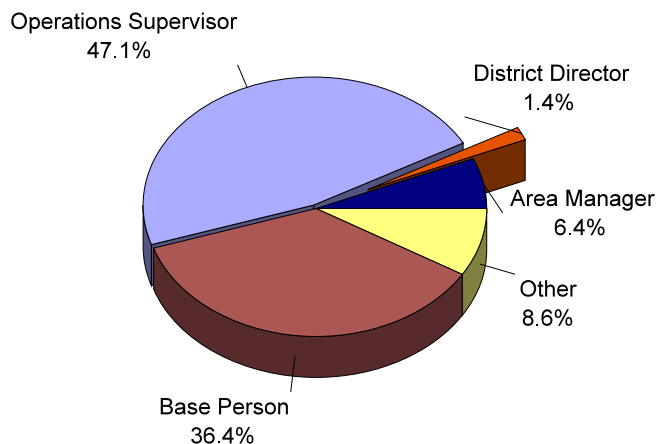
Question 2
Winter Seasons Worked with RWIS



Just under half (49.2%) of the respondents worked with RWIS for less than six winters. A number (15.8%) have worked with RWIS since its inception.

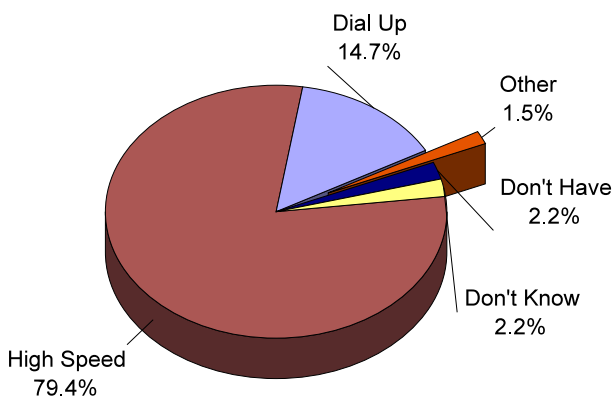
The two largest respondents to the survey, as expected, were operations supervisors (47.1%) and base persons (36.4%). Note that base persons includes dispatchers.

Question 3
Job Title



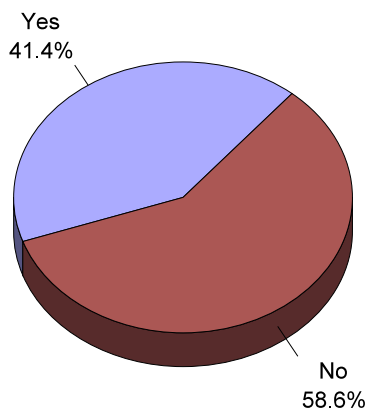
3.2 Access to RWIS

Question 5
Type of Connection for Internet Access



Over three-quarters (79.4%) of respondents reported that they had high speed internet access.

Question 6
RWIS Access from Home



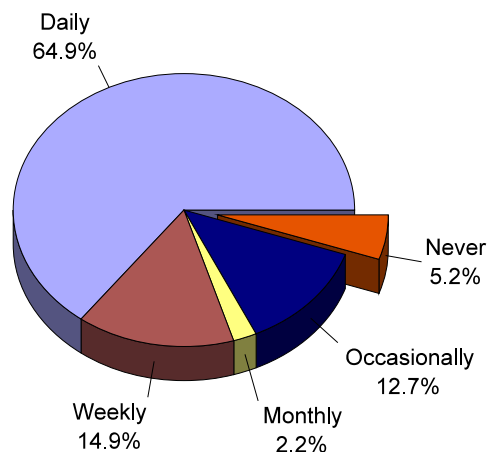
Over 4 in 10 of respondents (41.4%) reported that they had access to RWIS from home. Over three-quarters (77.1%) of those indicating that they had access to RWIS from home were either operations supervisors, area managers, or district directors.

3.3 Sources of Weather Information

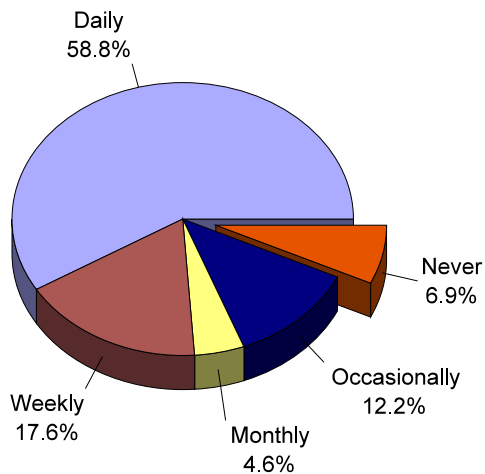
3.3.1 Intranet

Almost two-thirds of respondents (64.9%) reported that they used site specific information from the Intranet daily. Another 14.9% used it weekly, while 12.7% used it occasionally.

Question 7A
Intranet: Site Specific Forecasts



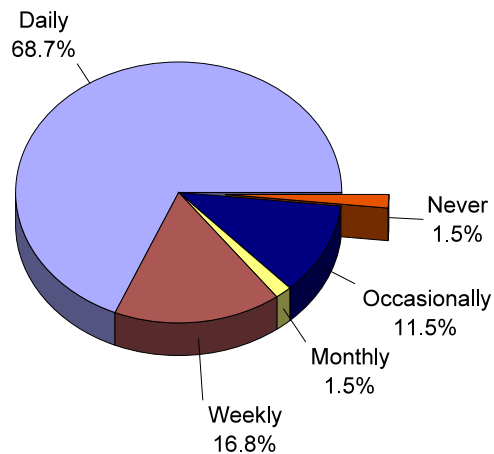
Question 7A
Intranet: Dept's RWIS Site



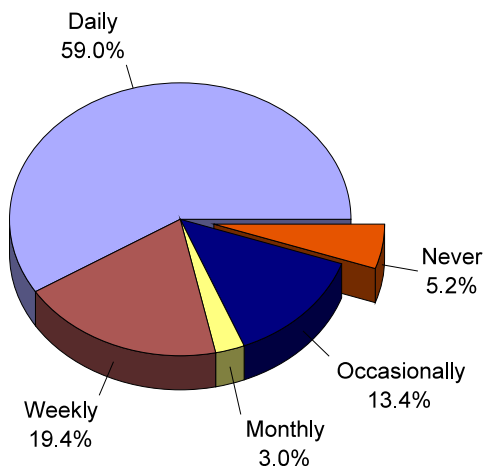
Just under 6 in 10 respondents (58.8%) used the department's RWIS site on the Intranet daily. Another 17.6% used them weekly, while 12.2% used them occasionally.

More respondents reported using radar loops daily (68.7%) than the other types of Intranet use.

Question 7A
Intranet: Radar Loops



Question 7A
Intranet: Web Cams

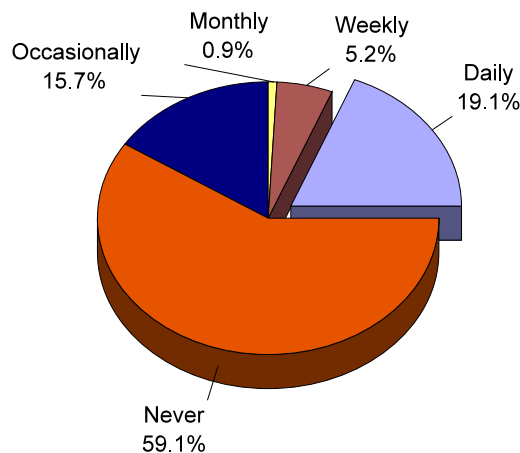


Almost 6 in 10 respondents (59.0%) used the web cameras daily. Another 19.4% used them weekly, and 13.4% used them occasionally.

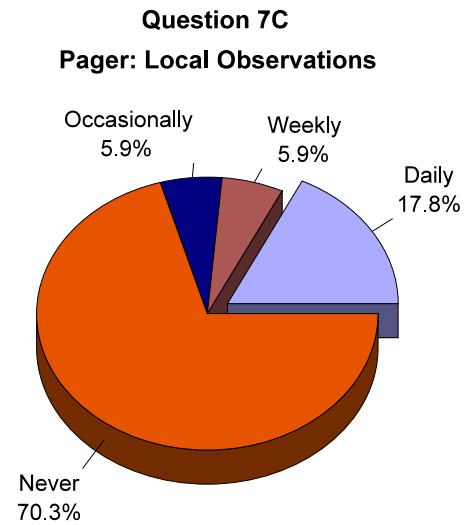
3.3.2 E-mailed Forecasts

Most of the respondents (59.1%) never used the e-mailed forecasts. While 19.1% of respondents used them daily, and 15.7% used them occasionally.

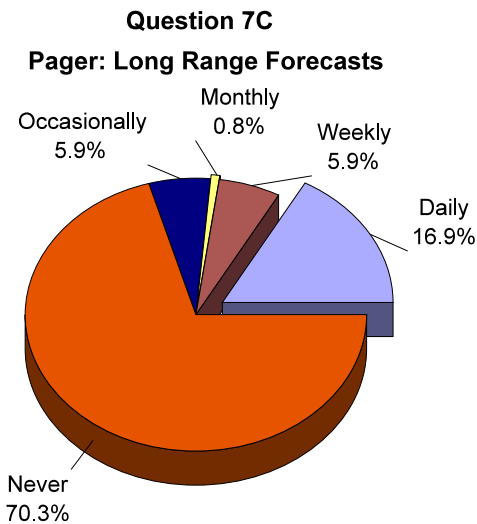
Question 7B
E-Mailed Forecasts



3.3.3 Pager

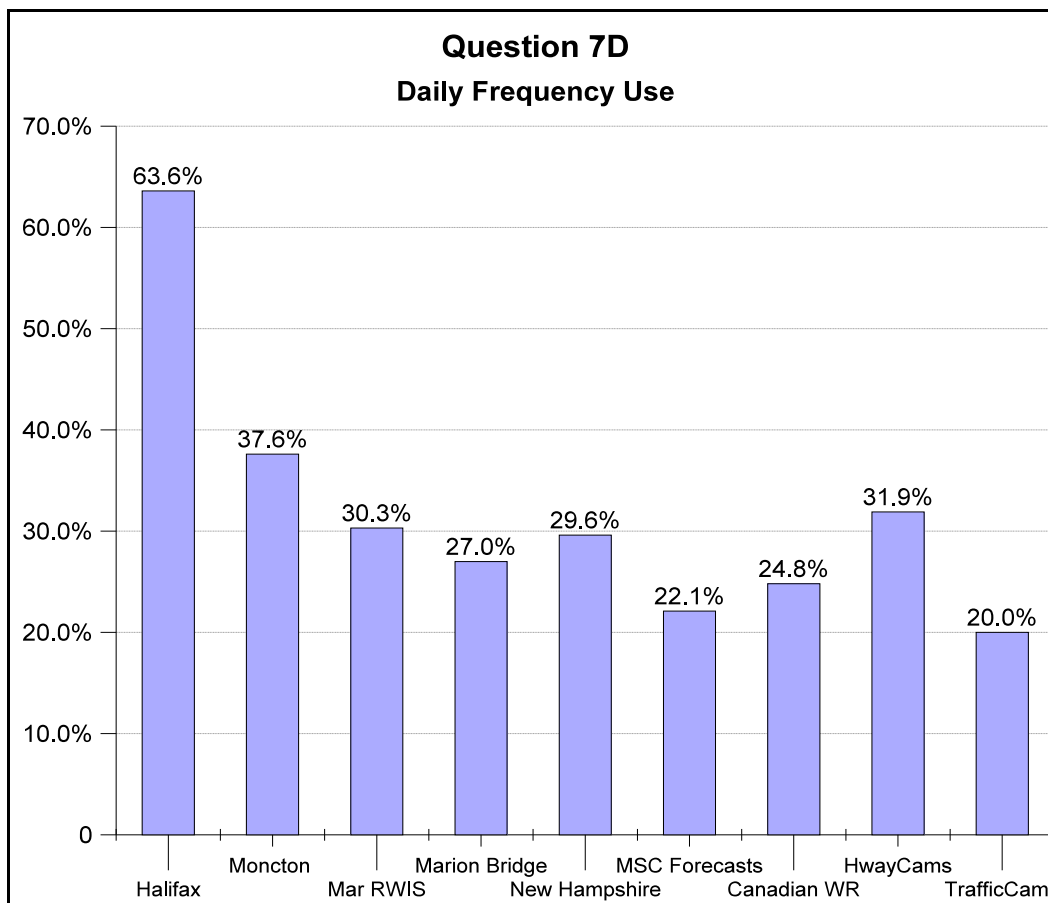


Few respondents used the pager services daily, only 16.0% used the site specific forecasts, 17.8% the local observations, and 16.9% the long range forecasts. Over 7 in 10 never used these services.



3.3.4 Internet

TPW staff used other sources of weather information quite frequently, from 20.0% to 63.6% daily. The Halifax (Environment Canada) Weather Radar was the most frequently used source of weather information on the Internet, with 63.6% of respondents accessing this site daily. The site used the least was the Marion Bridge (Environment Canada) Weather Radar, 34.8% of respondents reported that they never used this site.



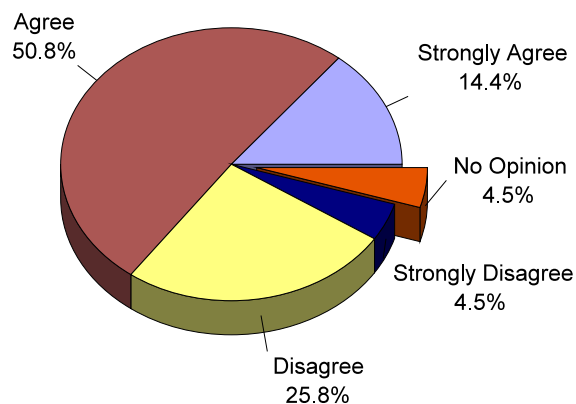
For detailed table with responses for other Internet sources of weather information, see Appendix B (page 29).

3.4 Level of Agreement with the Various Statements about the RWIS System

3.4.1 Weather Information

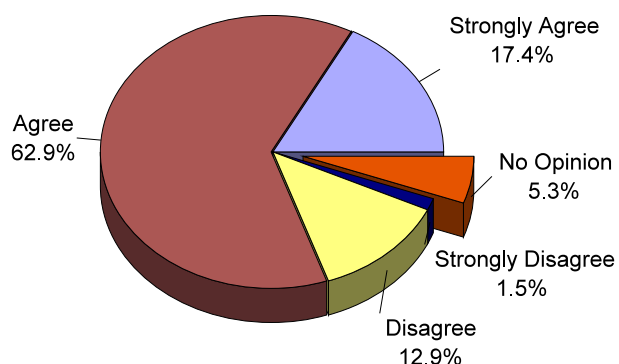
Over two-thirds of the respondents strongly agreed (14.4%) or agreed (50.8%) that they felt RWIS provided all the weather information that they needed to conduct winter maintenance operations; 30.3% of respondents disagreed with this statement.

Question 8A
Provided Weather Information Needed



3.4.2 Driving Conditions

Question 8B
Safer Driving Conditions

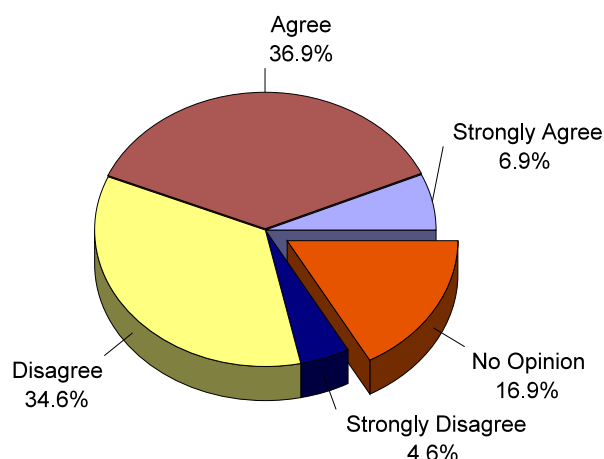


Over 8 in 10 strongly agreed (17.4%) or agreed (62.9%) that the implementation of RWIS had resulted in safer driving conditions; 14.4% disagreed with this statement.

3.4.3 De-icing Materials

Almost 4 in 10 respondents strongly disagreed (4.6%) or disagreed (34.8%) that the implementation of RWIS reduced the amount of de-icing materials used per storm; 36.9% agreed with this statement and 6.9% strongly agreed.

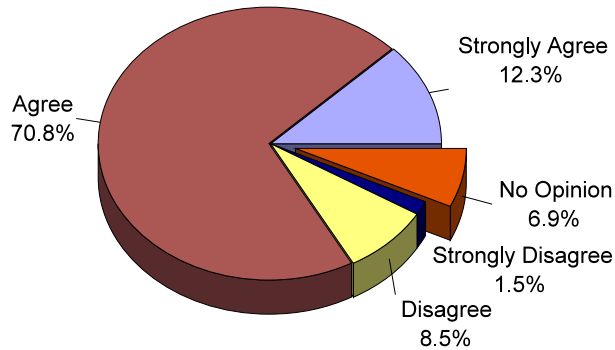
Question 8C
Reduced De-Icing Materials Used



3.4.4 Winter Maintenance Operations

Question 8D

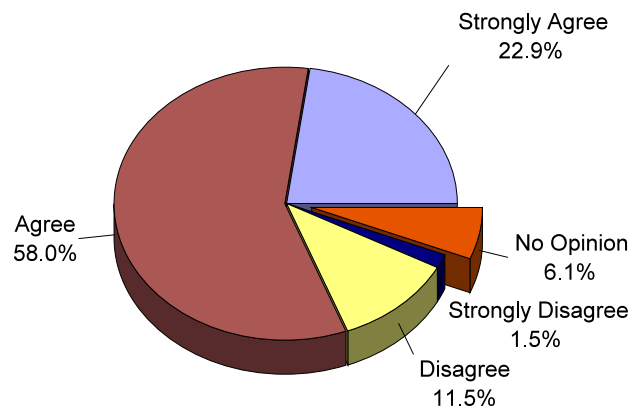
Improved Winter Maintenance Operations



Most respondents strongly agreed (12.3%) or agreed (70.8%) that the implementation of RWIS had resulted in improved winter maintenance operations; 10.0% disagreed with this statement.

Question 8E

Improved Winter Maintenance Crew Call-Outs



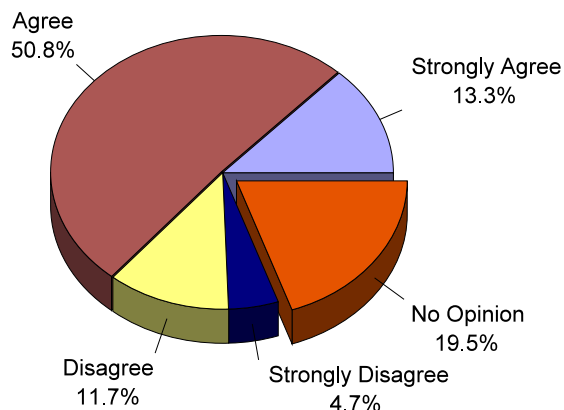
3.4.5 Crew Call-outs

Over 8 in 10 respondents either strongly agreed (22.9%) or agreed (58.0%) that the implementation of RWIS helped improve the timing of winter maintenance crew call-outs; 13.0% disagreed with this statement.

3.4.6 Pre-treatment of Roads

Question 8F

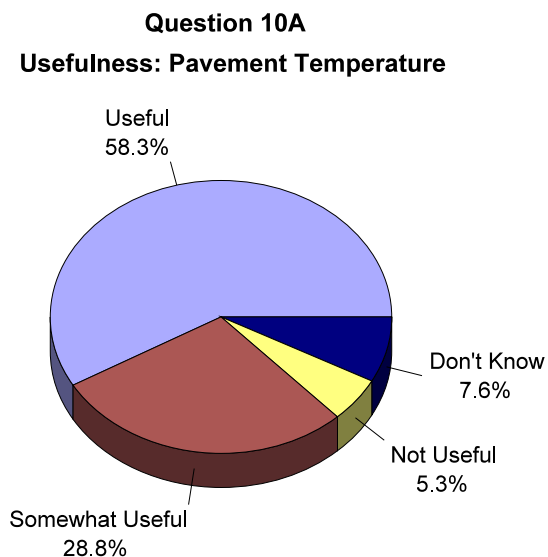
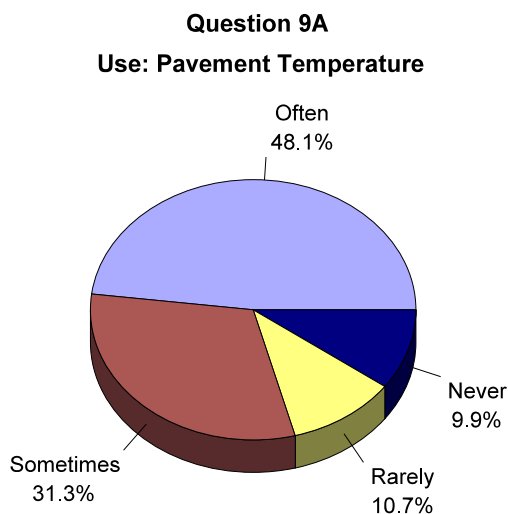
Improved Ability to Pre-Treat Roads



Almost two-thirds of respondents strongly agreed (13.3%) or agreed (50.8%) that the implementation of RWIS improved TPW's ability to pre-treat roads; 16.4% disagreed with this statement.

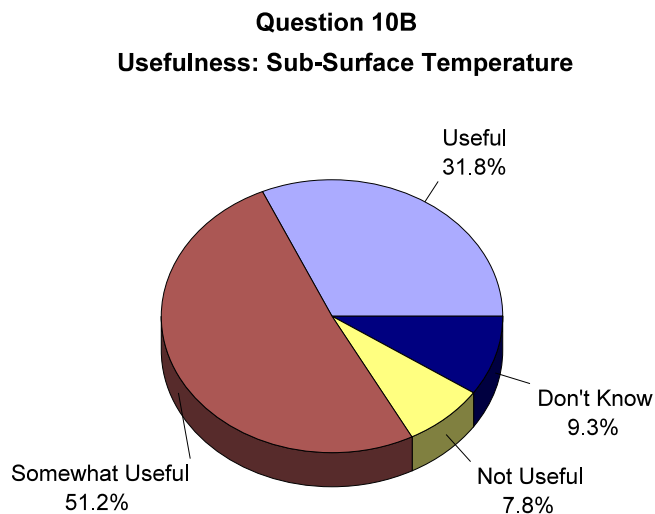
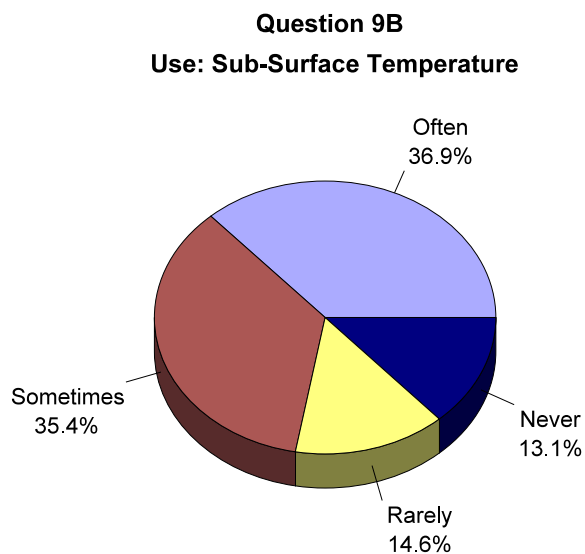
3.5 Use and Usefulness of RWIS Information

3.5.1 Pavement Temperature Graphs/Data



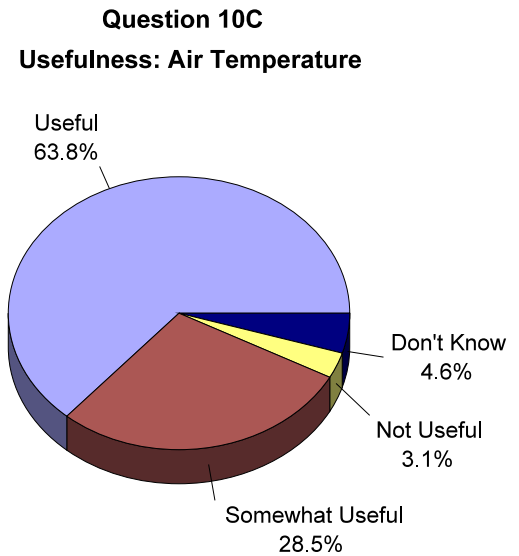
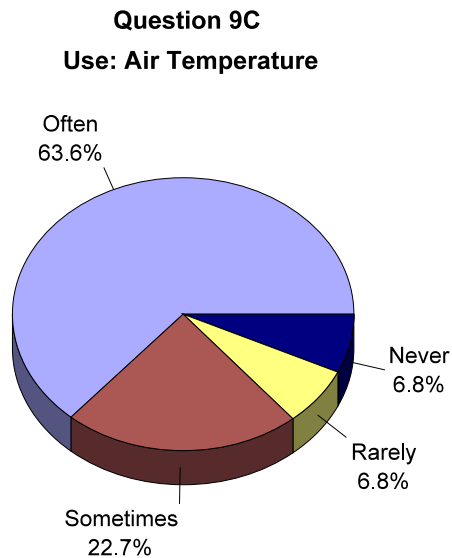
Almost half (48.1%) of the respondents used the pavement temperature graphs/data feature of RWIS quite often, while 31.3% used it sometimes. Most found it useful (58.3%) or somewhat useful (28.8%). Almost 1 in 10 (9.9%) never used this feature.

3.5.2 Sub-Surface Temperature Graphs/Data



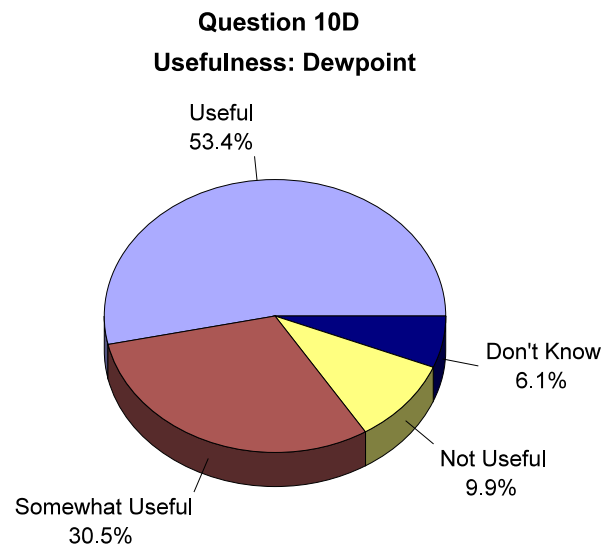
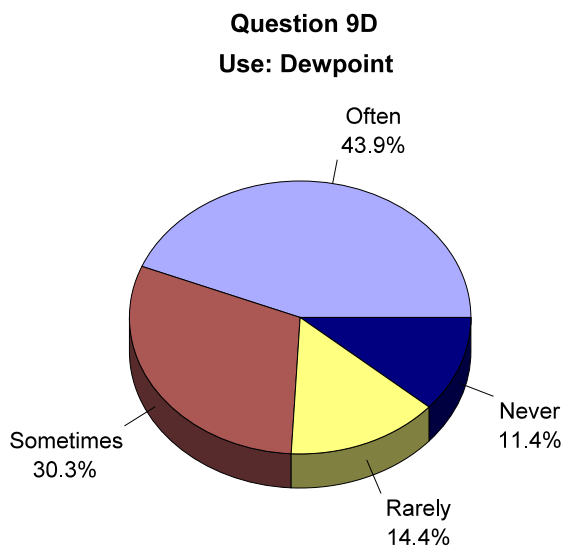
Almost three-quarters of respondents used the sub-surface temperature graphs and data often (36.9%) or sometimes (36.4%). Most found it useful (31.8%) or somewhat useful (51.2%). Just under 1 in 10 (7.8%) did not find this feature useful, and 13.1% never used it.

3.5.3 Air temperature Graphs/Data



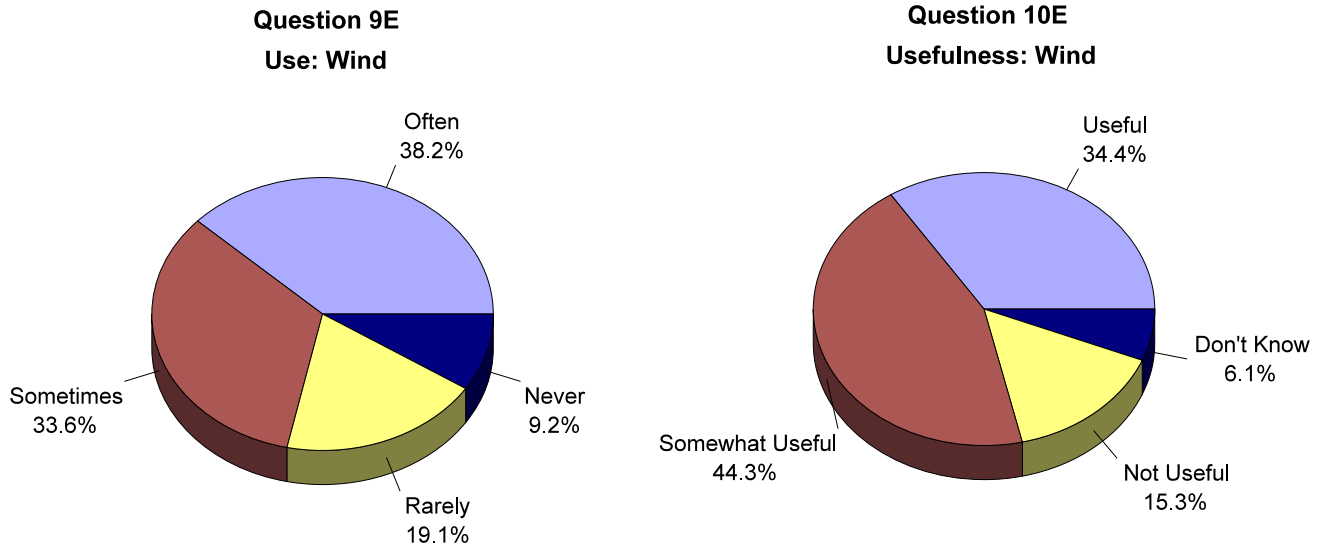
The air temperature graphs and data were one of the most used features of RWIS (63.6% used it often and 22.7% sometimes). It was also found to be one of the most useful features (63.8% found it useful and 28.5% somewhat useful).

3.5.4 Dewpoint Graphs/Data



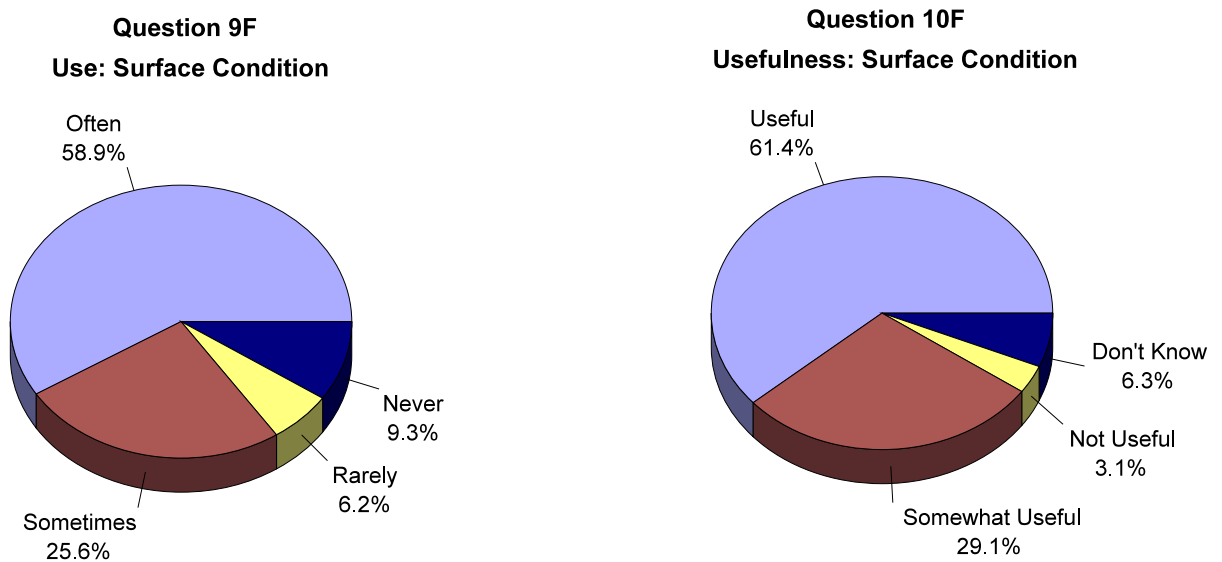
Most respondents used the dewpoint graphs and data (43.9% often and 30.3% sometimes). As well, most found this feature to be useful (53.4%) or somewhat useful (30.5%). Over 1 in 10 respondents (11.4%) never used this feature, while 9.9% did not find this feature useful.

3.5.5 Wind Data



The wind data was used by 38.2% of respondents often and 33.6% sometimes. Most found this feature useful (34.4%) or somewhat useful (44.3%). Almost 1 in 10 did not use this feature (9.2%) and another 19.1% rarely used it, while 15.3% did not find this feature useful.

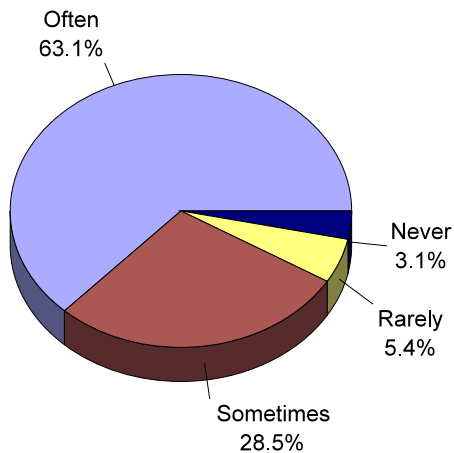
3.5.6 Surface Condition



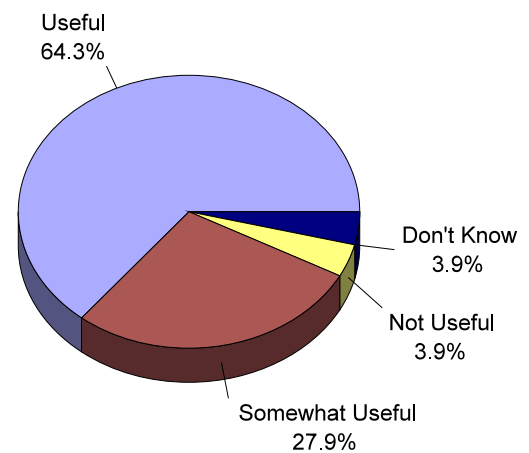
The surface condition feature of RWIS was used often by 58.9% of respondents. This feature was reported as being useful by 61.4% of respondents, and another 29.1% of respondents found it somewhat useful. Almost 1 in 10 respondents (9.3%) never used this feature.

3.5.7 Web Cameras: Latest Camera Image

Question 9G-1
Use: Latest Camera Image



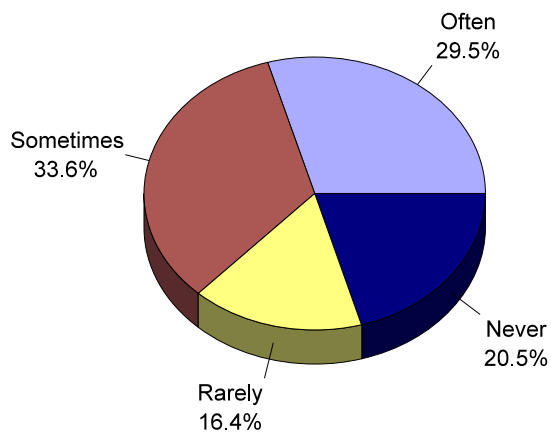
Question 10G-1
Usefulness: Latest Camera Image



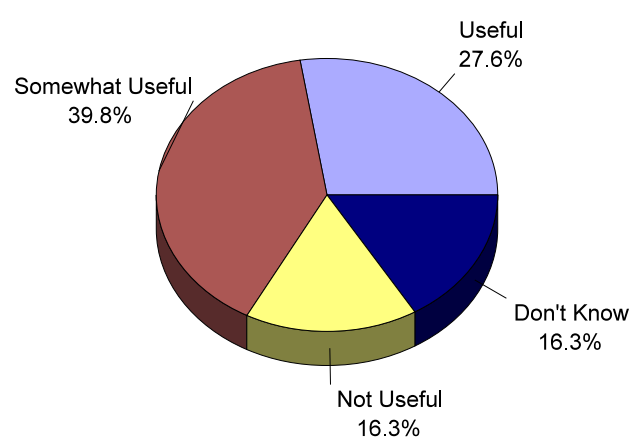
The latest camera image from the web cameras was reported as being one of the most used features of RWIS (63.1% used it often and 28.5% used it sometimes). As well, it was reported as being one of the most useful features (64.3% found it useful and 27.9% found it somewhat useful).

3.5.8 Web Cameras: Image Viewer

Question 9G-2
Use: Image Viewer



Question 10G-2
Usefulness: Image Viewer

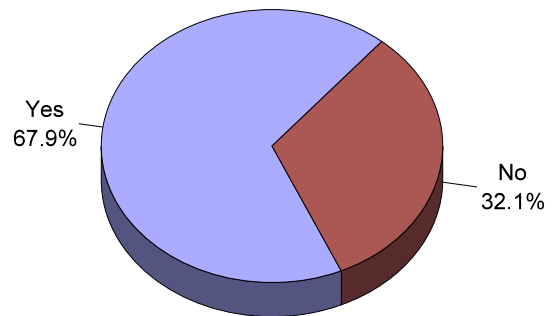


Almost two-thirds of respondents used the image viewer from the web cameras often (29.5%) or sometimes (33.6%). Around the same percentage reported this feature as being useful (27.6%) or somewhat useful (39.8%). Over 2 in 10 respondents (20.5%) never used this feature, while 16.3% felt that it was not a useful feature.

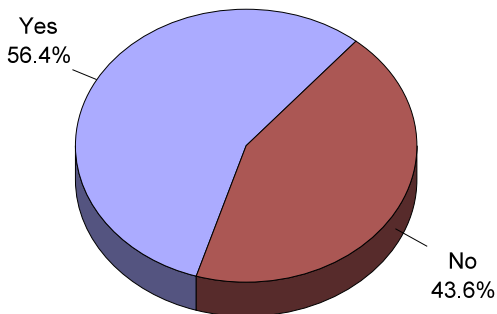
3.6 Training

Over two-thirds (67.9%) of respondents felt that the training was adequate, while 32.1% did not think that it was.

Question 11A
Is Training Adequate?



Question 12A
Require Further Training



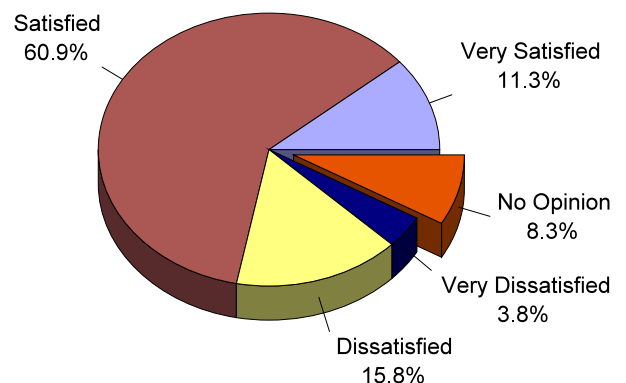
Over half (56.4%) of the respondents felt that they needed more training. Note that 49 or 35.0% of the respondents indicated that they had not received any training. Respondents indicated that they would like any training at all, training on specific features of RWIS, or training on how to interpret the data and graphs.

3.7 Satisfaction with RWIS

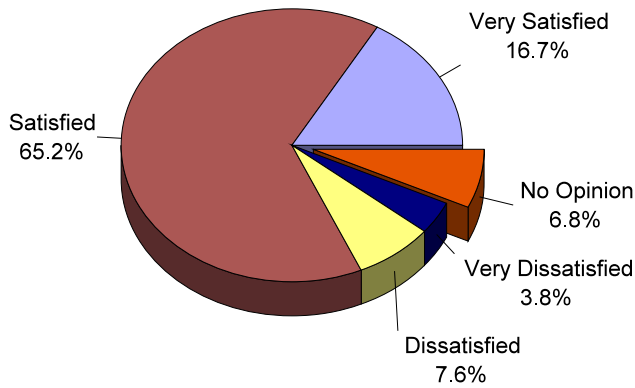
3.7.1 Satisfaction with Aspects of RWIS

Almost three-quarters of respondents were very satisfied (11.3%) or satisfied (60.9%) with the equipment reliability of RWIS. Almost 2 in 10 (19.6%) were not satisfied.

Question 13A
Equipment Reliability



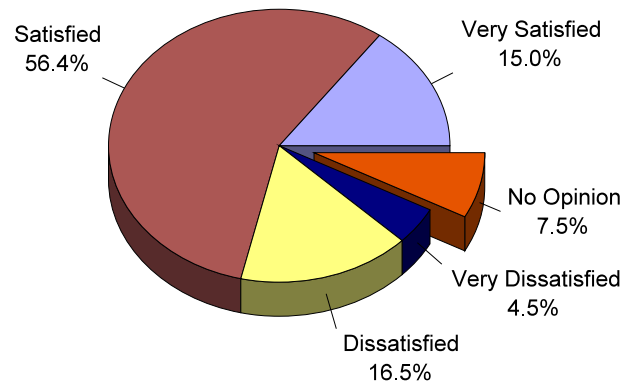
**Question 13B
Data Accuracy**



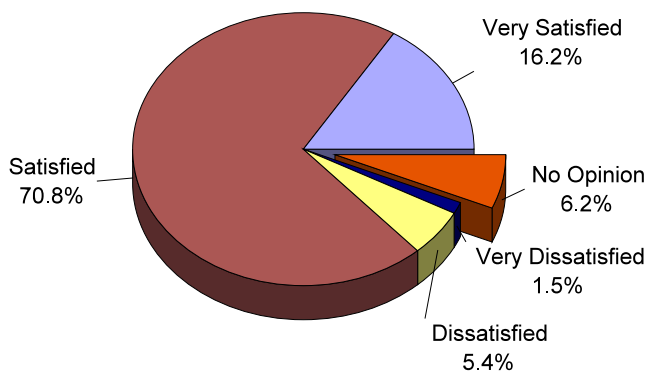
Over 8 in 10 respondents were very satisfied (16.7%) or satisfied (65.2%) with the data accuracy of RWIS. While 11.4% were dissatisfied with its accuracy.

**Question 13C
Location of Existing RWIS Sites**

Almost three-quarters (71.4%) of respondents were satisfied with the location of existing RWIS sites, while 21.0% were not.



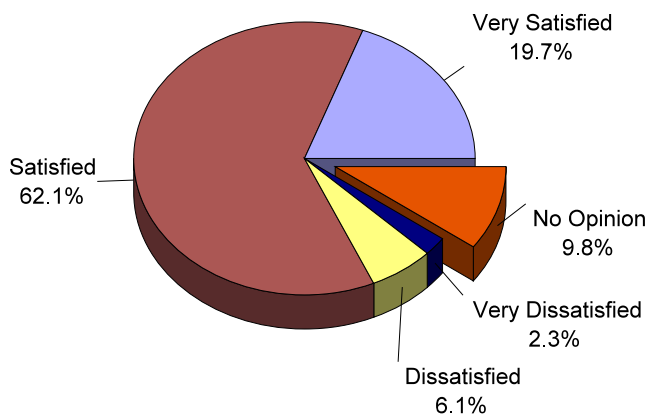
**Question 13D
Weather Forecast Information**



Most (87.0%) respondents were satisfied with the weather forecast information provided through RWIS. This was the feature with the highest satisfaction rating.

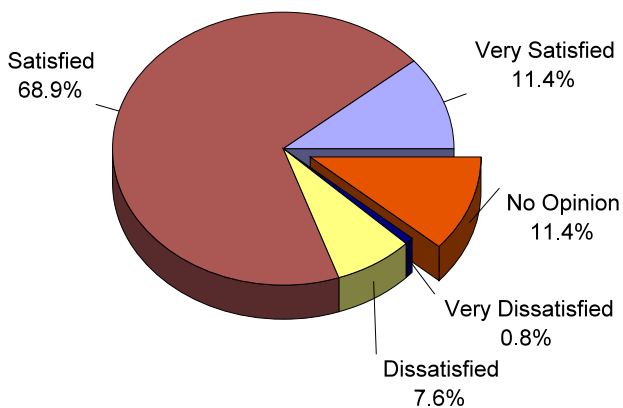
**Question 13E
Pavement Temperature Forecast**

Over 8 in 10 respondents (81.8%) were satisfied with the pavement temperature forecasts from RWIS.



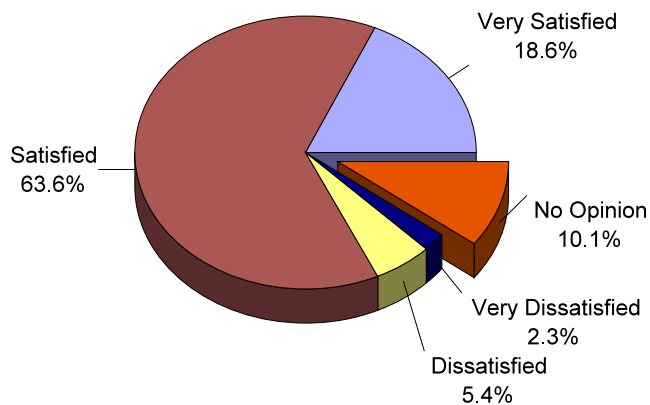
**Question 13F
Province Wide Weather Map**

About 8 in 10 respondents (80.3%) were satisfied with the province wide weather map from RWIS.

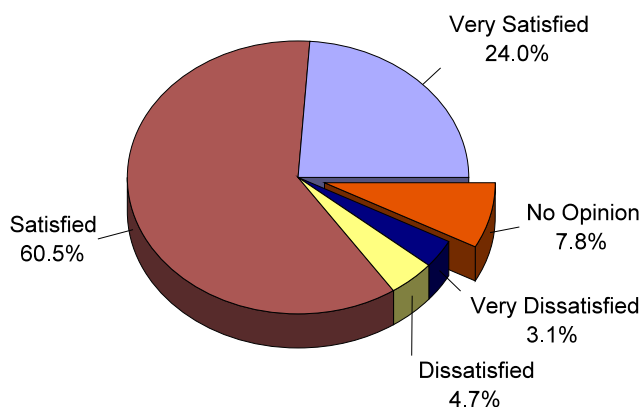


**Question 13G
RWIS Station Weather Condition**

Most (82.2%) respondents were satisfied with the RWIS station weather condition.



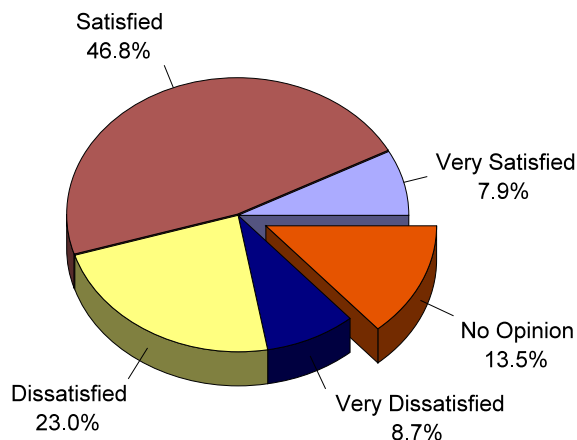
Question 13H
Current Pavement Temperatures



Satisfaction with current pavement temperatures was second highest, with 24.0% of respondents being very satisfied and 60.5% satisfied.

Dissatisfaction was highest with the training, with 31.7% of respondents indicating they were either dissatisfied (23.0%) or very dissatisfied (8.7%). Half (54.7%) indicated that they were satisfied with the training.

Question 13I
Training



3.7.2 Reasons for Dissatisfaction

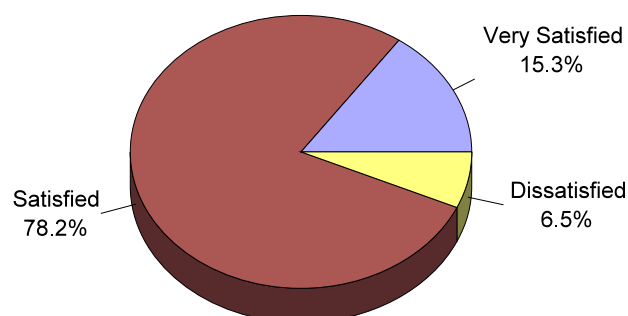
A total of 61 respondents (43.6%) provided reasons why they were dissatisfied with aspects of RWIS. The most noted reason was the lack of training (noted by 25 respondents). Other comments included:

- no RWIS stations in area/or need more — 14 respondents
- data not accurate — 8 respondents
- the information is not updated frequently enough — 7 respondents
- sites are down (some noted that this happens when they need it the most) — 5 respondents
- need better visibility at night — 4 respondents
- no computer nor access to RWIS — 2 respondents

3.7.3 Overall Satisfaction

Question 15
Overall Satisfaction with RWIS

Overall, almost all (93.5%) of the respondents reported that they were satisfied with RWIS.



3.8 Suggestions for Improvements

One-third (34.3%, i.e., 48 of the 140) of the respondents provided suggestions for improvements to RWIS. Some of the comments were praising the system, while others provided specific concerns or suggestions for improvements. Suggestions included:

- provide lights or infrared cameras for night time — 13 respondents
- have more RWIS sites (in some cases specific details were provided) — 8 respondents
- have access to RWIS at work — 5 respondents
- provide more training — 5 respondents
- have more frequent updating of the system or have live broadcasts — 5 respondents

3.9 Summary of Survey Findings

The number one source for weather information from RWIS were the radar loops on the Intranet. This was followed by the site specific information on the Intranet. The least used features were related to the pager, followed closely by the e-mailed forecasts.

Other sources of weather information were used from 20.0% to 63.6% daily. The most used of these was the Halifax Weather Radar (Environment Canada).

Users of RWIS found that it improved winter maintenance (83.1%), it improved the timing of the call-outs for maintenance crews (80.9%), and that it resulted in safer driving conditions (80.3%). Fewer felt that it provided the weather information they needed (65.2%) or that it improved the ability to pre-treat roads (64.1). Just over one-third (39.4%) felt that it decreased the amount of de-icing materials used per storm.

The latest camera images from the web cameras and the air temperature graphs and data were the most used and most useful features of RWIS. The surface conditions was the next most used and useful feature, followed by the pavement temperature graphs and data. The least used and least useful feature of RWIS was the image viewer from the web cameras. Note that this was still used often or sometimes by almost two-thirds of respondents.

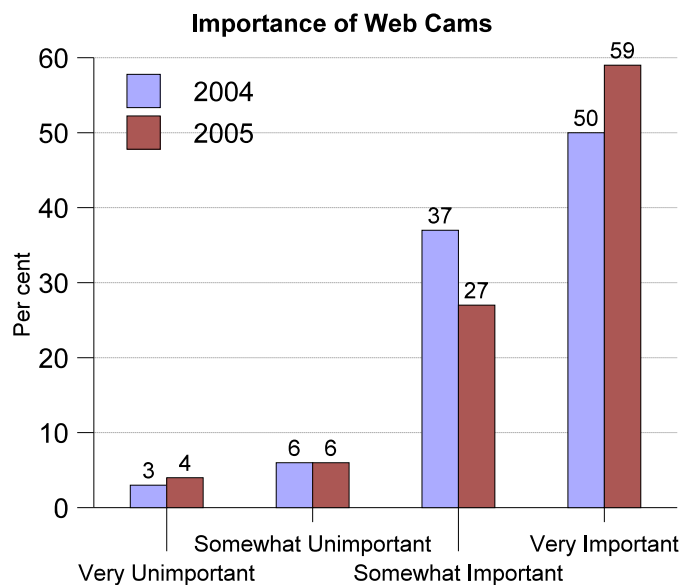
Overall satisfaction with RWIS was high, with 93.5% of respondents reporting that they were somewhat or very satisfied with RWIS. For the specific features of RWIS, the weather forecasts received the highest satisfaction rate, followed by the current pavement conditions, the RWIS station weather condition, and the data accuracy. The training received the lowest satisfaction rating, with only 54.7% reported that they were satisfied with the training.

4. Public Opinion on the Web Cameras

4.1 Provincial Highway System Customer Satisfaction Survey

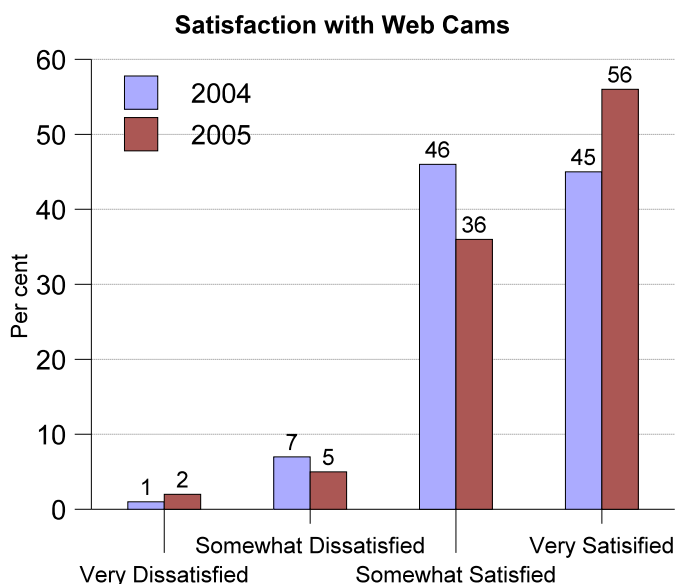
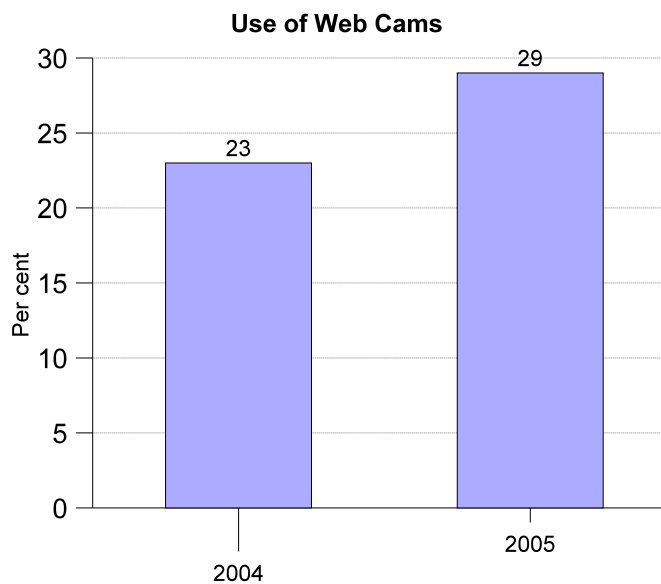
Every year the department undertakes a customer satisfaction survey of its provincial highway system¹. In the last two years the survey has included questions about the web cameras.

Most respondents felt that web cameras were important. Although the per cent who felt they were important did not increase from 2004 to 2005, the percentage feeling that they were very important increased.



¹Source: Department of Transportation and Public Works, 2004 and 2005 Customer Satisfaction Survey Provincial Highway System.

The percentage of Nova Scotians reporting that they used the web cameras increased from 23% in 2004 to 29% in 2005.



The percentage of Nova Scotians who were satisfied with the web cameras remained the same from 2004 (91%) to 2005 (92%). However, there was a shift amongst those who were somewhat satisfied to very satisfied.

Reasons for dissatisfaction in 2005 related to the cameras not being live or up-to-date.

4.2 2005-2006 E-mails

The highway web cameras are one of the most used sites on the Transportation and Public Works web site and that for the Government of Nova Scotia. People send e-mails about the web cameras, therefore, as part of the evaluation of RWIS an analysis of the e-mails received in Communications and Public Affairs about RWIS during the 2005-2006 fiscal year were included.

A total of 145 e-mails about RWIS were received in 2005-2006. Most (61.3%) of these were to inform the department that one or more web cameras were not working. A number of these came in at the same time and referred to the same problem. However, it is worth noting that two specific sites were mentioned more frequently in these e-mails: Bridgewater and Bridgetown.

Almost one-quarter (24.1%) of the e-mails were to let the department know that they liked the services and they found it useful in their travel plans. Some used it as a way of staying in touch with Nova Scotia, even though they lived in other parts of Canada or the world.

Some (12.4%) were asking if the department had plans to provide more cameras. Some of these included suggestions on where the cameras should go.

The remainder (6.2%) wrote to ask that the web camera pictures be updated on a more frequent basis, or that they be live.

5. Conclusion

Overall, there was a high level of satisfaction with RWIS by both TPW users and the general public. The radar loops on the Intranet were the number one source for weather information from RWIS. This was followed by the site specific information on the Intranet. Neither the pager nor the e-mailed forecasts were used by many respondents.

Respondents felt that RWIS resulted in safer driving conditions, and in improved winter maintenance operations and crew call-outs. Staff felt that RWIS provided the weather information needed, however, a number of other sources of weather information were used by staff.

The latest camera images and the air temperature graphs and data were the most used features of RWIS. While the image viewer was the least used feature.

Training was the biggest area of concern for staff, they felt that they needed more of it. They felt that they needed more training about the features of RWIS and how to use them, and how to interpret the information.

Appendix A
Department of Transportation and Public Works
2006 RWIS Satisfaction Survey

The Department of Transportation and Public Works provides meteorological forecasts and other data to field personnel as decision supporting tools for use during winter snow and ice control operations.

This questionnaire is designed to assess your satisfaction with the tools provided to help you conduct winter maintenance operation. We need your help to determine if we are meeting your needs and how we can improve. Your answers will be kept confidential and will be combined with those of other respondents.

- 1) How long have you worked for the Department of Transportation and Public Works? _____ years.
- 2) How many winter seasons have you worked with the Road Weather Information System (RWIS) at TPW? _____ winters.
- 3) What is your job title?
 1. Area Manager
 2. Base Person
 3. District Director
 4. Operations Supervisor
 5. Other (Please specify)_____
- 4) How many RWIS stations do you have access to in your area? _____ stations.
- 5) What kind of connection do you have for accessing the Internet at work?
 1. Dial up modem
 2. High speed or Cable modem
 3. I have access but don't know what kind it is
 4. I do not have access to the Internet at work
 5. Other, Please explain:_____
- 6) Do you access RWIS from home?
 1. Yes
 2. No

- 7) Please indicate how often you consulted the following sources of weather information to make winter maintenance decisions during the winter of 2005-2006:

	1. Daily	2. Weekly	3. Monthly	4. Occasionally	5. Never
a) Intranet					
1) Site Specific / Pavement Forecast	1	2	3	4	5
2) Department's RWIS Sites	1	2	3	4	5
3) Radar Loops	1	2	3	4	5
4) Web Cams	1	2	3	4	5
b) E-mailed Forecasts	1	2	3	4	5
c) Pager					
1) Site Specific Forecasts	1	2	3	4	5
2) Local Observations	1	2	3	4	5
3) Long Range Forecasts	1	2	3	4	5
e) Internet					
1) Halifax (Environment Canada) Weather Radar	1	2	3	4	5
2) Moncton (Environment Canada) Weather Radar	1	2	3	4	5
3) Maritimes RWIS (RweatherLight Web ANS Inc.)	1	2	3	4	5
4) Marion Bridge (Environment Canada) Weather Radar	1	2	3	4	5
5) Berlin, New Hampshire (Intellicast) Weather Radar	1	2	3	4	5
6) Meteorological Service of Canada (MSC) Weather Forecasts	1	2	3	4	5
7) Canadian Weather Radar (Environment Canada's Green Lane)	1	2	3	4	5
8) Maritimes Highway Conditions Weather Cams (The WeatherNetwork.com)	1	2	3	4	5
9) Maritimes Traffic Cams (The WeatherNetwork.com)					

- 8) Please circle the response that best describes your level of agreement with the following general statements about the RWIS system:

	1. Strongly Agree	2. Agree	3. Disagree	4. Strongly Disagree	5. No Opinion
a) I feel that RWIS provides all the weather information resources that I need to conduct winter maintenance operations.	1	2	3	4	5
b) The implementation of RWIS resulted in safer driving conditions.	1	2	3	4	5
c) The implementation of RWIS reduced the amount of de-icing materials used per storm.	1	2	3	4	5
d) The implementation of RWIS resulted in improved winter maintenance operation.	1	2	3	4	5
e) The implementation of RWIS helps TPW improve the timing of winter maintenance crew call-outs.	1	2	3	4	5
f) The implementation of RWIS improved our ability to pre-treat roads.	1	2	3	4	5

- 9) Please circle the response that best describes how often you used the various types of RWIS information during the 2005-2006 winter maintenance operation:

1. Often 2. Sometimes 3. Rarely 4. Never

a) Pavement Temperature Graphs/ Data	1	2	3	4
b) Sub-surface Temperature Graphs/ Data	1	2	3	4
c) Air Temperature Graphs/ Data	1	2	3	4
d) Dewpoint Graphs/ Data	1	2	3	4
e) Wind Data	1	2	3	4
f) Surface Condition	1	2	3	4
g) Web Cams				
- Latest Camera Image	1	2	3	4
- Image Viewer (e.g., shows last 1, 4, 6, or 12 hrs of photos)	1	2	3	4

10) How useful to you is each of the following site-specific information for making snow and ice control decisions?

1. Very Useful 2. Somewhat Useful 3. Not Useful 4. Don't Know

a) Pavement Temperature Graphs / Data	1	2	3	4
b) Sub-surface Temperature Graphs / Data	1	2	3	4
c) Air Temperature Graphs / Data	1	2	3	4
d) Dewpoint Graphs / Data	1	2	3	4
e) Wind Data	1	2	3	4
f) Surface Condition	1	2	3	4
g) Web Cams				
- Latest Camera Image	1	2	3	4
- Image Viewer (e.g., shows last 1, 4, 6, or 12 hrs of photos)	1	2	3	4

11) a) Is the training you received to interpret weather information from RWIS adequate to make snow and ice control decisions? 1. Yes 2. No

b) I have not received training to interpret weather information from RWIS

12) a) Do you feel you require further training? 1. Yes 2. No

b) Please list any RWIS related training that you feel you need or have an interest in taking:

13) Please circle the response that best describes your level of satisfaction with the following aspects of your RWIS stations:

1. Very Satisfied 2. Satisfied 3. Dissatisfied 4. Very Dissatisfied 5. No Opinion

a) Equipment Reliability	1	2	3	4	5
b) Data Accuracy	1	2	3	4	5
c) Location of Existing RWIS Sites	1	2	3	4	5
d) Weather Forecast Information	1	2	3	4	5
e) Pavement Temperature Forecast	1	2	3	4	5
f) Province Wide Weather Map	1	2	3	4	5
g) RWIS Station Weather Condition	1	2	3	4	5
h) Current Pavement Temperatures	1	2	3	4	5
i) Training	1	2	3	4	5

14) If dissatisfied with any of the above, please explain:

15) Overall, how satisfied are you with RWIS?

1. Very Satisfied 2. Satisfied 3. Dissatisfied 4. Very Dissatisfied

16) Please provide additional comments that will help us improve RWIS:

Please Return to Christina Corkett, Policy and Planning Division, Department of Transportation and Public Works, Johnston Building, 2nd floor, 1672 Granville Street, Halifax, NS B3J 3Z8 - It may also be sent by Fax 902-424-1163 or e-mail to corkettm@gov.ns.ca

Thank You

Appendix B
Detailed Tables - RWIS Satisfaction Survey

Q1. How long have you worked for the Department of TPW?

Years	Frequency	Per cent
1 - 5 yrs	6	4.5%
6 - 10 yrs	7	5.2%
11 - 15 yrs	24	17.9%
16 - 20 yrs	29	21.6%
21 - 25 yrs	25	18.7%
26 - 30 yrs	36	26.9%
31 - 35 yrs	7	5.2%
Total	134	100.0%

Q2. How many winter seasons have you worked with the RWIS at TPW?

Winter Seasons	Frequency	Per cent
1 - 5	59	49.2%
6 -10	42	35.0%
11+	19	15.8%
Total	120	100.0%

Q3. What is your job title?

Job Title	Frequency	Per cent
Area Manager	9	6.4%
Base Person	51	36.4%
District Director	2	1.4%
Operations	66	47.1%
Other	12	8.6%
Total	140	100.0%

Q4. How many RWIS stations do you have access to in your area?

Stations in Area	Frequency	Per cent
1 - 5 stations	96	84.2%
6 - 10 stations	9	7.9%
11 - 35 stations	1	0.9%
36 + stations	8	7.0%
Total	114	100.0%

Q5. What kind of connection do you have for accessing the Internet at work?

Internet Access	Frequency	Per cent
Dial Up	20	14.7%
High Speed	108	79.4%
Don't Know	3	2.2%
Don't Have	3	2.2%
Other	2	1.5%
Total	136	100.0%

Q6. Do you access RWIS from home?

Access at Home	Frequency	Per cent
Yes	58	41.4%
No	82	58.6%
Total	140	100.0%

Q7. How often do you consult the following sources of weather information to make winter maintenance decisions in the winter 2005-2006?

Source Type	Daily	Weekly	Monthly	Occasionally	Never	Total
Q7a. Intranet						
Site Specific	87	20	3	17	7	134
	64.9%	14.9%	2.2%	12.7%	5.2%	100.0%
Dept's RWIS Sites	77	23	6	16	9	131
	58.8%	17.6%	4.6%	12.2%	6.9%	100.0%
Radar Loops	90	22	2	15	2	131
	68.7%	16.8%	1.5%	11.5%	1.5%	100.0%
Web Cams	79	26	4	18	7	134
	59.0%	19.4%	3.0%	13.4%	5.2%	100.0%
Q7b. E-mailed Forecasts	22	6	1	18	68	115
	19.1%	5.2%	0.9%	15.7%	59.1%	100.0%
Q7c. Pager						
Site Specific Forecasts	19	3	1	9	87	119
	16.0%	2.5%	0.8%	7.6%	73.1%	100.0%
Local Observations	21	7	0	7	83	118
	17.8%	5.9%	0.0%	5.9%	70.3%	100.0%
Long Range Forecasts	20	7	1	7	83	118
	16.9%	5.9%	0.8%	5.9%	70.3%	100.0%
Q7d. Internet						
Halifax Weather Radar	82	24	2	14	7	129
	63.6%	18.6%	1.6%	10.9%	5.4%	100.0%
Moncton Weather Radar	44	17	8	23	25	117
	37.6%	14.5%	6.8%	19.7%	21.4%	100.0%
Maritimes RWIS	33	14	7	22	33	109
	30.3%	12.8%	6.4%	20.2%	30.3%	100.0%
Marion Bridge Weather Radar	31	12	5	27	40	115
	27.0%	10.4%	4.3%	23.5%	34.8%	100.0%
New Hampshire Weather Radar	34	18	9	23	31	115
	29.6%	15.7%	7.8%	20.0%	27.0%	100.0%
MSC Weather Forecasts	25	18	13	21	36	113
	22.1%	15.9%	11.5%	18.6%	31.9%	100.0%
Canadian Weather Radar	30	15	14	28	34	121
	24.8%	12.4%	11.6%	23.1%	28.1%	100.0%
Maritimes Highway Conditions Weather Cams	38	13	10	28	30	119
	31.9%	10.9%	8.4%	23.5%	25.2%	100.0%
Maritimes Traffic Cams	25	16	13	30	41	125
	20.0%	12.8%	10.4%	24.0%	32.8%	100.0%

Q8. Please circle the response that best describes your level of agreement with the following general statements about the RWIS system.

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	No Opinion	Total
a. RWIS provides all the weather information resources that I need.	19	67	34	6	6	132
	14.4%	50.8%	25.8%	4.5%	4.5%	100.0%
b. Safer driving conditions.	23	83	17	2	7	132
	17.4%	62.9%	12.9%	1.5%	5.3%	100.0%
c. Reduced the amount of de-icing materials used per storm.	9	48	45	6	22	130
	6.9%	36.9%	34.6%	4.6%	16.9%	100.0%
d. Improved winter maintenance operation.	16	92	11	2	9	130
	12.3%	70.8%	8.5%	1.5%	6.9%	100.0%
e. Improve the timing of winter maintenance crew call-outs.	30	76	15	2	8	131
	22.9%	58.0%	11.5%	1.5%	6.1%	100.0%
f. Improved our ability to pre-treat roads.	17	65	15	6	25	128
	13.3%	50.8%	11.7%	4.7%	19.5%	100.0%

Q9. Please circle the response that best describes how often you used the various types of RWIS information during the 2005-2006 winter maintenance operation.

Type of RWIS information	Often	Sometimes	Rarely	Never	Total
a. Pavement Temperature Graphs/Data	63	41	14	13	131
	48.1%	31.3%	10.7%	9.9%	100.0%
b. Sub-surface Temperature Graphs/Data	48	46	19	17	130
	36.9%	35.4%	14.6%	13.1%	100.0%
c. Air Temperature Graphs/Data	84	30	9	9	132
	63.6%	22.7%	6.8%	6.8%	100.0%
d. Dewpoint Graphs/Data	58	40	19	15	132
	43.9%	30.3%	14.4%	11.4%	100.0%
e. Wind Data	50	44	25	12	131
	38.2%	33.6%	19.1%	9.2%	100.0%
f. Surface Condition	76	33	8	12	129
	58.9%	25.6%	6.2%	9.3%	100.0%
g1. Web Cams: Latest Camera Image	82	37	7	4	130
	63.1%	28.5%	5.4%	3.1%	100.0%
g2. Web Cams: Image Viewer	36	41	20	25	122
	29.5%	33.6%	16.4%	20.5%	100.0%

Q10. How useful to you is each of the following site-specific information for making snow and ice control decisions?

Type of RWIS Information	Useful	Somewhat Useful	Not Useful	Don't Know	Total
a. Pavement Temperature Graphs/Data	77	38	7	10	132
	58.3%	28.8%	5.3%	7.6%	100.0%
b. Sub-surface Temperature Graphs/Data	41	66	10	12	129
	31.8%	51.2%	7.8%	9.3%	100.0%
c. Air Temperature Graphs/Data	83	37	4	6	130
	63.8%	28.5%	3.1%	4.6%	100.0%
d. Dewpoint Graphs/Data	70	40	13	8	131
	53.4%	30.5%	9.9%	6.1%	100.0%
e. Wind Data	45	58	20	8	131
	34.4%	44.3%	15.3%	6.1%	100.0%
f. Surface Condition	78	37	4	8	127
	61.4%	29.1%	3.1%	6.3%	100.0%
g1. Web Cams: Latest Camera Image	83	36	5	5	129
	64.3%	27.9%	3.9%	3.9%	100.0%
g2. Web Cams: Image Viewer	34	49	20	20	123
	27.6%	39.8%	16.3%	16.3%	100.0%

Q11a. Is the training you received to interpret weather information from RWIS adequate to make snow and ice control decisions?

Response	Frequency	Per cent
Yes	72	67.9%
No	34	32.1%
Total	106	100.0%

Q11b. I have not received training to interpret weather information from RWIS.

Response	Frequency	Per cent
Check mark	49	35.0%
Total	140	100.0%

Q12a. Do you feel you require further training?

Response	Frequency	Per cent
Yes	75	56.4%
No	58	43.6%
Total	133	100.0%

Q13. Please circle the response that best describes your level of satisfaction with the following aspects of your RWIS stations.

Aspect	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied	No Opinion	Total
a. Equipment Reliability	15	81	21	5	11	133
	11.3%	60.9%	15.8%	3.8%	8.3%	100.0%
b. Data Accuracy	22	86	10	5	9	132
	16.7%	65.2%	7.6%	3.8%	6.8%	100.0%
c. Location of Existing RWIS Sites	20	75	22	6	10	133
	15.0%	56.4%	16.5%	4.5%	7.5%	100.0%
d. Weather Forecast Information	21	92	7	2	8	130
	16.2%	70.8%	5.4%	1.5%	6.2%	100.0%
e. Pavement Temperature Forecast	26	82	8	3	13	132
	19.7%	62.1%	6.1%	2.3%	9.8%	100.0%
f. Province Wide Weather Map	15	91	10	1	15	132
	11.4%	68.9%	7.6%	0.8%	11.4%	100.0%
g. RWIS Station Weather Condition	24	82	7	3	13	129
	18.6%	63.6%	5.4%	2.3%	10.1%	100.0%
h. Current Pavement Temperatures	31	78	6	4	10	129
	24.0%	60.5%	4.7%	3.1%	7.8%	100.0%
i. Training	10	59	29	11	17	126
	7.9%	46.8%	23.0%	8.7%	13.5%	100.0%

Q14. If dissatisfied with any of the above, please explain:

Reason	Frequency
Lack of Training	25
Data Not Accurate	8
No RWIS Station in Area/Not Enough Stations	7
Need More RWIS Locations	7
Information Not Updated Frequently Enough	7
Sites are Down When Needed Most	5
Need Better Visibility at Night	4
No Computer or No Access to RWIS	2
Other	6

Q15. Overall, how satisfied are you with RWIS?

Satisfaction	Frequency	Per cent
Very Satisfied	19	15.3%
Satisfied	97	78.2%
Dissatisfied	8	6.5%
Very Dissatisfied	0	0.0%
Total	124	100.0%

Q16. Please provide additional comments that will help us improve RWIS:

Suggestions	Frequency
None - Positive Comments	6
Provide Lights or Infrared Cameras	13
Have More RWIS Sites	5
Have Access to RWIS at Work	5
Provide More Training	5
Update System More Frequently of Live Broadcasts	5
Other	14