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Athena 2016 Tabletop Exercise

Response to Rail Incidents Involving Flammable Liquids

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Athéna 2016 Tabletop Exercise: Response to Rail Incidents Involving Flammable Liquids

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1. INTRODUCTION

1.1 Background

The Canadian Safety and Security Program (CSSP) is a program funded by the federal government to strengthen Canada's ability to respond to serious accidents, natural disasters, and terrorist and criminal acts through the convergence of science and technology. The CSSP is managed by the Defence Research and Development Canada Centre for Security Science (DRDC CSS).

After the catastrophic derailment in Lac-Mégantic, Québec, in July 2013, Transport Canada's (TC) Transport Dangerous Goods Directorate (TDG) underwent regulatory and operational changes to better respond to incidents involving flammable liquids by establishing and promoting best practices for internal and external actors. These changes respond to the recommendations of the Emergency Response Task Force (ERTF), which was created following the Lac-Mégantic incident. The recommendations include research studies on the properties of flammable liquids (petroleum crude oil), amendments to standards for tank cars, and a program improving response capabilities for derailments involving flammable liquids.

In order to improve response capabilities, a multi-phase program was designed to determine the effectiveness of current response capabilities for rail incidents involving flammable liquids (which today require an Emergency Response Assistance Plan or ERAP). The goal of this program is to better understand the risks related to the transportation of flammable liquids by rail and develop and improve existing response capabilities and best practices.

The first series of exercises included a Tabletop Exercise (TTX) and the Vulcan Full-Scale Exercise (FSX), which took place in November 2015 and March 2016 respectively. The primary objective of these exercises was to identify the effectiveness of response capabilities to a rail incident involving flammable liquids. The secondary objectives were to improve knowledge of the risks involved with flammable liquids, of the appropriate response tactics and of the resources available from government and industry specialists in case of an incident. The exercises also tested an awareness e-learning from the Canadian Association of Petroleum Producers (CAPP) and the Canadian Association of Fire Chiefs (CAFC).

The Athéna exercises use the same format, with a Tabletop Exercise (TTX) and a Full-Scale Exercise (FSX). These two exercises incorporate lessons learned from the Vulcan exercise, which allowed to refine the exercise and training program, and will allow to validate the reach of such a program in different jurisdictions across the country.

The Athéna program exercises include:

- A Tabletop Exercise (TTX) at Beaumont Town Hall in Beaumont, Québec, on December 7, 2016; and
- A Full-Scale Exercise (FSX) at the Institut Maritime du Québec in Lévis, Québec, on February 25-26, 2017.

1.2 Objectives of the Tabletop Exercise

The ultimate objective of this exercise was to provide awareness and response training for rail incidents involving Class 3 flammable liquids to fire chiefs of small communities. The exercise sought to identify any strengths and areas for improvement in the training leading to the development of a full-scale exercise, with the view of supporting the development of a national training program for first responders.

More specifically, the tabletop exercise was designed to enhance the knowledge of:

- TC's Emergency Response Assistance Plan (ERAP) program;
- The existence of and the access to specialized response resources (petroleum industry, railway industry and TC); and
- The response strategies and techniques, as well as the coordination of efforts of all organizations under an organized command system.

The exercise also allowed to:

- Collect and evaluate feedback of a checklist that can be used as a response support tool for rail incidents involving flammable liquids;
- Collect feedback on the CAPP-CAFC awareness e-learning; and
- Evaluate the information provided and identify gaps in order to support the development of a national response program for incidents involving flammable liquids transported by rail.

1.3 Scope of the Document

This report describes the strengths and areas for improvement identified during the tabletop exercise. These points cover the results of the simulated scenario, the results of the evaluation of an Incident Response Guide (checklist) and the e-learning as well as awareness training provided by members of the petroleum industry, the rail industry, and TC. This report also contains recommendations to address the gaps identified, as well as solutions to improve the exercise program to support awareness training during the full-scale exercise and the development of a national awareness program for the response to incidents involving flammable liquids transported by rail.

2. EXERCISE CONDUCT

2.1 Exercise Date and Location

The Athéna TTX took place on December 7, 2016, at Beaumont Town Hall, 48 du Domaine Road, Beaumont, Québec.

2.2 Exercise Schedule

The Athéna TTX consisted of an agenda of presentations followed by a scenario-based facilitated discussion. Table 1 below contains the TTX schedule.

Table 1: Athéna TTX Schedule – December 7, 2016

Time	Activity	Presenters
8:30 – 9:00	Registration	ISR
9:00 – 9:15	Introduction	TC, ISR
9:15 – 9:45	ERAP Program and CANUTEC	TC
9:45 – 10:00	Tools for the response to rail incidents	ISR, TC
10:00 – 10:30	Properties and hazards of flammable liquids (crude oil)	Alain Carmel (Suncor)
10:30 – 10:45	Break	
10:45 – 11:45	Site and hazard assessment, train consist and wrecking operations	Yves Hamel (CN), Sylvain Brière (GW)
11:45 – 12:15	Response actions and risks for first responders	Alain Carmel (Suncor)
12:15 – 13:00	Lunch	
13:00 – 14:30	Rail incident scenario – Inject 1 and 2	ISR
14:30 – 14:45	Break	
14:45 – 15:15	Rail incident scenario – Inject 3	ISR
15:15 – 15:45	Recap of day/feedback on response tools	ISR
15:45 – 16:45	Services offered by industry specialists	ERAC, GHD, MD-UN, Drain-All

2.3 Participating Organizations

The partners for the TTX included members of:

- DRDC CSS
- TC
- International Safety Research (ISR)
- Suncor
- CN Rail
- Genesee & Wyoming Canada Inc.
- Railway Association of Canada (RAC)
- Emergency Response Assistance Canada (ERAC)
- École nationale des pompiers du Québec
- MD-UN
- Drain-All
- GHD

The participants for the TTX included representatives of the fire departments from:

- Saint-Henri
- Saint-Anselme
- Laurier Station
- Beaumont
- Lévis
- Saint-Lambert-de-Lauzon
- Bellechasse Regional County Municipality (RCM)
- Nouvelle-Beauce RCM
- Saint-Isidore
- Saint-Charles-de-Bellechasse

In addition, there were several observers from the following organizations:

- Direction générale de la sécurité civile et de la sécurité incendie
- Institut de protection contre les incendies du Québec (IPIQ)
- Indigenous and Northern Affairs Canada (INAC)
- Ministère des Transports, de la Mobilité durable et de l'Électrification des transports du Québec
- Institut maritime du Québec
- Centre RISC, Campus Notre-Dame-de-Foy
- City of Drummondville.

2.4 Conduct and Layout

The exercise began with presentations by members of the petroleum industry, rail industry and TC. These presentations were intended to make the fire chiefs aware of the existence of the TC ERAP program, the specialized response resources as well as the response strategies and techniques available to first responders for rail incidents

involving flammable liquids.

TC's presentation explained the different roles and responsibilities of organizations under TC's responsibility as well as the work and support tools resulting from ERTF meeting sessions. This presentation also included information about the TC ERAP program and the assistance available under this program.

The presentations by Suncor covered the properties of flammable liquids, including viscosity, density, boiling point, flash point and toxicity, and how these properties affect the response. These presentations also explained the hazards related to spill and fire situations during a derailment involving flammable liquids, as well as the response actions, including non-intervention, defensive and offensive.

The presentation by members of the rail industry included an incident management system for rail incidents involving flammable liquids as well as the responsibility of the members of the petroleum and rail industry under a command structure. The specialized response equipment available was also described. The train consist was introduced and explained, in order to find the necessary information related to the tank cars carrying dangerous goods involved in a derailment. The presentation also covered the physical hazards present on a derailment site and how to ensure the safety of the public and first responders.

After these presentations, a derailment scenario involving flammable liquids was presented to the participants (Appendix A). With the help of a facilitator who guided the response steps, the fire chiefs discussed the response steps to take in a derailment involving flammable liquids. The facilitator asked the participants specific questions during the exercise to extract information relating to the exercise objectives.

2.5 Evaluation

A feedback session took place immediately after the exercise. The feedback was intended to evaluate the strengths and areas for improvement for the response steps and actions discussed during the TTX. All these elements will support the development of training for a full-scale exercise and help support the development of a national awareness program for the response to incidents involving flammable liquids transported by rail. The following elements were discussed during the feedback:

- To what extent knowledge has changed about the existence of TC ERAP program and the access to specialized response resources (petroleum industry, rail industry and TC);
- To what extent knowledge has changed about response techniques and strategies as well as coordination of all the organizations under an organized command structure;
- Strengths and areas for improvement regarding the use of a checklist (Incident Response Guide) as a support tool during rail incidents involving flammable liquids;
- Strengths and areas for improvement for the CAPP-CAFC e-learning; and
- Strengths and gaps in the program in order to support the development of a national awareness program for the response to incidents involving flammable liquids transported by rail.

After the feedback session, the participants received a copy of the feedback form (Appendix B) to give them the opportunity to rate the training given, the exercise and the CAPP-CAFC e-learning.

The results of the feedback session, the observations made during the presentations by members of the petroleum industry, rail industry and TC, the observations made during the simulated scenario and the results of the feedback forms were used as evaluation tools. These results were examined by themes, in terms of strengths and areas to improve, and were used as the basis for recommendations and best practices for exercises and awareness training program.

3. EXERCISE RESULTS

3.1 Overall Results

In general, participants to the Athéna TTX indicated that fire chiefs' awareness was higher than that of participants of the Vulcan Tabletop Exercise. There are two main factors that could have contributed to this increase. The first factor is the requirement for all first responders in Québec to take awareness and operational training for dangerous goods response. The second factor is that fire chiefs took the CAPP-CAFC e-learning prior to the TTX. This training was not available to the fire chiefs prior to the Vulcan TTX and it was the presentations by the members of the petroleum industry, rail industry and TC that served as an introduction to familiarize the stakeholders before the exercise scenario.

Figure 1 below shows that the participants found the CAPP-CAFC e-learning beneficial for their awareness regarding the response to flammable liquid incidents. This impression supports the overall results showing that CAPP-CFAC e-learning helped the participants prepare for the exercise.

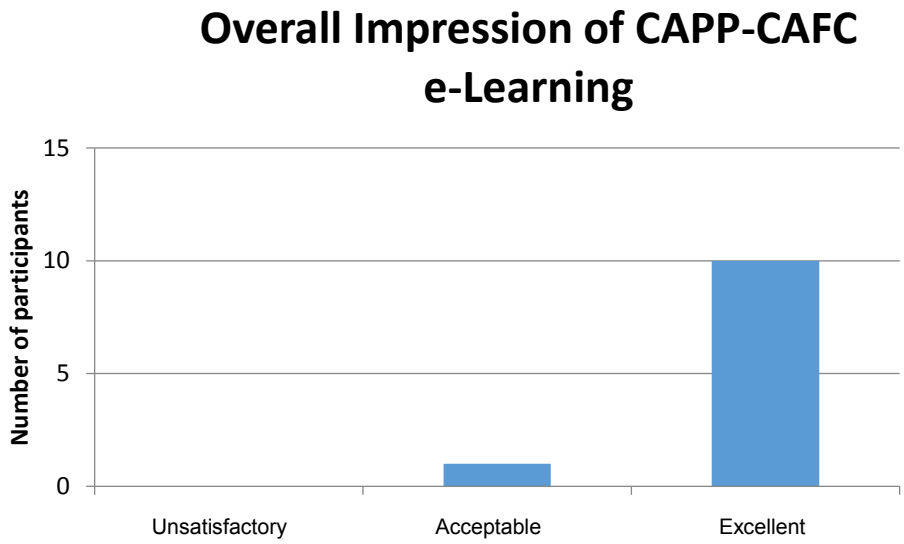

Figure 1: Overall Impression of CAPP-CAFC e-Learning

Participants indicated that the exercise was beneficial by enabling them to get to know the petroleum industry and rail industry notification procedures when first responders are called. Participants also received information to clarify their roles during the notification. Participants indicated that the exercise was beneficial by providing more information about the ERAP program. Participants learned that the program is intended to better protect the public with the activation of an ERAP, which will provide help and technical assistance.

Members of the rail industry indicated that this exercise is beneficial for the response to rail incidents involving flammable liquids. Giving the first responders the necessary

training to evaluate the scene safely enables them to gather field information that can help the response even before support teams arrive on site.

In general, participants indicated that the structure of a half-day awareness training and a half-day simulation scenario was beneficial and well received. The participants found that the awareness training and simulation scenario helped fill in the gaps in their response procedures (Figure 2).

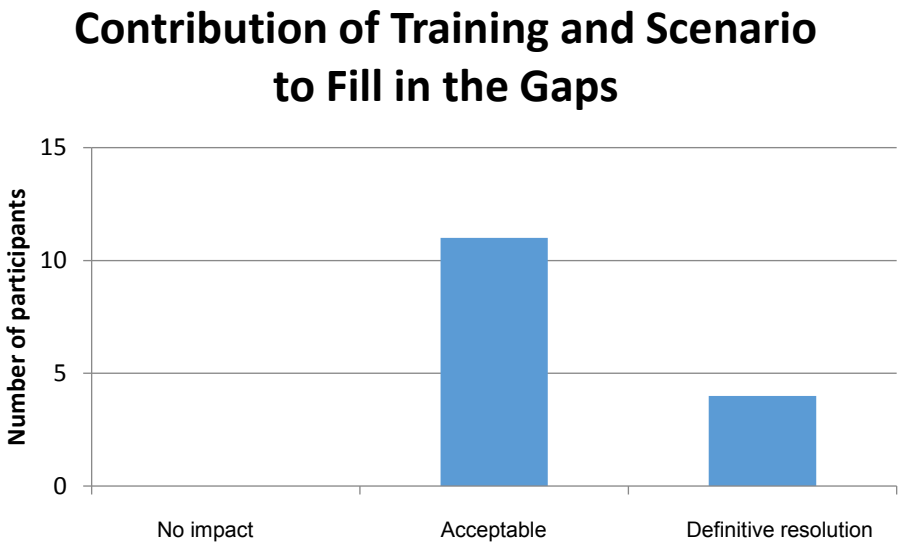

Figure 2: Contribution of Training and Scenario to Fill in the Gaps

However, participants indicated that the presentations given by response contractors on their services were not as beneficial as other parts of the program (Figure 3).

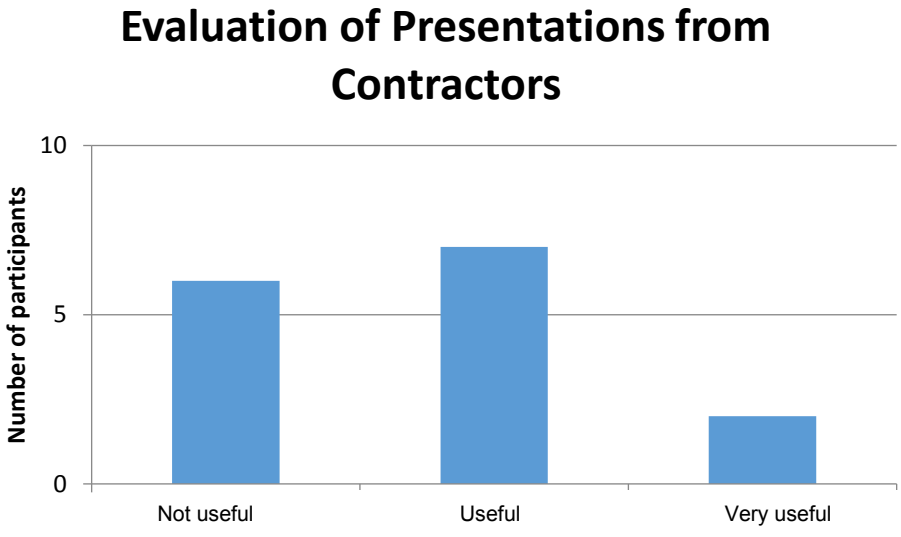

Figure 3: Evaluation of Presentations from Contractors

3.2 Awareness Training

The awareness training included various presentations by members of the rail industry, petroleum industry and TC. The subsections below identify the strengths and areas for improvement observed during the training.

3.2.1 Strengths

The most important strength in the presentation was emphasizing not to rush into incidents involving flammable liquids. This approach is contrary to first responders' usual reflexes for other types of incidents, so it was important for this lesson to be clearly presented and clearly understood.

The presentation on the train consist included practical examples and the participants had the opportunity to identify the pertinent information contained in the train consist. Participants were asked to identify the ERAP telephone number, whether tank cars were carrying dangerous goods and other characteristics of tank cars and their contents. These types of practical examples should also be included in the full-scale exercise as well as any other future exercise to ensure that participants can benefit from a better learning opportunity.

During the presentations, industry members presented to the participants the general terminology used in responses, to ensure that all response team members (TC, petroleum industry, rail industry and first responders) use the same terms. This terminology standardization will make it possible to better share information during discussions involving multiple different organizations. A unified glossary could facilitate this task.

All participants received a copy of TC's *Competency Guidelines for Responders to Incidents of Flammable Liquids in Transport, High-Hazard Flammable Trains*. [1] This document produced by the ERTF describes the knowledge and skills in addition to the current dangerous good response standard (NFPA 472), and recommended for first responders when responding to rail incidents involving flammable liquids. The document also provides information for first responders about the steps and hazards of responding to incidents involving flammable liquids transported by rail.

3.2.2 Areas for Improvement and Recommendations

Table 2 presents the areas for improvement identified during the awareness training. These points are related to the training itself, its content, the topics covered, and the actual response procedures. The points identified will make it possible to improve the full-scale exercise training program as well as the development of a national awareness program for response to incidents involving flammable liquids transported by rail. Recommendations to address these points are also provided below.

Table 2: Areas for Improvement and Recommendations for the Awareness Training

Areas for Improvement	Recommendations
There is an opportunity to improve the availability of English-French bilingual resources. Currently, many of the resources available to first responders are in English only.	Developing an electronic French version of the Emergency Response Guidebook (ERG) is necessary to support first responders. The training should also mention that CANUTEC can provide translation assistance (CANUTEC can organize teleconferences between different organizations and facilitate communications if the technical information is provided in English).
There is contradictory information about calling and activating an ERAP. The presentations are not clear whether CANUTEC or the first responders make the call. Since the ERAP is not activated for less serious incidents, it is important for the first responders to call both the ERAP organization and CANUTEC.	Make changes to the presentations for the full-scale exercise and the training to make sure a clear message is given to the participants (that anyone can call the ERAP number and the plan holder decides whether or not to activate it).
The participants indicated that the awareness training should strengthen the use of foam during the response	Ensure that the full-scale exercise includes theoretical and practical training on considerations for using foam during the response.
The participants indicated that it would be beneficial to have an interactive derailment simulation.	Ensure that the full-scale exercise program includes the use of an interactive derailment simulation tool.
The participants indicated that the training and the exercise program should be less focused on industry involvement during response. The training should also cover the initial actions that will be taken when the incident is discovered until industry arrives.	The TTX structure for developing a national awareness program for response to incidents involving flammable liquids transported by rail should be modified to focus on these important elements. These elements must also be considered for the full-scale exercise.
The training and presentations provided minimal information regarding response strategies and tactics (non-response, defensive, offensive).	In the future, modify the full-scale exercise presentations and the training program to focus on these important elements (we should also give students technical data, references, etc.).

3.3 Response During the Scenario

This section provides the response activities identified by the first responders, the members of the petroleum industry, rail industry and TC during the simulation of a derailment scenario involving flammable liquids:

- Ensure that all rail transport is stopped;
- Maintain a safe distance and gather more information;

- Confirm that there are danger placards identifying dangerous goods;
- Analyze the situation from multiple positions such as the two ends of the derailment;
- Prepare a command post and approach the scene taking into consideration wind speed and direction;
- Send a team to find the train conductor and collect the train consist;
- Call the railway company to gather more information and, if the train conductor is not available, obtain the train consist;
- Identify the railway crossing number;
- Identify the types of tank cars involved;
- Call CANUTEC;
- Check with CANUTEC for the mobilization status of the TC representative designated for the incident (a Remedial Measures Specialist (RMS) who will monitor the progression of the incident may be deployed on site);
- Contact the mutual assistance organizations of neighbouring municipalities;
- Activate the municipality's emergency plan and, if needed, request assistance from other government organizations, as indicated in the local emergency preparedness plan;
- For the railway company: communicate with the ERAP holder, and if the plan is activated, involve the contractors identified in the plan;
- Adjust the safety distance according to circumstances (e.g. risk of fire);
- Prioritize evacuating roads and areas closest to the incident;
- Take into account the needs of vulnerable groups;
- Take into account requirements for evacuation or protection in place;
- Railway police: Arrive on scene and report to the command post about half an hour after the initial call to support securing the scene;
- Industry: Establish contact with command once arrived on scene;
- First responders: Find support from members of industry to identify the necessary resources, such as equipment, foam, etc.;
- Various industry members: provide assistance in terms of personnel and equipment for air monitoring, cartography, etc.;
- Obtain advice from members of industry about personal protective equipment (PPE) required for the response;
- Railway company: Have the capacity to support municipal representatives in responding to media requests;
- Industry: Provide support for the decontamination of people and equipment;
- First responders: Develop an action plan to maintain incident control, collaborating with the railway company on tactics;
- First responders: Collaborate with industry to remediate the scene.

3.3.1 Strengths

In general, the fire chiefs confirmed the steps to take during response to a rail incident involving flammable liquids. These responses corresponded with the suggestions provided in the response support tools.

3.3.2 Areas for Improvement and Recommendations

Table 3 shows areas for improvement identified during the response simulation. These areas involve information that should be modified or better presented during the training to improve first responder's awareness. The points identified here will allow to improve the full-scale exercise training program and the development of a national awareness program for the response to rail incidents involving flammable liquids. Recommendations to address these points are also provided.

Table 3: Areas for Improvement and Recommendations for the Scenario

Areas for Improvement	Recommendations
There is confusion about the notification procedure, since first responders do not know if they should call the railway company to inform them of the incident or whether they have already received information from the company. It was agreed that first responders should always call the railway company's emergency number.	In the future, the full-scale exercise and training should be modified to focus on these important aspects. The generic TTX scenario should also be modified to enable first responders to detect and identify the incident. This way, first responders are not informed by the railway company, enabling them to test the notification process.
It was determined that it is important for first responders to confirm which railway line is involved during the notification process.	In the future, the full-scale exercise and training presentations should be modified to focus in these important aspects (modify the response tools to reflect this point).
There were no detailed discussions about the choice of PPE by the fire chiefs before the simulated arrival of industry on scene.	The structure of the generic TTX should be modified to ensure that the questions to be discussed focus on this important point (modify the presentations of the full-scale exercise and training).
The fire chiefs needed to clarify how to coordinate the response with the specialists present on site and maintain incident command when members of industry arrive.	Ensure that the full-scale exercise program includes practical training dealing with the response coordination with specialists under an organized command system.

3.4 Training and Response Tools

In general, the participants indicated that the CAPP-CAFC e-learning was beneficial for the fire chiefs. The participants found that the detail and utility of the information presented were appropriate (Figure 4 and Figure 5). The responses for the three sections were relatively comparable.

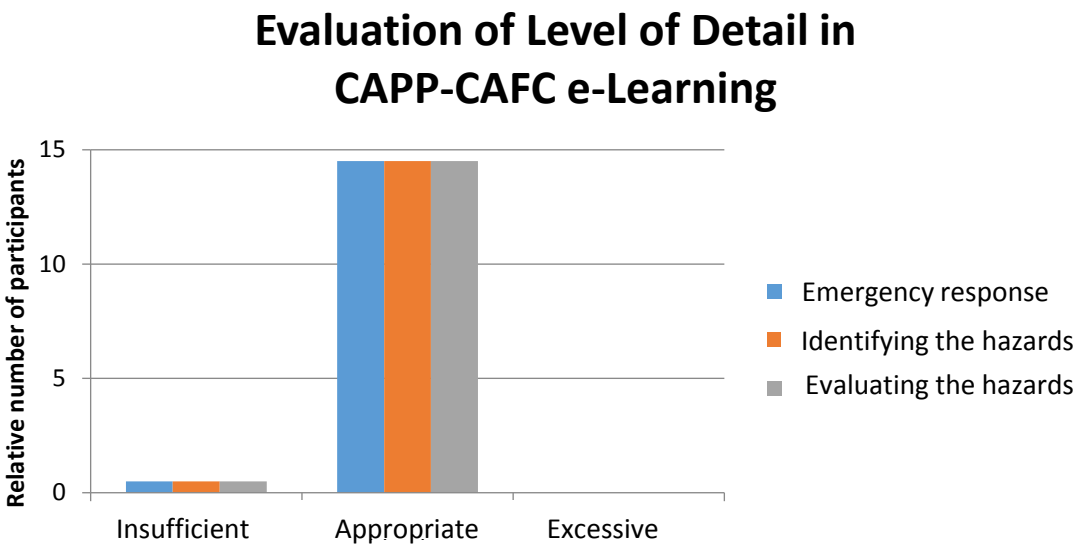

Figure 4: Evaluation of Level of Detail in CAPP-CAFC e-Learning

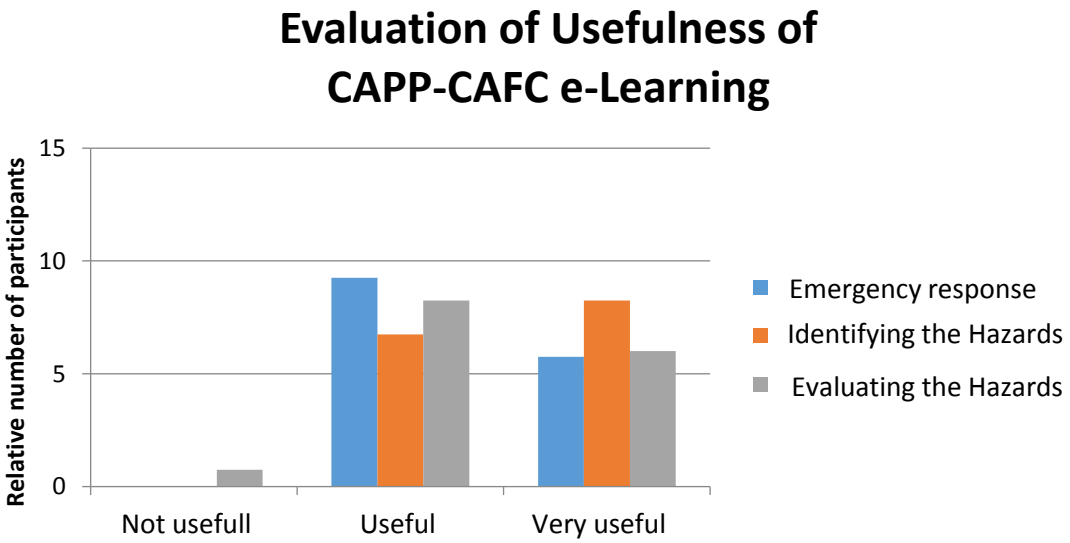

Figure 5: Evaluation of Usefulness of CAPP-CAFC e-Learning

3.4.1 Strengths

The majority of participants found the "Takeaway Notes" useful, which shows that this section should be kept in future versions of the e-learning (Figure 6).

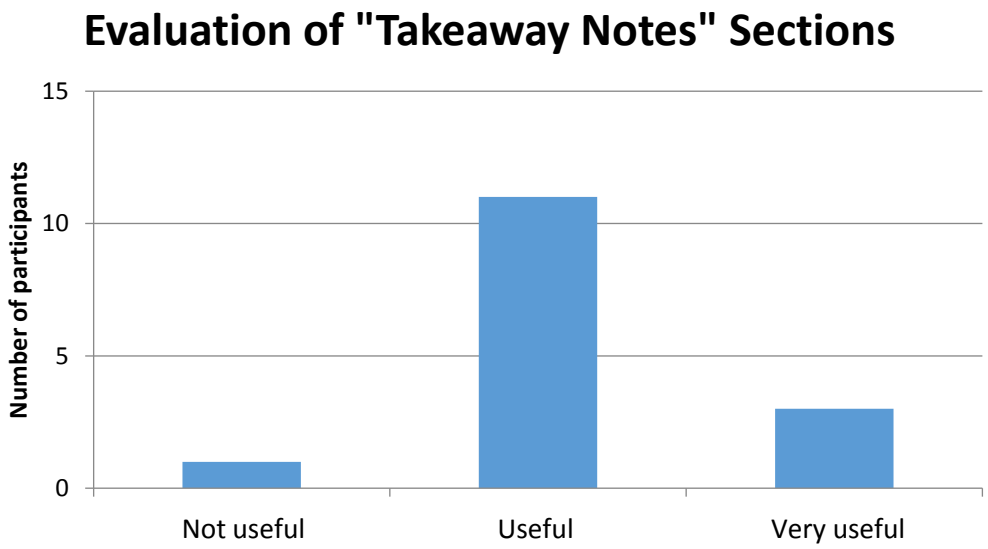

Figure 6: Evaluation of "Takeaway Notes" Sections

3.4.2 Areas for Improvement and Recommendations

The participants identified several ways to improve the CAPP-CAFC e-learning to improve the learning experience. The participants indicated that adding tests at the end of the sections would be the most useful improvement (Figure 7).

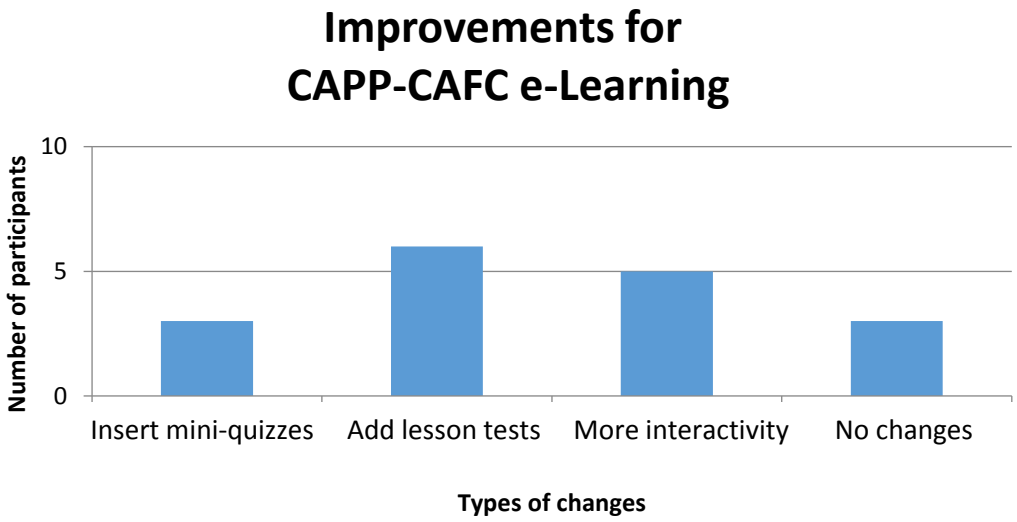

Figure 7: Improvements for CAPP-CAFC e-Learning

Table 4 shows the areas for improvement identified to support the development of training and response tools. The points identified here will allow to improve the training and response tools in development for first responders, including CAPP-CAFC e-learning and the Incident Response Guide (checklist). Recommendations to address these points are also provided.

Table 4: Areas for Improvement and Recommendations for the Training and Response Tools

Areas for improvement	Recommendations
There are cases where dangerous goods may be transported without using danger placards (e.g. box cars). In these cases, the train consist should be used to determine the products involved in the derailment. This case is not included in the tools currently available.	Step 3 of the Incident Response Guide (checklists) should be modified to better identify how first responders could identify dangerous goods if the danger placards are not easily identifiable. Step 3 of the Guide (checklist) should better identify the fact that you have to go to the next step to get the train consist from the train crew or CANUTEC.
There are gaps in Steps 4 and 5 of the Incident Response Guide, because Québec fire departments do not work under a Unified Incident Command System (ICS).	The Incident Response Guide should be generalized in terms of references to the work done within a command structure to represent the different types of organized command structures. The Guide should specify the role of the local fire chief as Incident Commander.
The participants asked that CAPP-CAFC e-learning be divided into independent sections so it can be easier to complete it in multiple sessions, with the ability to save training progress.	CAPP-CAFC e-learning should be changed so it can be completed in multiple sessions.
The Incident Response Guide does not contain enough details about other resources and partners (e.g. nongovernment organizations) that will also be involved in the response.	The Incident Response Guide should be modified to include details about the involvement of other resources and partners in response to rail incidents involving flammable liquids.

4. SUMMARY

The Athéna exercises held between September 2016 and March 2017 will reflect the lessons identified in the Vulcan exercise and the regulatory changes to improve the response to rail incidents involving flammable liquids, made in response to the catastrophic derailment in Lac-Mégantic, Québec, in July 2013.

The Athéna TTX took place on December 7, 2016, with the ultimate objective of providing awareness training to fire chiefs from small communities when responding to rail incidents involving flammable liquids. The specific objectives of the exercise were to enhance fire chiefs' knowledge of the TC ERAP program, the access to specialized response resources strategies and techniques, as well as the coordination of multiple organizations' efforts under an organized command system.

The TTX participants included members of fire departments of small communities located near the railway line and near Lévis, Québec, with several observers and partners from the petroleum industry, the rail industry and the federal government. The exercise began with presentations by members of the petroleum industry, rail industry and TC. After the presentations, a derailment scenario involving flammable liquids was presented to the participants, to enable the fire chiefs to discuss the response steps to take during a derailment involving flammable liquids.

At the end of the exercise, a feedback session took place to evaluate the strengths and areas for improvement in the steps and response actions discussed during the scenario. The feedback also made it possible to evaluate the Incident Response Guide (checklist) as a response support tool, collect comments about the CAPP-CAFC e-learning and identify gaps to support the development of a national awareness program for the response to rail incidents involving flammable liquids.

In general, the exercise confirmed that fire chiefs' awareness at this initial stage of the exercise program was higher than observed during the Vulcan exercise. One of the two factors that may have contributed to this improvement is that the fire chiefs were exposed to CAPP-CAFC e-learning prior to the TTX.

The awareness training presentations were well received, particularly in that they reinforced the warning not to rush in and gave practical examples of how to use the train consist. It is necessary to modify the training program to better identify French-language resources available to first responders and improve their availability, to clarify the ERAP activation process, to provide additional information on foam use, to focus on initial actions to be taken when the incident is discovered and to provide additional information about response strategies and tactics (non-intervention, defensive, offensive).

During the simulated response, points were identified that should be modified or better presented during the training to support first responders' awareness. These changes include clarifying the role of first responders in the notification process and the information regarding response with specialists under an organized command system. Further TTXs should be modified to ensure that questions about choosing PPE are covered in detail.

The feedback also identified elements to improve regarding the use of the Incident Response Guide and CAPP-CAFC e-learning. Participants identified that the Guide should be modified to refine the steps to take when the danger placards are not easily identifiable and to include details about the involvement of other resources and partners in a response under various command systems. The participants suggested practical changes to the CAPP-CAFC e-learning, including separating it into modules that can be completed independently, and the option to save progress.

In general, the participants found the exercise was beneficial in helping them understand the notification procedure and their role, as well as the support available from the industry through the ERAP. They also identified that this training provides the necessary tools to first responders to better support rail industry members during an incident. The areas for improvement and recommendations identified in the training will also be beneficial for developing a national awareness program for responding to rail incidents involving flammable liquids.

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[1] Transport Canada, National Fire Protection Association. *Competency Guidelines for Responders to Incidents of Flammable Liquids in Transport, High-Hazard Flammable Trains*. Accessed: February 8, 2017, at https://www.tc.gc.ca/media/documents/tdg-eng/TC-Competency_Guidelines-e.pdf.

[2] Government of Canada. *Liquefied Petroleum Gases Bulk Storage Requirements*. Accessed: February 8, 2017, at http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._1152/.

APPENDIX A. SCENARIO AND DISCUSSION ITEMS

1.1 PRODUCT DESCRIPTION

Petroleum crude oil is a naturally occurring, unrefined petroleum product that is extracted from oil reserves. It is rich in energy and composed of various liquid and gas organic compounds. It is refined to extract usable products such as propane, gasoline, diesel and various forms of petrochemical products.

The properties of crude oil vary from deposit to deposit, and even within the same deposit. Heavy crude is very viscous and less flammable. Light crude contains light hydrocarbons and a greater proportion of dissolved gases, which make it more flammable and more dangerous.[2] Crude oil is generally transported in non-pressurized tank cars.

1.2 SCENARIO START STATE

There have been extreme weather and heavy rains in the area since last week.

On December 7 at 9:00 a.m., a freight train of 38 tank cars, including 6 cars of crude oil, approached the town of Saint-Charles-de-Bellechasse, Québec, at a speed of 35 km/h.

1.3 LOCATION AND WEATHER CONDITIONS

The incident took place a few hundred metres southwest of the town of Saint-Charles-de-Bellechasse, Québec.

Figure 8: Derailment Site[1]

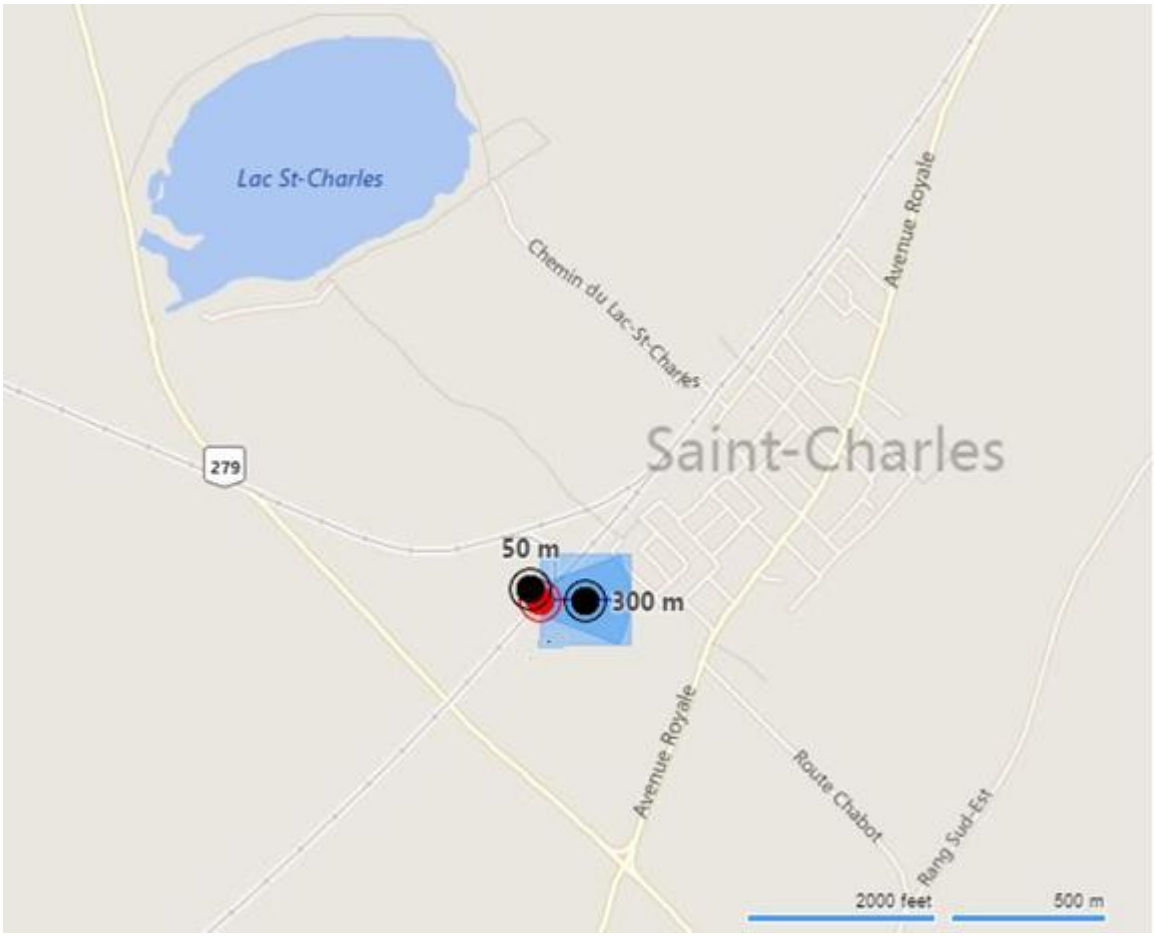

Table 5: Scenario Weather

Date and time	Wind direction (from)	Speed	Temperature
Day 1 – 9:00 a.m.	West	7 km/h	2°C
Day 1 – 11:00 a.m.	Southwest	9 km/h	2°C
Day 2 – 9:00 a.m.	West	5 km/h	4°C

1.3.1 Inject No. 1 – Analysis and Initial Response to the Situation – 9:30 a.m.

When the train approached the town from the southwest, the locomotive engineer noticed what appeared to be a deviation in rail alignment and elevation (the track had

[1] https://webwiser.nlm.nih.gov/getSubstanceData.do&location=saint%20charles%20de%20bellechasse&mapTop=0&mapLeft=0&mapBottom=0&mapRight=0&mapStyle=aerial&spillSize=large&timeOfDay=night&windDirection=180.4867242826764&labels=show&mapUnits=metric&lineRed=255&lineGreen=0&lineBlue=0&fillRed=0&fillBlue=255&fillGreen=128&lineOpacity=0.5&fillOpacity=0.3

been washed out). He started applying the brakes, but it was too late to prevent the locomotive and several cars from derailing. The crew managed to escape the locomotive and the engineer sent an emergency message to the rail traffic controller, who alerted local emergency services.

Table 6 below shows the questions the participants were asked after Inject No. 1 was introduced, which guided the discussion of the response.

Table 6: Inject No. 1 – Discussion Questions

Objectives		
• Identify the effectiveness of current response capabilities during an initial site assessment.		
No.	**Discussion questions**	**Additional points**
1.	What measures will be taken to analyze the scene?	What would be the safe distance? How will the analysis be conducted? Where can the information be found and what is important to know?
2.	How will you identify whether there are dangerous goods in the tank cars?	Visual inspection (placards, type of car), shipping documents, train consist, ask the train crew, contact CANUTEC, consult AskRail. Indicate that there is a crude oil spill due to a damaged tank as soon as the appropriate analysis steps are identified by the participants.
3.	What are the hazards from the product? How will you determine the PPE required?	General discussion of the possible effects of this kind of incident. Where will the responders be positioned based on the hazards?
4.	What are the other hazards on scene?	Physical hazards on scene (stressed rail, irregular ground, flooding, power lines, etc.). Note: limit discussion regarding other dangerous goods. Important to note, but focus on the objectives of the exercise, namely crude oil.
5.	What has to be done to protect the public?	Is evacuation necessary and, if so, how do we decide what the distance should be?
6.	Do you have the resources necessary for an initial response? If you need	Focus on resources and equipment. Focus on the ERAP activation request.

	more support, who would you contact first? Do you have toxic or flammable gas detectors? What resources do you prioritize contacting?	
7.	What agreements are in place to access the additional support required?	Have these mutual agreements been exercised recently? Are they for personnel or equipment?
8.	Are there differences in capabilities and approach to this type of incident in other jurisdictions?	Involve the representatives of each jurisdiction to compare and contrast their capabilities and approach.

1.3.2 Inject No. 2 – Response Follow-up – 11:00

The train consist indicates that several of the tank cars are carrying petroleum crude oil (UN 1267). Several tank cars caught fire and the smoke is heading towards the residential area and spreads over several kilometres. Due to the severity of the incident, Saint-Charles-de-Bellechasse has initiated its emergency plan. The fire department is present on scene of the accident and due to the severity of the incident, other fire departments from adjacent jurisdictions are also present as a result of mutual assistance agreements. The derailed tank cars keep burning and leaks have been observed in some of the adjacent damaged cars that contain other dangerous goods. Three additional fireballs occurred as a result of Heat Induced Tears (HIT).

Table 7 below shows the questions the participants were asked after the introduction of Inject No. 2, which guided the discussion of the response.

Table 7: Inject No. 2 – Discussion Questions

Objectives		
Identify the effectiveness of response capabilities, inform the authorities and plan the response.		
No.	**Discussion questions**	**Additional points**
9.	Which new hazards does the fire situation now represent?	Sudden Heat Induced Tear, impact on adjacent cars. What indications will be visible?
10.	Who should be consulted to discuss the progression of the incident?	CANUTEC, shipper, ERAP resource person.
11.	What are the possible response tactics? How can we find advice for this type of decision? Do you have the means to implement these tactics?	Review the protective action distances, identify resources and equipment available. Non-intervention, defensive or offensive response?

		If they choose defensive or offensive response, how do they make sure they have enough knowledge and resources (equipment, water, foam) and personnel to respond safely? Make sure that they request assistance from industry specialists.
Inject No. 2b – Industry specialists arrive on scene		
12.	What capabilities are available from the industry in this situation?	Advice on strategies, qualified firefighters, spill control. Is industry foam compatible with firefighters' foam?
13.	How are industry responders integrated into the incident command structure?	This is an important topic, but focus the discussion on the objectives (unified command). Who manages resource integration? How are decisions and instructions communicated?

1.3.3 Inject No. 3 – Transition to Recovery – 9:00

After several hours of efforts, the fires are extinguished, but the risk of fire remains high. About 40,000 litres of crude oil (about 1/3 the capacity of a DOT-117 tank car) spilled from the derailed tank cars and was not completely burned. The Ministry of the Environment is on scene with specialized service organizations and the owner of the railway.

Table 8 below shows the questions asked to the participants after the introduction of Inject No. 3, which guided the discussions of the response.

Table 8: Inject No. 3 – Discussion Questions

Objectives		
Identify the effectiveness of supporting response capabilities in the long term and the transition to corrective actions		
No.	**Discussion questions**	**Additional points**
14.	What are the activities of your organization 24 hours after the incident occurred? • Resources (relief) • Equipment and material	What are some of the command related challenges as the situation transition to recovery? And if the situation worsens?
15.	What PPE is required to work on scene	Check with ERG?

	once the fire is out? Is breathing apparatus required?	How to protect against hydrogen sulphide?
16.	Is decontamination necessary for personnel and PPE?	How will it be implemented?
17.	Who is responsible and what are the resources available from the industry to implement the primary and long term corrective actions for the site?	Prevent spill propagation, cleaning, air monitoring, decontamination. Additional points on financial responsibilities, paying short-term costs.
18.	What will be the next steps over the next 24 to 48 hours for all agencies?	Focus the discussion on fire chiefs' actions. Explore the challenges in remediation of the site in light of the environmental damage.
19.	Which provincial organizations would be involved at this stage of the response?	Environnent, Transport, Public Health, Sûreté du Québec.

APPENDIX B. ATHÉNA TTX – PARTICIPANT FEEDBACK FORM

Canadian Association of Petroleum Producers and Canadian Association of Fire Chiefs, CAPP-CAFC e-Learning

1. What was your overall impression of the effectiveness and content of the CAPP-CAFC e-learning?

[ ] Unsatisfactory
[ ] Acceptable
[ ] Excellent

2. Evaluate the content of the CAPP-CAFC e-learning in terms of the following:
Level of detail: '1' = insufficient, '2' = appropriate, '3' = excessive
Usefulness: '1' = not useful, '2' = useful, '3' = very useful

CAPP-CAFC e-Learning Section	Subject	Detail	Usefulness
Part I: Emergency Response in Canada	Emergency Response Guidebook (ERG)		
	CANUTEC		
	Emergency Response Assistance Plan (ERAP)		
	Remedial Measures Specialists (RMS)		
Part II: Identifying Hazards at the Scene of a Rail Incident Involving Flammable Liquids	Recognizing flammable liquids tank cars		
	Determining if dangerous goods are present (danger placards, shipping documents)		
	Railway company emergency number		
	Properties of flammable liquids		
Part III: Site-Specific Hazard Assessment and Response	Potential rail car failure		
	Heat induced tears		
	Physical site hazards		
	Fire assessment – rail cars		
	Air monitoring		
	Personal protective equipment (PPE) considerations		
	Considerations for fire response (non-intervention, offensive, defensive strategies)		
	Mitigation		
	Environmental considerations		
	Flammable liquid spill response, with no fire		
	Planning and preparing for response		
	Incident command		

3. How much time was necessary to complete the CAPP-CAFC e-learning?

[ ] Less than 2 hours
[ ] Between 2 and 2.5 hours
[ ] Between 2.5 and 3 hours
[ ] More than 3 hours

4. Were the "Takeaway Notes" sections useful to summarize each part?

[ ] Not useful
[ ] Useful
[ ] Very useful

5. How, if at all, would you modify the CAPP-CAFC e-learning to enhance the overall learning experience? (Check all that apply)

[ ] Insert mini-quizzes
[ ] Add tests at the end of the lessons
[ ] Include interactive portions
[ ] No changes
[ ] Other: _____

The following questions will be used to compare CAPP-CAFC e-learning and the training provided during the tabletop exercise:

6. What do you think of the language and terminology used during the training?

Language and terminology: '1' = need improvement, '2' = acceptable, '3' = exceptional
Pace of information: '1' = need improvement, '2' = acceptable, '3' = perfect

	Language and terminology	Pace of information
By the CAPP-CAFC e-learning narrator		
By the instructors in the classroom training		

7. Are their subjects in the CAPP-CAFC e-learning that should have been further elaborated on during the presentations?

_____
_____
_____

8. Were there areas where there was too much duplication between the CAPP-CAFC e-learning and the information provided during the exercise?

_____
_____
_____

Tabletop Exercise (TTX)

9. In which of the following areas is there the greatest gap between your procedures and the response procedures proposed in this exercise?

[ ] Identifying a situation involving flammable liquids
[ ] Contacting organizations for support, including CANUTEC
[ ] Activating the ERAP
[ ] Identifying the hazards of flammable liquids
[ ] Identifying the tactics and strategies required to respond
[ ] Identifying support available from the industry
[ ] Other: _____

10. Do you think the training provided and the simulation helped resolve these gaps?

[ ] No impact
[ ] Acceptable
[ ] Definitive resolution

11. Do you think the exercise scenario was representative of probable derailment conditions and the availability of response resources in your region?

[ ] Not representative
[ ] Acceptable
[ ] Representative

12. How would you improve the scenario to make it more representative?

_____
_____
_____
_____

13. Evaluate the effectiveness of the exercise.

[ ]	Not effective
[ ]	Somewhat effective
[ ]	Effective
[ ]	Very effective
[ ]	Extremely effective

Response contractors' presentations

14. What did you think of the contractors' presentations?

[ ] Not useful
[ ] Useful
[ ] Very useful

15. To what extent did the response contractors' presentations make you more comfortable calling upon their expertise?

[ ] No impact
[ ] Acceptable
[ ] Completely comfortable

Overall appreciation

16. Overall, what did you think of all the information provided (ERAPs, resources from industry, response contractors) and the relevance of including these elements in your local emergency preparedness plans?

[ ] Not relevant
[ ] Relevant
[ ] Very relevant

17. Additional comments

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