CACOUNA, LE 4 JUIN 2006

MESSIEURS LES COMMISSAIRES,

VISION CACOUNA VOUS PRÉSENTE TOUT D'ABORD LE PREMIER RAPPORT DE MONSIEUR JAMES A.FAY INTITULÉ« PUBLIC SAFETY ISSUES AT THE PROPOSED CACOUNA LNG TERMINAL » QUI A ÉTÉ PRODUIT EN MARS 2005 . NOUS VOUS FAISONS AUSSI PARVENIR LE DERNIER RAPPORT DE MONSIEUR FAY , PLUS RÉCENT CELUI-CI ET DATANT DU 10 MAI 2006, TOUJOURS CONCERNANT LES QUESTIONS RELATIVES À LA SÉCURITÉ DU TERMINAL . VOUS COMPRENDREZ QUE LORSQU'IL A RÉDIGÉ SON PREMIER RAPPORT, L'ÉTUDE D'IMPACT D'ÉNERGIE CACOUNA N'ÉTAIT PAS ENCORE COMPLÉTÉE. DONC, CE SECOND RAPPORT EST UNE MISE À JOUR QUE DR.FAY A BIEN VOULU GENTIMENT DÉPOSER À NOTRE DEMANDE ET CELA SANS JAMAIS EXIGER DE RÉTRIBUTION QUELCONQUE POUR SON TRAVAIL. BIEN SÛR, SI VOUS AVEZ DES QUESTIONS D'ORDRE PLUS TECHNIQUE CONCERNANT LA DÉMARCHE DE MONSIEUR FAY , QUI NE PEUT ÉVIDEMMENT ÊTRE EXPLIQUÉE EN QUELQUES PAGES, VOUS TROUVEREZ SES COORDONNÉES À LA PAGE SUIVANTE ET IL SE FERA SÛREMENT UN PLAISIR DE RÉPONDRE À VOS QUESTIONS.

BIEN À VOUS,

JOSÉE BOUDREAU
POUR VISION CACOUNA

RAPPORT CONCERNANT LA SÉCURITÉ POUR LE TERMINAL DE GROS-CACOUNA

DEMANDÉ PAR VISION CACOUNA

PRÉSENTÉ AUX AUDIENCES PUBLIQUES SUR LE PROJET D'IMPLANTATION D'UN TERMINAL MÉTHANIER DANS LE VILLAGE DE CACOUNA

JUIN 2006

PRODUIT PAR
DR.JAMES A. FAY

PROFESSEUR ÉMÉRITE AU MASSACHUSETTS INSTITUTE OF TECHNOLOGY AU DÉPARTEMENT D'INGÉNIERIE MÉCANIQUE

DR.JAMES A. FAY
PROFESSEUR ÉMERITE
DÉPARTEMENT D'INGÉNIERIE MÉCANIQUE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

LES RECHERCHES DE DR.JAMES A.FAY PORTENT PRINCIPALEMENT SUR LES PROBLÈMES RELIÉS À LA POLLUTION DE L'EAU ET DE L'AIR INCLUANT LA DISPERSION DES POLLUANTS ATMOSPHÉRIQUES DANS L'ATMOSPHÈRE, LES PLUIES ACIDES, LES DANGERS DE SÉCURITÉ RELIÉS AUX GAZ LIQUÉFIÉS ET À LA DISPERSION DE CES LIQUIDES DANS L'OCÉAN. IL A PRODUIT DE NOMBREUX RAPPORTS DE CE TYPE POUR PLUSIEURS COMMUNAUTÉS, NOTAMMENT AUX ETATS-UNIS.

Return to ME Personnel

Department of Mechanical Engineering, MIT

James A Fay

Professor Emeritus, Senior Lecturer

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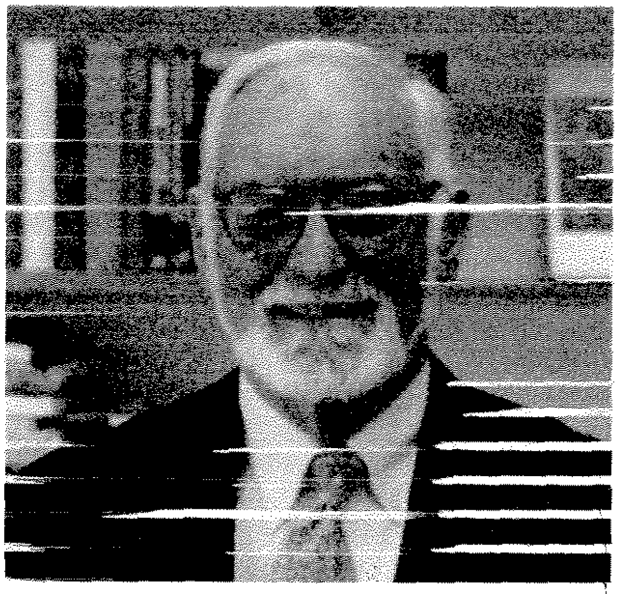
Research topics and projects



Education

B.S. 1944 Webb Institute of Naval Architecture; M.S. 1947 Massachusetts Institute of Technology; Ph.D. 1951 Cornell University

Honors and Awards

Fellow, American Academy of Arts and Sciences, 1963; Fellow, American Physical Society, 1964; Fellow, American Institute of Aeronautics and Astronautics, 1968; Fellow, American Association for Advancement of Science, 1978; Overseas Fellow, Churchill College, Cambridge University, 1980; Fulbright Lecturer, India, 1990; Member, National Academy of Engineering, 1998.

Research Interests

Atmospheric Dispersion of Air Pollutants; Gravity Flow of Density StratifiedLiquids and Vapors

Society Memberships

American Academy of Arts and Sciences; American Physical Society; American Institute of Aeronautics and Astronautics; American Association for the Advancement of Science; American Society of Mechanical Engineers; Sigma Xi; Air and Waste Management Association

Teaching Interests

Textbooks of Fluid Mechanics, Energy

Biographical Summary

James A. Fay is Professor Emeritus of Mechanical Engineering at the Massachusetts Institute of Technology. His current field of interest is environmental engineering, and his recent research activities have concentrated on air and water pollution problems, including the dispersion of air pollutants in the atmosphere, acid rain, the safety hazards of liquefied gases, renewable energy (including small scale tidal power) and the spread of oil and other hazardous liquids on the ocean. In previous years he carried out research on combustion and detonation, hypersonic heat transfer, magnetohydrodynamics and plasmadynamics.

Professor Fay served as Chairman of the Massachusetts Port Authority (1972-1977) and as Chairman of the Air Pollution Control Commission of the City of Boston (1969-1972). He has served on twelve boards, committees and panels of the National Research Council, including two terms on the Environmental Studies Board. He is currently a director emeritus of the Union of Concerned Scientists and was formerly a director of the Conservation Law Foundation.

A fellow of the American Academy of Arts and Sciences, the American Physical Society, the American Institute of Aeronautics and Astronautics, and the American Association for the Advancement of Science, Professor Fay is also a member of the National Academy of Engineering and four technical societies. In 1980 he was an Overseas Fellow of Churchill College, Cambridge University, and in 1990 he was a Fulbright Lecturer in India.

Professor Fay received his B.S. degree from Webb Institute of Naval Architecture in 1944, the M.S. degree from the Massachusetts Institute of Technology in 1947 and the Ph.D. degree from Cornell University in 1951. He was an Assistant Professor in the Department of Engineering Mechanics at Cornell University from 1951 to 1955. Since 1955 he has been a member of the faculty in the Department of Mechanical Engineering at M.I.T.

Textbooks in Print

James A. Fay and Dan S. Golomb, *Energy and the Environment*, Oxford University Press., New York, 2002. This is a volume in the MIT-Pappalardo Book Series. (May be ordered from the Oxford University Press.) (Download a pdf Errata file for this volume.)

James A. Fay, *Introduction to Fluid Mechanics*, MIT Press, Cambridge, 1994. (May be ordered from The MIT Press.) (Download a pdf Errata file for this volume.)

James A. Fay, *Mecanica de Fluidos*, Compania Editorial Continental, S.A. de C.V., Azcapotzalco, 1996. (This is the Spanish Language edition of *Introduction to Fluid Mechanics*. Publisher's address: Renacimiento 180, Colonia San Juan Tihuaca, Delegacion Azcapotzalco, Codigo Postal 02400, Mexico, D.F.)

James A. Fay and Nishikant Sonwalkar, *A Fluid Mechanics Hypercourse*, MIT Press, Cambridge, 1996. (May be ordered from The MIT Press.) This CD-ROM is designed to accompany James Fay's *Introduction to Fluid Mechanics*. An enhanced hypermedia version ofthe textbook, it offers a number of ways to explore the fluid mechanicsdomain. These include a complete hypertext version of the original book,physical-experiment video clips, excerpts from external references, audioannotations, colored graphics, review questions, and progressive hints forsolving problems. Throughout, the authors provide expert guidance innavigating the typed links so that students do not get lost in the learning process.

System requirements: Macintosh with 68030 or greater processor and with at least 16 Mb of RAM. Operating System 6.0.4 or later for 680x0 processor and System 7.1.2 or later for Power-PC. CD-ROM drive with 256-color capability. Preferred display 14 inches or above (SuperVGA with 1 megabyte of VRAM). Additional system font software: Computer Modern postscript fonts (CM/PS Screen Fonts, CMBSY10, and CMTT10) and Adobe Type Manager (ATM 3.0 or later).

James A. Fay, *Molecular Thermodynamics*, Addison Wesley, Reading, 1964. (May be ordered directly from the author at the address above.)

This page last modified on 04/11/02

Public Safety Issues at the Proposed Cacouna LNG Terminal

Dr. James A. Fay

77 Massachusetts Avenue, Rm. 3-258

Cambridge, MA 02139

March 28, 2005

1 Introduction

TransCanada Pipelines Limited and Petro-Canada have jointly proposed to construct and operate a liquefied natural gas (LNG) import terminal, denoted as the Cacouna Energy Project[1], in Gros Cacouna, Quebec. To reach this terminal, ocean-going LNG tankers must move through the Chenal du Sud of the St. Lawrence River. Both the terminal site and the tanker route are potential sources of LNG spills and their attendant hazards to human health.

Natural gas, a hydrocarbon fuel, is usually piped directly from a gas well to the end consumer, never being stored locally in large amounts. When cooled to liquid form, however, as much as 80,000 tons can be stored in insulated tanks on land or aboard ship. In this form it is especially hazardous if it escapes by accident from its container, spilling onto ground or water and turning very rapidly into gaseousform, whereupon it will mix with air and then burn if ignited. By its very nature, an LNG import terminal and its associated tanker traffic constitutes a hazardous industrial complex which could experience accidental fires that might harm surrounding populations and property.

To build and operate an LNG terminal at the Gros Cacouna site, Energy Cacouna must obtain permission from national and provincial authorities. The authorities' objective in safety regulation is to limit, but not necessarily prevent, harm to persons and property outside the confines of the terminal site, should there be an accidental release of LNG at the site. The principal harmful effects are two: vapor plumes or clouds that can be ignited outside the site boundaries and harmful thermal radiation from on-site fires that extends across the site borders. But the authorities' safety rules do not consider all credible spills on the site or any from the LNG tankers while in transit to the terminal or being unloaded, a significant oversight that fails to protect public safety.

This report explains the safety hazards that will be associated witht the Cacouna Energy project. It delineates the geographic extent of harmful effects that could be expected from LNG spills at the site or from marine tankers approaching it.

2 Site selection criteria

The official site selection rules (CSA)[2] require the LNG terminal owner to install extensive technological features that will limit the harmful consequences of an accidental spill of LNG to within the property line enclosing the terminal. The harmful effects are twofold: combustible mixtures of vapor and air, such as might be driven by the wind blowing over an evaporating pool of spilled LNG, and thermal radiation from a fire burning above a liquid spill on the site. The types of spills to be considered are also twofold: a spill from transfer piping connecting the storage tanks to the regasification facilities, and the failure of the primary storage tank enclosure.

Limiting these effects at a terminal requires the construction of impounding areas surrounding potential spill sources so as to collect the spilled liquid and slow its vaporization or burning rate. If the spills are sufficiently small or slow, harmful effects will not extend beyond the site boundaries. For transfer line spills, the LNG is collected in a central impounding area. For storage tank spills, the primary storage container is surrounded by a secondary containment system which can contain all the LNG that might spill from the primary container.

The potential for harmful effects to humans from a given spill decreases with distance from the spill site. The harmful effect of ignitable natural gas vapor is measured by the flammability distance, a distance down wind from the spill site at which the vapor has been so diluted by mixing with air that it cannot be ignited. Any ignition at a closer distance can propagate a flame, but that flame will

[1] http://www.energiecacouna.ca/en/

[2] Canadian Standards Association CSA Z276-01. (www.csa.ca).

not propagate beyond the flammability distance. If the latter distance lies within the site boundary, no flame can extend beyond that boundary.

Thermal radiation from on-site LNG fires fed by an evaporating pool of spilled LNG can cause pain and first, second or third degree burns to the skin of humans exposed to the radiation, depending upon the intensity of radiation. For a given fire, this intensity decreases with distance from the fire. The least intense thermal radiation that CSA rules allow humans outside the site boundary to be exposed to is 5 kilowatts per square meter, an amount that produces second degree burns after only thirty seconds exposure.[3]

The CSA requirements for the proposed Cacouna terminal can be estimated from the Environmental Impact Statement for the Irving Oil project in New Brunswick.[4] This project, consisting of storage tanks and an unloading pier, employs the technology likely to be used at the Cacouna Energy facility. For the latter facility, it is to be expected that neither radiation nor flammability will exceed the CSA limits beyond the site boundary.

3 Risks that the CSA standard ignores

There are several important public safety risks that are not considered in the CSA regulations discussed above.

1. First of all, CSA's regulations ignore 'worst case' spills, in which the outermost containment system, whether on land or marine tanker, fails, allowing LNG to spill onto ground or water, where it would evaporate or burn. Because the lateral extent of such spills would be so much greater than those considered in the CSA regulations, it is to be expected that their harmful effects would exist very far beyond the site boundaries, including the marine tanker route to the terminal.

2. Secondly, CSA allows damaging thermal radiation beyond the site boundary as long as its level is below 5 kilowatts per square meter. However, it is not until the thermal radiation intensity falls below 1.6 kilowatts per square meter that there is no damage to exposed humans. A safe radiation distance for fires would be that for which the thermal radiation level does not exceed 1.6 kilowatts per square meter. Distances at which the radiation exceeds this value would define a thermal radiation danger zone.

To show how public safety can be adversely affected by credible spills that have been overlooked by the CSA standard, we have calculated these effects[5], summarized in Table 1 and described below.

[3] More intense and thereby more damaging exposure is permitted depending upon land use characteristics beyond the site boundary.

[4] Environmental Impact Statement, Irving Oil, Ltd. Liquefied Natural Gas (LNG) Marine Terminal. Environment and Local Government, New Brunswick. May 2004. (http://www.ceaa-acee.gc.ca/010/0003/0012/report_e.htm).

[5] The methods or values used for this assessment are identical to those contained in the following U.S. government agency reports: "Consequence assessment methods for incidents involving releases from liquefied natural gas carriers", Report 131-04 GEMS 1288209, ABS Consulting, Inc., May 13, 2004, (available on FERC web site at www.ferc.gov/industries/gas/indus-act.asp) and its Attachment 1 of June 29, 2004, as listed on the FERC site at http://ferris.ferc.gov/idmws/search/fercgensearch.asp under docket AD04-6; "Draft Environmental Impact Statement, Weaver's Cove LNG Project", FERC/EIS-0169D, 2004, Federal Energy Regulatory Commission, Washington DC; "Draft Environmental Impact Statement, Crown Landing LNG and Logan Lateral Projects", FERC/EIS-0179D, 2005, Federal Energy Regulatory Commission, Washington DC.

Table 1: Flammability and radiation distances for 'worst case' spills

Spill source	Volume (cubic meters)	Flammability danger zone (km)	Thermal radiation danger zone (km)
Storage tank	160,000	6.1	1.4
Tanker hold	23,000	7.1	3.0

3.1 Thermal danger zones

The thermal radiation danger zones for the largest spills from a storage tank and a marine tanker at the unloading pier, listed in Table 1, are shown in Figure 1. Both of these extend well beyond the site boundaries, especially so for the tanker spill with fire. Altogether, about 2 square kilometers of land in the Gros Cacouna area is affected by the storage tank spill with fire, while 7 square kilometers of land are at risk from a tanker spill with fire at the unloading pier.

3.2 Flammable vapor danger zones

The blue circles in Figure 2 depict the flammability danger zone for a spill, without fire, from both a storage tank and the marine tanker while located at the terminal pier. For any such spill, the flammable vapor plume or cloud would extend from the spill site about 6-7 kilometers in the downwind direction, encompassing an area of about 6 square kilometers.

3.3 Tanker danger zones

Spills from a fully loaded LNG tanker can occur not only at the unloading dock, as shown in Figures 1 and 2, but also at any point along the ship channel while approaching the terminal. At each point along the ship's route, thermal radiation and flammable vapor danger zones, of the sizes given in Figures 1 and 2, will move with the ship's travel toward the terminal. It is clear that danger zones extending up to 5 kilometers inland from the waterfront will exist all along the approach path to the terminal.

4 Conclusions

1. **The CSA safety requirements for the proposed Cacouna Energy LNG terminal will not prevent harm to humans outside the site boundary because they ignore large spills on land and all spills from marine tankers, whose harmful effects spread well beyond the terminal's boundaries.**

2. **Thermal radiation danger zones from these spills extend as far as 3 kilometers from the spill location. Flammable vapor danger zones extend even further, about 6 kilometers from the spill.**

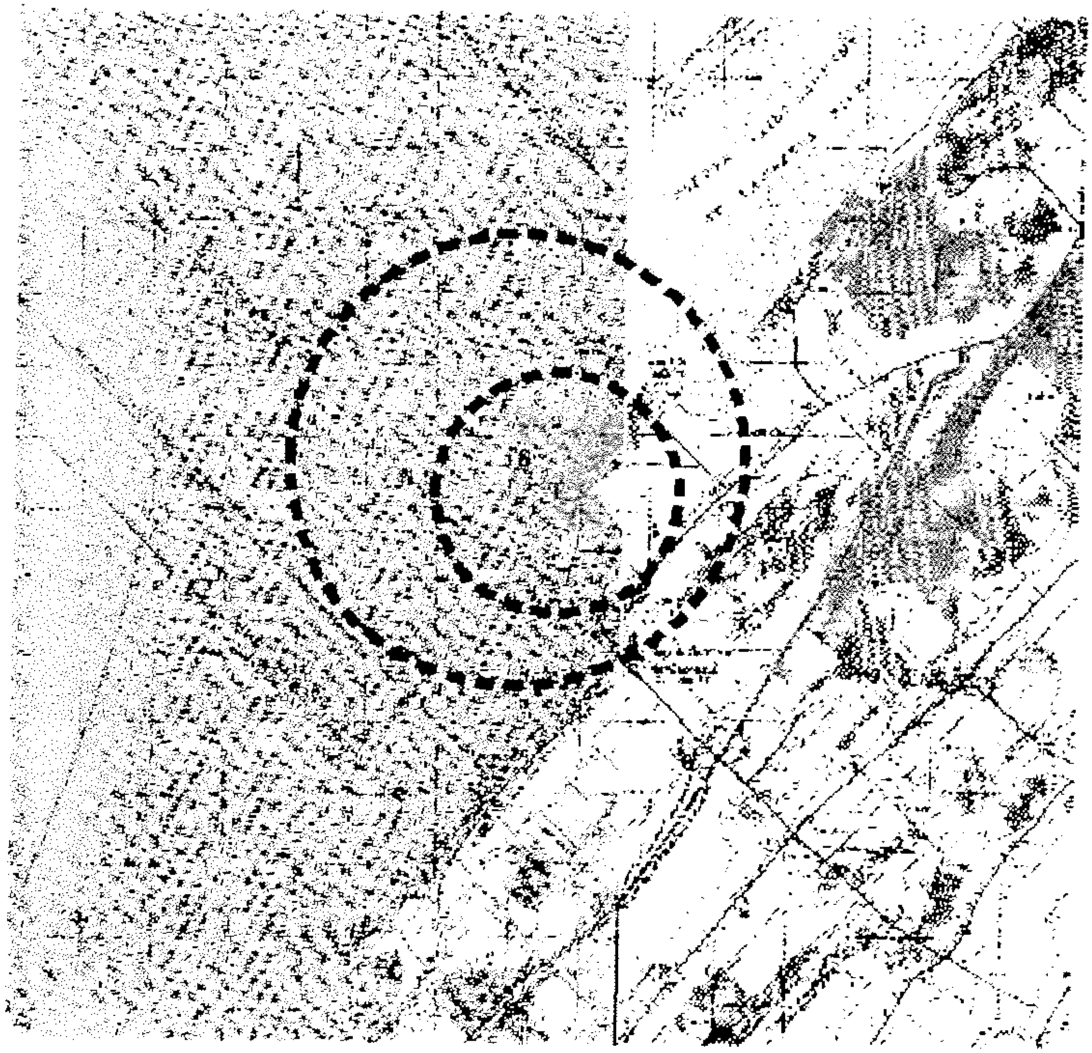


Figure 1: The thermal radiation danger zones for spills listed in Table 1. Red circles are distances to radiation intensities of 1.6 kW/m^2 for a spill with fire; smaller for loss of containment of land storage tank, larger for spill from one hold of LNG tanker. *S* marks the tanker spill location, *T* the land storage tank location.

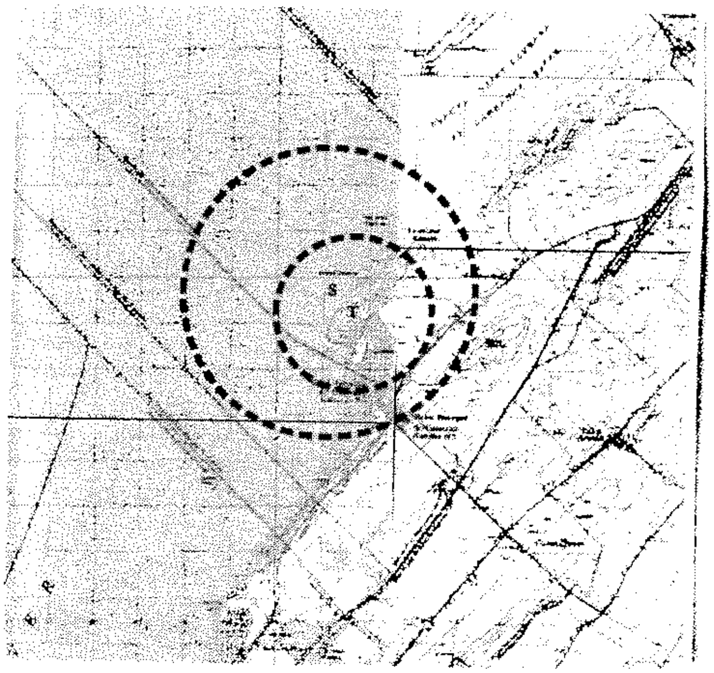


Figure 1: The thermal radiation danger zones for spills listed in Table 1. Red circles are distances to radiation intensities of 1.6 kW/m^2 for a spill with fire; smaller for loss of containment of land storage tank, larger for spill from one hold of LNG tanker. *S* marks the tanker spill location, *T* the land storage tank location.

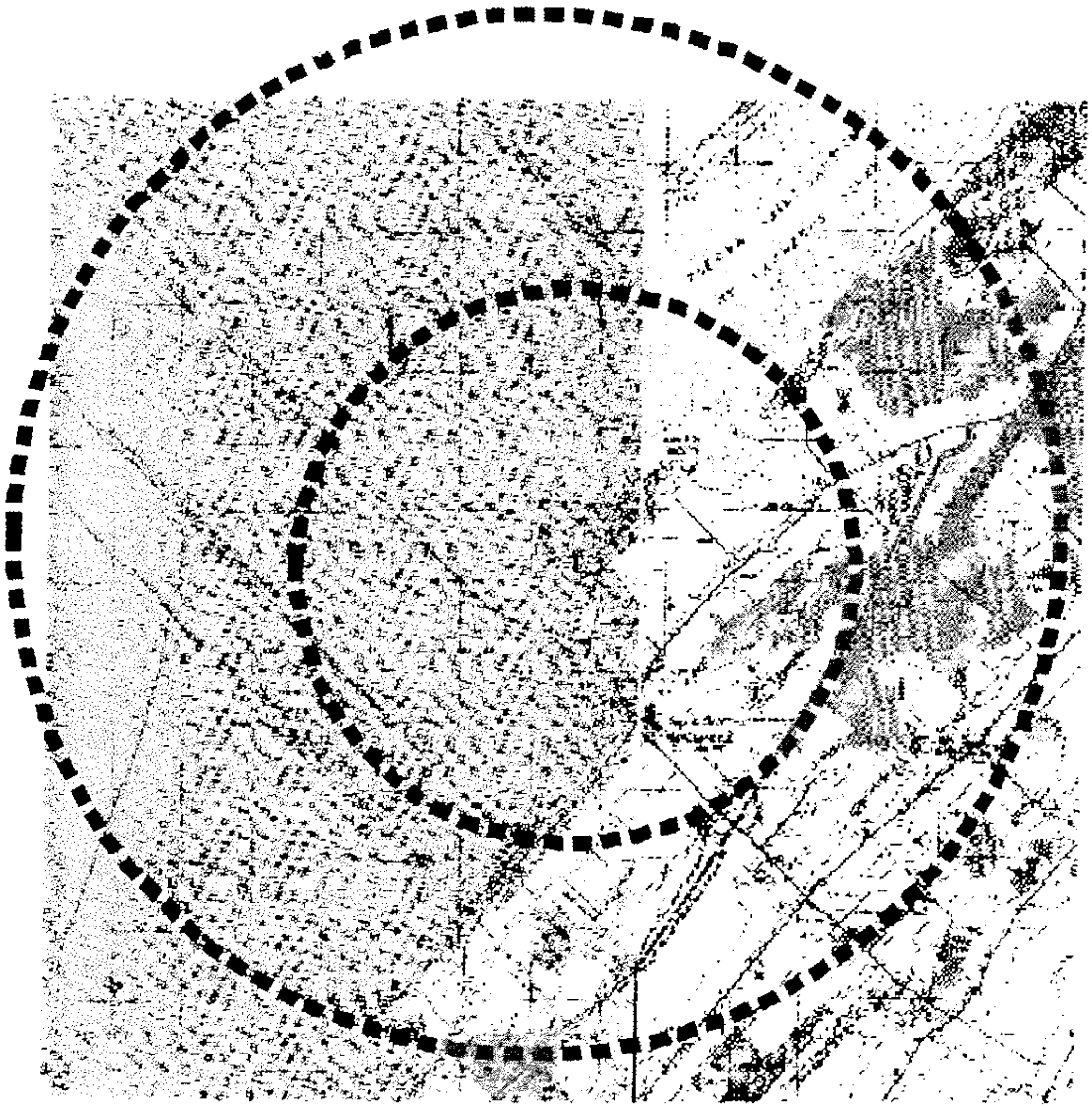


Figure 2: The flammable vapor danger zones for spills listed in Table 1. Blue circles are distances to an LNG vapor concentration of 2.5 % for a spill without fire; smaller for loss of containment of land storage tank, larger for spill from one hold of LNG tanker. *S* marks the tanker spill location, *T* the land storage tank location.

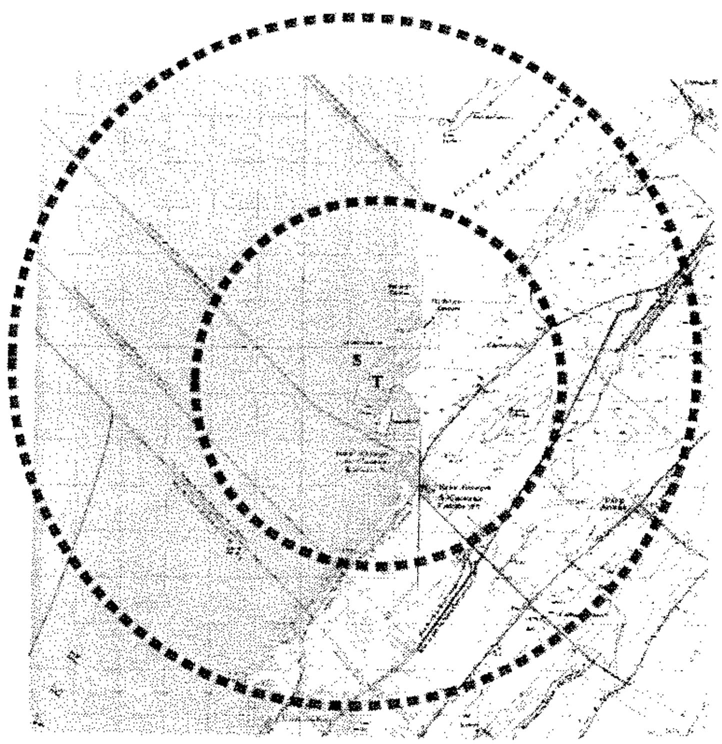


Figure 2: The flammable vapor danger zones for spills listed in Table 1. Blue circles are distances to an LNG vapor concentration of 2.5 % for a spill without fire; smaller for loss of containment of land storage tank, larger for spill from one hold of LNG tanker. *S* marks the tanker spill location, *T* the land storage tank location.

3. **For a tanker spill anywhere along the route leading to the LNG terminal, thermal radiation and flammable vapor danger zones can reach the shoreline if the tanker is less than 3 or 7 kilometers, respectively, from the shore.**

Public Safety Issues at the Proposed EnergyCacouna LNG Terminal

Dr. James A. Fay

77 Massachusetts Avenue, Rm. 3-258

Cambridge, MA 02139

May 10, 2006

1 Introduction

TransCanada Pipelines Limited and Petro-Canada have jointly proposed to construct and operate a liquefied natural gas (LNG) import terminal, denoted as the Cacouna Energy Project[1], in Gros Cacouna, Quebec. To reach this terminal, ocean-going LNG tankers must move through the Chenal du Sud of the St. Lawrence River. Both the terminal site and the tanker route are potential sources of LNG spills and their attendant hazards to human health.

EnergyCacouna has published an Environmental Impact Study[1] that addresses the dangers from accidental (or intentional) spills of LNG. The potential harm to the public is of two types: exposure to thermal radiation from large fires at a spill site or envelopment in a burning vapor cloud blown downwind of the LNG spill.

This report explains the safety hazards that will be associated with the Cacouna Energy project. It delineates the geographic extent of harmful effects that could be expected from LNG spills from marine tankers at the terminal site.

2 Harm to humans from LNG spills

The potential for harmful effects to humans from a given spill is limited to a region surrounding the spill. The degree of harm is greatest close to the spill and decreases with distance from the spill site. Far enough from the spill, harmful effects are insignificant.

There are two levels of harm that need to be taken into account. The worst is damage that can result in death, immediate or after failed medical treatment. The second is lesser injury that may cause temporary or permanent impairment, physical or psychological.

To distinguish among the various levels of harm to humans, we define two geographical zones of harm surrounding the spill site: the *fatality zone* and the *injury zone*. Within the smaller, fatality zone humans can be fatally injured; within the larger, injury zone they can be harmed, but not necessarily fatally; outside the injury zone there will be no injury at all.

As explained below, each zone is described as a circular area, centered on the spill site, with a radial extent related to the level of harm, from either thermal radiation or vapor flammability, appropriate to that zone.

2.1 Thermal radiation injury

Thermal radiation from LNG fires fed by an evaporating pool of spilled LNG can cause pain and first, second or third degree burns to the skin of humans exposed to the radiation, depending upon the intensity of radiation and the duration of exposure. At high enough levels of exposure, death can ensue.

For a given fire, thermal radiation intensity decreases with distance from the fire. For intensities greater than 5 kilowatts per square meter (kW/m^2), severe injury that can lead to death is possible. The thermal radiation fatality zone is that within which thermal radiation intensity exceeds this value. On the other hand, a thermal radiation intensity of less than 1.6 kW/m^2 provokes no noticeable injury. The thermal radiation injury zone is defined to be that within which thermal radiation intensity exceeds 1.6 kW/m^2.

[1] http://www.energiecacouna.ca/en/

2.2 Flammable vapor injury

If an LNG spill does not catch fire at its source, the rapidly boiling liquid forms a plume or cloud that drifts downwind from the source. Fresh air is mixed with the vapor, diluting the vapor more and more with increasing downwind distance, making it easier to ignite. Eventually, however, it becomes so diluted that ignition is impossible, and there is no possibility of starting a flame within the cloud.

Harm to humans can come from being enveloped within a fire propagating through the vapor cloud, or being exposed to thermal radiation from such a fire nearby. Fatalities will result from close proximity to such events, while lesser injury will be possible if flammability is possible only at a distance.

The flammable vapor fatality zone is associated with an average vapor concentration higher than 5%; the corresponding injury zone with an average concentration half as high.

3 Fatality and Injury zones for a tanker spill

The size of fatality and injury zones for a spill from a typical LNG tanker have been determined from three recent studies of LNG tanker spills, the results being listed in Table 1. The studies are identified by the titles Cacouna[2], FERC[3], and Sandia[4]. Each of these reports considers a spill from a typical LNG tanker onto water under nearly the same conditions.[5]

For the thermal radiation zones, the three studies are in close agreement, a consequence of the similarity of the methodology and underlying science. But there is greater disagreement over the size of the flammability zone, reflecting in part the different methods and the scarcity of relevant experimental observations. To narrow the disagreement, the final column of Table 1 lists the geometric mean of the three studies in each category.

The circular fatality (red) and injury (blue) zones for a tanker spill at the unloading pier of the proposed LNG terminal at Cacouna are shown in Figures 1 and 2 for thermal radiation and vapor flammability, respectively.[6] The radial distances from the spill site to the zone edge for all these cases lie between 1.4 and 3.8 kilometers. All of these zones reach well beyond the site boundaries and some clearly impinge on settled areas along route 132.

[2]CacounaEnergy, Environmental Impact Study, http://energiecacouna.ca/fr/eis.fr.html, 2006.

[3]Federal Energy Regulatory Commission, "Consequence assessment methods for incidents involving releases from liquefied natural gas carriers", Report 131-04 GEMS 1288209, ABS Consulting, Inc., May 13, 2004 (www.ferc.gov/industries/gas/indus-act.asp), and its Attachment 1 of June 29, 2004, as listed on the FERC site at http://ferris.ferc.gov/idmws/search/fercgensearch.asp under docket AD04-6.

[4]Sandia National Laboratories, "Guidance on Risk analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water", Sandia report SAND2004-6258, 2004.

[5]The size of the injury zones are not directly given in Cacouna and Sandia, but are extrapolated from the size of the fatality zones.

[6]The zone sizes are based upon the geometric mean values of Table 1.

Table 1: Radial extent (km) of fatality and injury zones for thermal and flammability hazards of tanker spills

Zone	Cacouna	FERC	Sandia	Geometric mean
		Thermal radiation		
Fatality	1.37	1.50	1.31	1.39
Injury	2.37	2.60	2.26	2.40
		Flammability		
Fatality	1.83	4.10	2.45	2.64
Injury	2.63	5.90	3.53	3.80

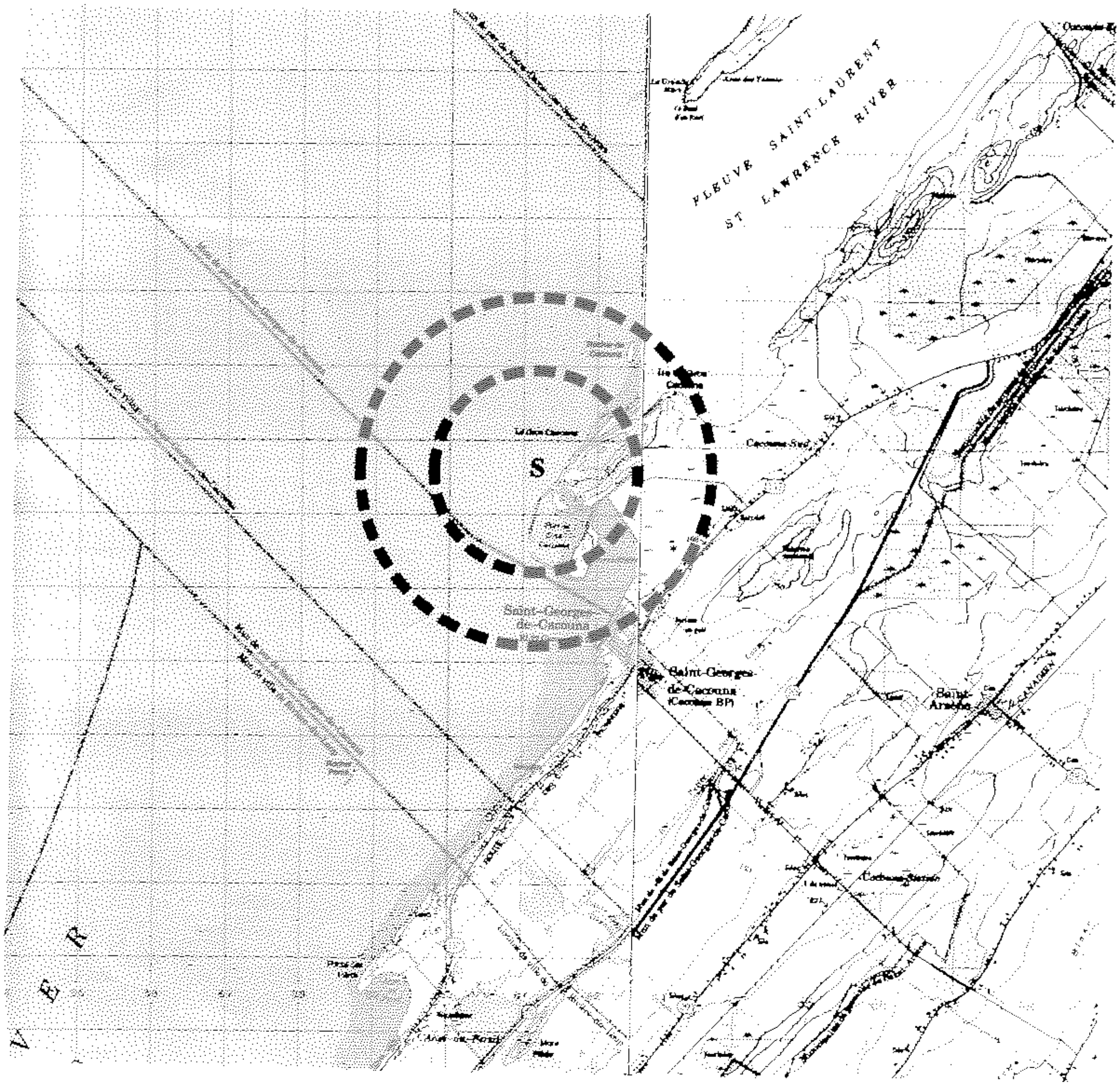


Figure 1: The fatality (red) and injury (blue) zones of thermal radiation hazard from a tanker spill at the unloading pier (S), as listed in Table 1.

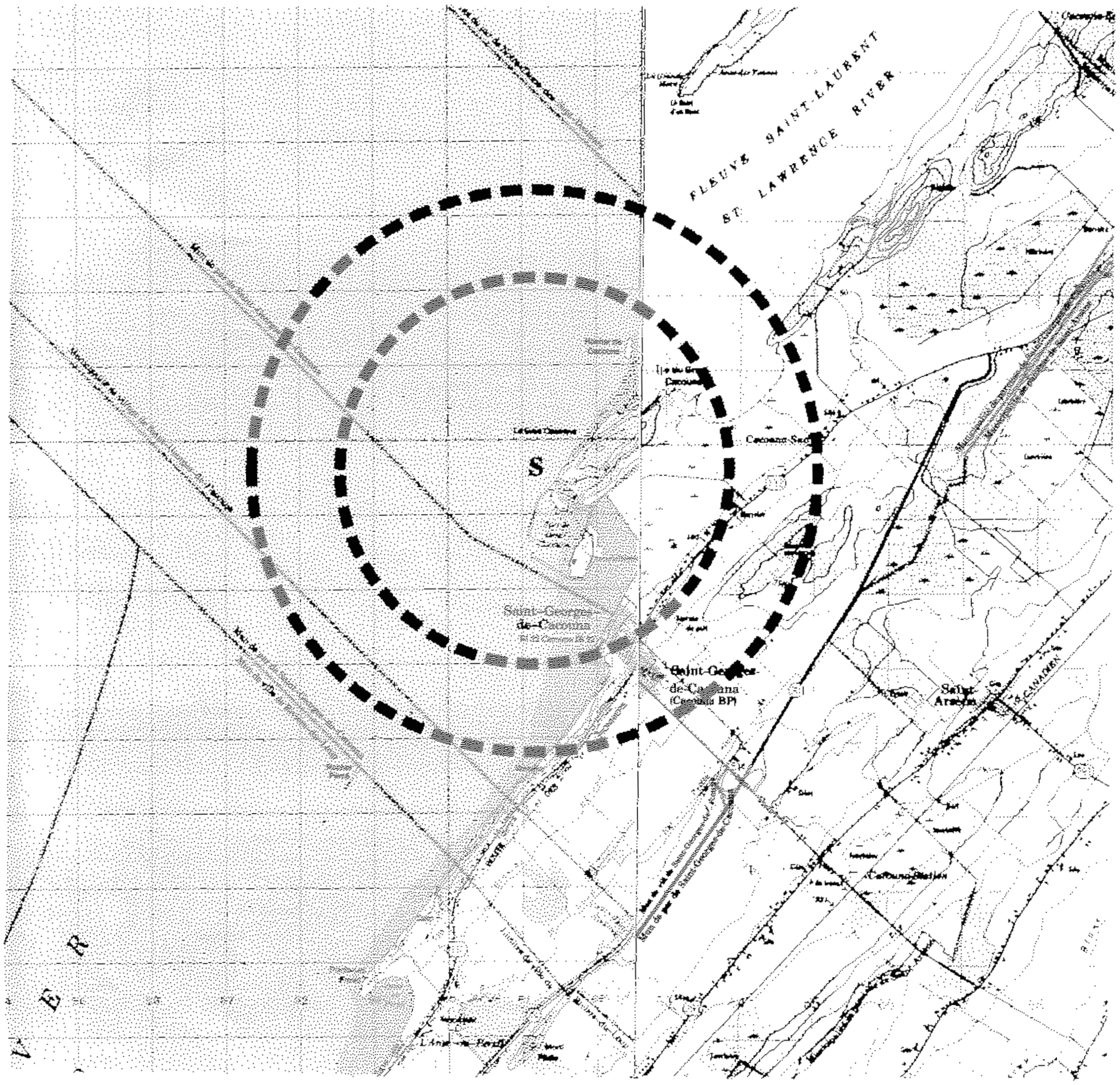


Figure 2: The fatality (red) and injury (blue) zones of vapor flammability hazard from a tanker spill at the unloading pier (S), as listed in Table 1.

Sujet: Re: cacouna project
De: James Fay <jfay@MIT.EDU>
Date: Wed, 1 Mar 2006 14:33:00 -0500
Pour: josbou@cegep-rdl.qc.ca

Josee:

I will be glad to respond to an interview on camera, at whatever time would be convenient for your schedule. I have already such an agreement with the group contesting the Rabaska terminal.

I will neither charge nor accept a fee for this interview.

You can always contact me by phone at the number below.

Regards,

J. Fay

Sujet: Re: Cacouna project
De: James Fay <jfay@MIT.EDU>
Date: Thu, 4 May 2006 16:29:24 -0400
Pour: josbou@cegep-rdl.qc.ca

Josee:

Here is a description of a request for further information to be included in the EIS that would help to show how the risk extends to much greater distances than the report now acknowledges:

"The risk analysis is incomplete, since it does not include the assessment of individual risk for persons in populated areas of Cacouna who can be harmed by the largest accidents at the tanker and terminal.

Figure 9.4-6 presents individual risk contours for accidents listed in Table 9.4-15 that present the major risk to individuals in the terminal area. It excludes large scale accidents with spills from the marine tanker, marine transfer lines, and storage tanks whose harmful consequences would extend to 3 kilometers from the spill site. This figure should be extended to include individual risk contours for such accidents, no matter how small the individual risk may be, out to the distance where fatalities might be encountered from the worst case accidents, as listed in items 7 - 10 of table 9.4-16."

You can add to this some explanatory material of why the EIS isn't telling the full story of the dangers from the terminal.

I will try to revise my report soon, making it short but supporting my analysis.

Usually, the hearing record is held open for a limited time so that written comments can be submitted. If my report is not ready for the hearing, it can be submitted afterwards. In some cases this is more effective, especially for a technical report.

Regards,

J. Fay

Sujet: Cacouna2 report
De: James Fay <jfay@MIT.EDU>
Date: Thu, 11 May 2006 09:15:42 -0400
Pour: josbou@cegep-rdl.qc.ca

Josee:

I have finished revising my Cacouna report. I have mailed a hard copy to your home address. This is suitable for reproduction.

Enclosed is a pdf file of the report. Unfortunately, it does a terrible job of reproducing the illustrations because of problems with my software. That is why I have sent a hard copy.

You can see that the spill hazards are not as great as in my first report, for reasons I won't try to explain here. But the references I have used, which include the Cacouna EIS, are unassailable, so CacounaEnergy won't be able to dismiss them. Nevertheless, my analysis should be useful for giving the public some idea of what the worst case effects might be.

Regards,

J. Fay
--
James A. Fay

Cacouna2 .pdf	**Content-Type:**	application/pdf
	Content-Encoding:	base64