

PUBLIC SAFETY ISSUES AT THE DCP SEARSPORT LPG MARINE TERMINAL

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1. Introduction

The US Army Corps of Engineers (ACE) has called for comments on an application for construction of an LPG marine terminal in Searsport, Maine, submitted by DCP Midstream Partners, LP (DCPMR).² It is soliciting "comments on both the project itself and the range of issues to be addressed in the environmental documentation", among which are public "safety" and marine "navigation".³ These comments are submitted to demonstrate that there are likely to be significant adverse effects on public safety and marine navigation that must be addressed in a comprehensive Environmental Impact Statement conducted by the Corps of Engineers. My qualifications to provide this opinion are submitted in Annex A.¹

2. Description of the Proposed Project

The DCP Midstream application⁴ describes the principal features of the LPG marine import terminal. Those most pertinent to the issue of public safety include an unloading pier at which oceanic-sized LPG tankers of approximately 30,00 metric tons (53,000 cubic meters) cargo capacity will pump their refrigerated cryogenic fluid ashore by pipeline to a storage tank, of 86,000 cubic meters volume (49,000 metric tons), located close to US highway 1. In between LPG marine tanker arrivals, the refrigerated LPG will be processed for storing as a non-refrigerated liquid in pressurized tanks prior to loading into highway LPG tank trucks and railway LPG tank cars for distribution to LPG to end users.

The major public safety concern about such facilities lies in the uncontrolled release to the atmosphere of large quantities of LPG, either as a refrigerated or pressurized liquid, which would rapidly vaporize and mix with air to form a combustible mixture. If ignited close to the spill, it would form a pool fire, causing thermal radiation induced skin burns to persons beyond the edge of the pool, as well as fatalities to those engulfed by the pool. If ignited further downwind, a ground level flame would propagate throughout the cloud, harming anyone in its path. In either case, virtually all of the spilled liquid would be burned up. In addition, there is the

¹ See Annex A for statement of qualifications.

² US Army Corps of Engineers, New England District. Public Notice. Manchester, ME. 31 Jan 2012.

³ Opus cit., p. 2.

⁴ Application for Natural Resources Protection Act and Clean Water Act Section 404 Permits. DCP Searsport, LLC Searsport, Maine.

The principle requirements are: (1) The refrigerated liquid storage tank must be surrounded by an (secondary) impoundment system that will store as much liquid volume as that of the tank (albeit open to the atmosphere above); (2) A sump within the impoundment capable of holding LPG spilled from (transfer) lines spillage; and (3) Tanks, impoundments, and systems draining spilled LPG cannot be closer than 100 feet to a property line that can be built upon, a public way, or a navigable waterway.

These minimal requirements are inadequate in the context of an LPG terminal located in an economic environment dominated by scenic attractions, tourism, fishing (both sport and commercial), and recreational sailing.

4. Experience with LNG Import Terminals

In contrast to these standards for a refrigerated LPG import terminal, those for a corresponding LNG terminal¹⁰ are more stringent. The principal difference is that the possible harmful consequences from a set of defined spills of refrigerated fuel must lie within the site boundaries, or within an exclusion zone beyond the site boundaries from which the facility owner has the authority to exclude the public. The defined spills are: (1) loss of liquid contents from the primary containment vessel and (2) loss of liquid flowing through transfer lines from ship to the storage tank and from storage tank to processing facilities, the volume of such spills being the maximum transfer rate times a ten minute flow time. The spilled fluid must be collected in sumps that prevent its spread beyond the property line. Finally, all such defined spills must pass two tests: (1) if the spilled liquid catches fire, thermal radiation from the blaze may not exceed a defined value at the property line or edge of an exclusion zone, and (2) if the spilled liquid vaporizes to form a vapor cloud or plume, the vapor concentration at a property line or exclusion zone cannot exceed the lower flammability limit of the refrigerated fuel.

A 2007 study compared the radiant energy flux of pool fires formed on water from equal spill volumes (12,500 cubic meters) of LPG and LNG.¹¹ The most pertinent result of this study is that the calculated radiant energy flux, as a function of distance from the center of the spill, is nearly the same for both fuels. This reinforces the argument that the radiation hazard from pool fires at LPG and LNG import terminals are comparable for equal storage volumes and that LPG import terminals should be evaluated for safety using the same standards as apply to LNG terminals.

¹⁰ Code of Federal Regulations, 49 CFR, Part 193.

¹¹ David W Johnson and John B. Cornwell. Modeling the release, spreading, and burning of LNG, LPG and gasoline on water. *Journal of Hazardous Materials* **140** (2007) 535-540.

5. It is Imperative That a Maine Example is Followed Here

An example of the kind of safety analysis needed for the environmental impact statement of the DCP Searsport LPG import terminal can be seen in the Draft Environmental Impact Statement for the proposed Downeast LNG import terminal on Passamaquoddy Bay¹². This part of the EIS considers, among other things, the thermal radiation consequences of a pool fire ignited after a loss of primary containment of one of two LNG refrigerated storage tanks. Each tank stores 200,000 cubic meters of LNG (compared with 53,000 cubic meters of LPG for DCP Searsport). The corresponding distance from the fire center to the 5 kilowatt per square meter thermal flux level is 950 feet.

One might think that a similar loss of primary containment accident at the DCP Searsport LPG import terminal would produce a much smaller thermal flux distance since its storage volume is only a quarter of that of the Downeast LNG tank. But the resulting pool fire diameter determines the thermal flux distance, and for the DCP Searsport LPG tank that is much larger than for the Downeast tank. As a result, the distance to the 5 kilowatt per square meter thermal flux level is 2400 feet (Fig. 1). This far exceeds the distance to the nearest property line of 300 feet. It encompasses about a mile of Highway 1, and encloses about ten square miles of property not owned by DCP Searsport. It is certain that the DCP Searsport LPG import terminal would also fail to prevent flammable gas from crossing beyond the terminal property boundaries.

6. Explosions

The U.S. Environmental Protection Agency has issued risk management program guidance for propane storage facilities that apply to the DCP Searsport LPG import terminal¹³. Under this program, the overpressures from an explosion of LPG plumes must be determined for the storage tank at the DCP Searsport LPG import terminal. Using the EPA RMP*COMP program, the calculated distance to an overpressure of 1 psi is 3.7 miles for the loss of contents of the LPG storage tank (Fig. 2). This overpressure contour encloses an area of 150 square miles.

7. Conclusion

It can be seen from the above sections, the public safety implications of accidental spills at the proposed DCP Searsport LPG import terminal extend far beyond the

¹² Federal Energy Regulatory Commission, FERC Docket CP07-52, Draft Environmental Impact Statement, Section 4.12, Reliability and Safety. 2009.

¹³ Risk Management Program Guidance for Propane Storage Facilities (40 CFR Part 68). EPA 550-B 00 001. Washington, D.C. 2009.

terminal boundary. For these reasons, there must be an environmental impact statement in conformity with 40 CFR 1508.27(2) (4) and (5). Any environmental impact statement for the project should include the considerations outlined above in order to fulfill both federal and state requirements.

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Figure 1: Thermal Radiation Hazard Zone

DCP Midstream, LP, Liquefied Propane Gas ("LPG") Terminal
Searsport, Maine

