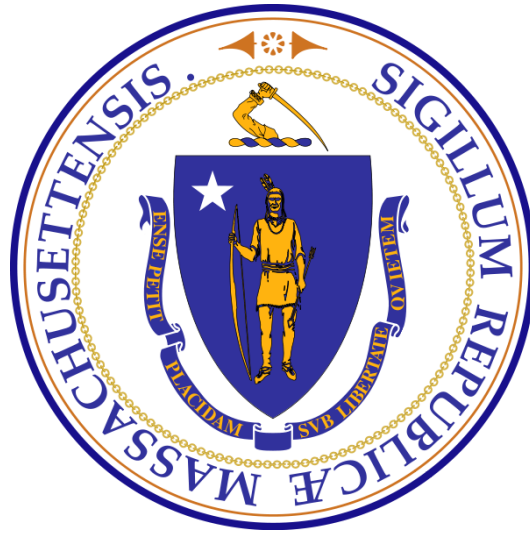


**COMMONWEALTH OF MASSACHUSETTS**



**Large Volume/High Concentration Ethanol Incident Response Appendix to  
the  
Hazardous Material Annex to the  
Comprehensive Emergency Management Plan**

**June 29, 2016**

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## 1. INTRODUCTION

This Appendix establishes a coordinated framework to support incident/unified commanders responding to large volume and/or high concentration ethanol rail or barge incident occurring within the Commonwealth of Massachusetts. It identifies notification, roles and responsibilities, and resource allocation activities within that support framework.

### a. Purpose

The purpose of the Massachusetts Large Volume/High Concentration (LV/HC) Ethanol Incident Response Appendix is to promote situational awareness and outline the operational activities surrounding a state response to large scale emergency involving ethanol, such as the response to an incident involving railroad tank cars or a barge containing ethanol, within the Commonwealth of Massachusetts.

**Note:** in the context of this Appendix, the term “ethanol” typically refers to denatured ethanol (i.e., ethanol with 3% to 5% (but may be as high as 7%) gasoline or other denaturant added to the ethanol unfit for drinking).

The activities conducted by the Commonwealth are intended to support local responders as directed by the Massachusetts Comprehensive Emergency Management Plan (CEMP) and may include activation of Massachusetts Emergency Support Function 10 – Environmental Protection and Hazardous Materials (MAESF-10), MAESF-4 – Firefighting, and other Emergency Support Functions. This Appendix intends to provide the information required to refine the plans and procedures documented in the CEMP Hazardous Materials Annex to address the challenges involved with a LV/HC ethanol incident.

This Appendix does not provide in-depth guidance for dealing with related or coinciding activities such as shelter-in-place, public warning, or evacuation operations. Those response elements are covered in the CEMP and supporting annexes. In addition, intentional releases impacting homeland security are governed by the State Terrorism Incident Response Plan and require a separate response structure than described in this Appendix and close involvement with law enforcement and the Federal Bureau of Investigation (FBI).

To assist the local on-scene Incident Commander (IC) at a LV/HC ethanol incident, a “Quick Reference” card with key response information is provided in **Attachment 2**. A checklist for summarizing critical information about an ethanol incident is also presented in **Attachment 4**. For a more detailed guide to local emergency management and incident command response to LV/HC ethanol incidents, see the Large Volume / High Concentration Ethanol Incident Response Planning Guidance (MEMA, 2016).

### b. Scope

This Appendix outlines the actions the state intends to take in support of a LV/HC ethanol incident, including mobilizing and providing personnel, equipment, supplies, and other resources as required. The Massachusetts Contingency Plan (MCP: 310 Code of Massachusetts Regulations: Massachusetts Department of Environmental Protection 40.0000 Massachusetts Contingency Plan Subpart C: Notification of Releases and Threats of Release of Oil and Hazardous Material; Identification and Listing of Oil and Hazardous Material and Subpart D:

Preliminary Response Actions and Risk Reduction Measures [310 CMR 40.0300 and 40.0400]) governs state participation in the response and recovery process, including long-term monitoring and remediation.

This Appendix addresses actions surrounding an initial response, mitigation activities, and the recovery process for a railroad incident, including the interfacing with the appropriate authority having jurisdiction (local Fire Department [FD], United States Environmental Protection Agency [USEPA], United States Coast Guard [USCG], and/or Massachusetts Department of Environmental Protection [MassDEP]). Additionally, this Appendix briefly addresses incidents that may occur off-shore or in navigable waters under the USCG jurisdiction.

### **c. Policies**

The LV/HC Ethanol Incident Response Appendix is a Functional Appendix to the Hazardous Material Annex, which in turn is an Annex of the Massachusetts CEMP. The Appendix follows the policies and regulations identified in the CEMP. As an incident requires, and at the direction of the Massachusetts Emergency Management Agency (MEMA) Director or State Emergency Operations Center (SEOC) Manager, this Appendix will be implemented to support activities related to LV/HC ethanol incidents in the Commonwealth. MEMA will provide overall support and situational awareness to the on-scene IC and/or Unified Command (UC) regarding coordination of the state response to impacted areas of the Commonwealth in the event of an emergency or disaster.

The MAESF agencies and organizations detailed in this annex will work collaboratively to support the Appendix in accordance with following:

- This Appendix supersedes the 2011 Large Volume/High Concentration Ethanol Annex currently referenced in the CEMP.
- This Appendix does not supersede existing local ethanol response plans, but rather is designed to supplement and support them. This Appendix builds upon established capabilities at the local level.
- The MAESF agencies and organizations assigned responsibilities within this Appendix will develop and maintain the necessary plans, standard operating procedures and mutual aid agreements to successfully accomplish assigned tasks.
- MEMA is responsible for overall coordination of this Appendix and for coordinating with responsible MAESFs to access any additional resources necessary to support LV/HC ethanol incident response efforts across the Commonwealth, such as the response to an incident involving railroad tank cars or a barge containing ethanol.

## **2. SITUATION AND ASSUMPTIONS**

See **Attachment 3** for information about the general conditions and properties of ethanol and basic information on firefighting and spill response for a LV/HC ethanol spill.

### **a. Situation**

The basic statements listed below describe the situation related to ethanol transport and potential for ethanol transport related incidents throughout the Commonwealth of Massachusetts. These statements lend context to planning for a LV/HC ethanol release.

***i. Current Methods for Ethanol Transport***

Carriers of LV/HC ethanol typically include railroads and marine vessels, such as tank barges (See **Attachment 4** for common LV/HC ethanol transportation routes). Although on-road tanker transports (i.e., tractor trailer tanker trucks) and tank ships (i.e., tankers – marine vessels for bulk liquids) may be used to transport LV/HC ethanol, these modes are not specifically addressed in the Appendix; however, the information provided for rail tank cars and barges, respectively, is generally applicable to these other modes of transport.

**Attachment 5** provides the contact information for carriers of LV/HC ethanol.

1. Railroad Transport

The most common mode of transporting LV/HC ethanol in Massachusetts is via the railroads. Commonly referred to as a “virtual pipeline,” a single-unit train (typically 80 to 100 tank cars in a unit train) may contain upwards of 3 million gallons of ethanol. In addition, railroads may have one or more tank cars with ethanol on a general consist (i.e., a train hauling mixed freight cars). Railroad tank cars typically have capacities of approximately 24,000 to 32,000 gallons. The most common type of tank car used to transport ethanol in 2015 was the DOT 111, but CJC 1232 tank cars (jacketed and non-jacketed) are also used. The newer, safer DOT 117 tank cars are being phased in for general use for transporting ethanol. Additional information about railroad tank cars that may be used is presented in **Attachment 6**.

2. Marine/Navigable Waterway Transport

On the navigable waterways of Massachusetts, such as along the coast and in Boston Harbor, ethanol is generally shipped in tank barges. Tank barges are non-self-propelled vessels that use tugs to push or tow them through the waters. They have minimal or no crew accommodations onboard, and are typically used for inland and coastwise trade. Tank barges used to ship ethanol usually have cargo capacities of 10,000 to 15,000 barrels (420,000 to 630,000 gallons). Additional information about barges that may be used is presented in **Attachment 6**.

***ii. Locations Where Ethanol is Transported***

Railroad lines that may be used for transporting ethanol pass through densely populated (urban) and less densely populated (rural) areas (see **Attachment 4**). Barges that may be used for transporting ethanol travel through near shore marine (i.e., saltwater) environments. Key factors to be considered for accidents in these different locations are described in the following sections.

1. Urban

Urban environments are the towns and cities characterized by large populations and number of critical facilities that may be impacted by an accident involving LV/HC ethanol. Key factors to be considered for accidents in urban areas include, but are not limited to, the following:

- Fire or the potential for a fire
  - defensive tactics (control and containment),
  - offensive tactics, and/or

- non-intervention tactics;
- Evacuation
  - hospitals and medical centers,
  - long-term care facilities (nursing homes, rest homes, assisted living),
  - schools and daycare,
  - colleges and universities, and/or
  - residences and businesses; and
- Highway or road closures
  - commuter transit (bus, rail);
- Contain release:
  - flow into storm drains or sewers, and/or
  - flow down streets or natural drainages.

2. Rural

Rural environments are generally sparsely populated areas with fewer facilities that may be impacted by an accident involving LV/HC ethanol. In addition, railroad lines may be in relatively remote locations that are not close to established roads, which may make getting the needed resources close to the accident scene difficult. Key factors to be considered for accidents in rural areas include, but are not limited to, the following:

- Fire or the potential for a fire
  - access to incident,
  - allow fire to burn;
- Evacuation
  - hospitals and medical centers,
  - long-term care facilities (nursing homes, rest homes, assisted living),
  - schools and daycare,
  - colleges and universities, and/or
  - residences and businesses;
- Highway or road closures;
- Contain release:
  - flow into natural drainages,
  - into water bodies or waterways,
  - into environmentally sensitive areas.

3. Marine/Navigable Waterways

Barges that may be used for transporting ethanol generally come through the Cape Cod Canal and into Boston Harbor. Along these navigable waterways, there are generally little or no populations or facilities that may be impacted by an accident involving LV/HC ethanol; however, commercial and recreational vessel traffic, as well as adjacent



infrastructure (e.g., bridges, dock/piers) may be affected. Key factors to be considered for accidents in marine environments include, but are not limited to, the following:

- Fire or the potential for a fire
  - allow fire to burn,
  - move vessel to safe location;
- Evacuation
  - distance from shore,
  - residences and businesses,
  - commercial and recreational vessel traffic;
- Bridge or road closures;
- Contain release:
  - not practicable on water.

### ***iii. Potential Water Contamination***

#### **1. Contamination of surface water (drinking or process water intakes)**

A release that enters surface waters may impact drinking water supplies, as well as process water, aquaculture, or cooling water. Specifically, a release may directly enter (e.g., from an adjacent rail line) or flow into a reservoir, lake stream, river, or other surface water body in the vicinity or upstream of water intakes.

In water, the ethanol component will readily mix with water and the denaturant will separate and float on the water surface. Therefore, the water users who will be potentially impacted will need to be informed of the incident, so they can determine if their intake(s) needs to be shut down and for how long.

In addition, impacts from ethanol entering a surface water body may cause significant fish kills. This may be due to direct contact with the ethanol or because the natural degradation of ethanol will deplete the oxygen in the water. Furthermore, an ethanol release into a surface water body may impact the recreational uses of the water body.

#### **2. Contamination of groundwater**

Ethanol may also infiltrate into the groundwater and potentially impact groundwater. This may impact public and private water sources for drinking and other uses, so the users will need to be notified. In addition, bio-degradation of ethanol in groundwater may release large quantities of methane, so potential long-term impacts, such as methane build-ups in confined spaces (e.g., cellars, basements, under concrete slabs), need to be monitored.

### ***iv. Ethanol Incidents***

The MCP and federal regulations (Title 40 of the Code of Federal Regulations Part 110 [40 CFR 110] and 49 CFR 130) require that the responsible party for a denatured ethanol spill (i.e., carrier or facility where the spill occurs) report the spill to MassDEP, the National

Response Center (NRC), and other appropriate persons and agencies. The NRC will provide the required notifications to federal agencies, such as USEPA, USCG, and the Federal Railroad Administration (FRA), as needed, depending on the location and conditions of the spill.

See the CEMP and the Commonwealth of Massachusetts Threat Hazard Identification and Risk Assessment (THIRA) for specific situational assumptions, threats, and hazards.

**b. Planning Assumptions**

Below is a list of assumptions used when constructing this Appendix:

1. LV/HC ethanol incidents may occur at any time with little or no warning.
2. The local on-scene Incident Commander will typically be the chief of the local fire department or her/his designee for a land-based (i.e., railroad) incident.
3. The UC will be established as early as practicable for LV/HC ethanol incidents that involve several jurisdictions and/or several agencies from the same jurisdiction.
4. The initial UC should include fire, law enforcement, emergency medical services, and a representative for the Responsible Party (RP).
5. The carrier is the RP for a release and will provide technical and tactical response resources to mitigate the release and is financially responsible for the response, clean-up, remediation, and recovery.
6. Local responders have some familiarity with responding to ethanol releases.
7. LV/HC ethanol incidents may overwhelm local and regional responders.
8. It is usually better to control and contain a LV/HC ethanol fire and let it burn out; only attempt fire suppression for life safety (i.e., rescue), if an offensive strategy can be implemented safely.
9. Most fire departments and fire districts will not have sufficient Alcohol-Resistant Aqueous Film-Forming Foam (AR-AFFF) foam concentrate in inventory to deal with a LV/HC ethanol release and fire, such as from a High Hazard Flammable Train (HHFT – for example an ethanol train) derailment or a fire on a barge transporting ethanol.
10. The local on-scene Incident Commander will request mutual aid and Commonwealth of Massachusetts resources, as needed, and representatives of the state agencies may form or enter the UC with the local on-scene Incident Commander.
11. Agencies of the Commonwealth may be requested to provide assistance response support.
12. Along with resources specifically tailored to HAZMAT response, Commonwealth agencies have additional assets that may be useful when mitigating an ethanol release.
13. At the time of an aid request, state resources may be committed to other emergency response efforts, potentially including coinciding releases.
14. The Commonwealth will prioritize its operational needs and deploy or redeploy assets based on need and availability.
15. The Commonwealth will call upon mutual aid resources and the federal government as needed.

16. Proper implementation of local plans reduces or prevents releases and related harmful exposures to the public and to the environment.
17. Use of local and outside resources requires careful coordination.
18. Protective actions for the general population may include in-place sheltering or evacuation.

### 3. CONCEPT OF OPERATIONS

#### a. General

This section details the concept of response operations, including notifications, activation, response operations, and recovery actions. In **Attachment 2** is a one-page “quick reference” guide for LV/HC ethanol incidents that summarizes the key points of the concepts of operations for local FDs. A checklist for summarizing critical information about an ethanol incident is also presented in **Attachment 2**.

#### b. Activation

MEMA and other state agencies, such as MassDEP, will start monitoring a LV/HC ethanol incident when they learn of it, such as when a Spill Notification is made to the MassDEP spill hotline that is staffed by the MEMA Communications Center, even if MEMA and/or the state agencies are not formally contacted for assistance. However, the lead response agency (typically the local FD) should specifically notify MEMA of a LV/HC ethanol incident, even if state resources are not initially needed. When the MEMA Communications Center Based starts monitoring an ethanol incident, MEMA will place activation this plan on stand-by status and full activation will depend on how the incident progresses.

The initial notification to MEMA by the lead response agency should include as much of the information shown on the checklist in **Attachment 2** as is available when MEMA is notified; however, the notification to MEMA should not be delayed while obtaining this information.

Once it is determined that the incident will require state support and resources, there are two different paths to activate this plan: through MEMA or through the Fire Control Point.

##### ***i. Activation through MEMA***

This plan may be activated by the MEMA Director or SEOC Manager upon notification of MEMA of an actual or potential LV/HC ethanol incident. Upon plan activation the SEOC will act in a support role for the IC/UC to determine whether additional state resources are required. When the need for additional assistance is determined, a mission task request will be sent to the SEOC, which will make contact with the lead state agency for the appropriate MAESF to fill the request. Other MAESFs will be activated as needed. Note that calls to the MassDEP Spill Reporting Line are routed through the MEMA Communications Center, which will start monitoring the incident and start to assess the need for plan activation.

##### ***ii. Activation through Fire Control Point***

Upon the Fire Control Point receiving notification of an actual or potential LV/HC ethanol emergency, the Fire Control Point may standby to activate the Massachusetts Fire and EMS Mobilization Plan (the Fire Mobilization Plan). The Fire Control Point may then activate the

Fire Mobilization Plan when the local FD requests more resources than can be provided from the mutual aid FDs within the local FD's fire district.

Upon activation of the Fire Mobilization Plan, the Fire Control Point should notify MEMA that the Fire Mobilization Plan is being activated. The Fire Control Point should also provide the information that MEMA requires to determine the need to activate this plan to provide support to the IC/UC in handling the incident.

**c. Notification**

Although separate reporting requirements under the MCP and various federal regulations require the responsible party to report to MassDEP and the NRC, emergency responders need only escalate notifications in the event that additional resources may be needed. However, MEMA should be notified directly or through Fire Control Point of any LV/HC incident. The chain of notification is discussed in the following section.

**i. Local Agencies**

1. Initial Discovery – A carrier/facility operator, first responder, or member of the general public will likely discover the ethanol release. Note that for a marine incident, the carrier is required to notify the USCG and the public may notify the Massachusetts Environmental Police (MEP), who will in turn notify MassDEP, and other federal and state agencies in accordance with their procedures.
2. Local Notification – Calls from the discovering party to 9-1-1, the appropriate Fire District Control Point, or communication via public safety radio will be the most likely avenue for local FD notification. Note that for an incident on land (e.g., railroads incident) the Fire Chief for the local FD, or her/his designee, will be the IC until the UC is established; for a barge incident on a navigable waterway, the USCG will likely be the IC until the UC is established.
3. Regional – Local FD may call for support from adjacent municipalities (i.e., mutual aid), from the Fire District, or directly to MassDEP and/or the regional Hazardous Material Response Team (HMRT) in accordance with local plans and procedures.

**ii. State Agencies**

1. MEMA – In the event of a LV/HC ethanol incident, MEMA personnel will be notified, as appropriate, via the Communications Center.
2. MAESF 10 Lead Agencies – MAESF 10 lead agencies such as the MassDEP, Department of Fire Services (DFS), and Department of Public Health (DPH) will be notified by MEMA if the activation of MAESF 10 is required. These lead agencies act in coordination with other MAESFs so that the various aspects of a response are supported, and specifically MAESF 10 coordinates closely with MAESF 4. Through MEMA, MAESF 10 is the conduit through which state resources are channeled into a HazMat incident response. Note that one or more of the lead agencies may have been notified directly by the on-scene IC/UC in accordance with requests for assistance or support.
3. State Agencies – MEMA will notify state agencies with direct and support roles, as needed, when it is determined that state action is or may become necessary.

4. Executive Branch – MEMA will notify the executive branch in accordance with its internal policies and procedures.
5. Alternate Notification – Due to MCP reporting requirements for the responsible party or requests for assistance from the Fire District, MassDEP may be notified of a release before MEMA is formally notified. Therefore, MassDEP should contact MEMA to confirm it was notified, if MassDEP receives information concerning a LV/HC ethanol incident.

Note that when there is an ethanol release, the MCP requires the carrier/facility operator call MassDEP Emergency Response after calling 9-1-1. Also, a member of the general public may also contact MassDEP Emergency Response. Furthermore, the carrier may also call the NRC regarding an ethanol release, in accordance with federal regulatory requirements.

### ***iii. Federal Agencies***

Federal Assistance – If the carrier calls the NRC to report the ethanol incident, relevant federal agencies (e.g., USEPA, USCG, FRA) will be notified by the NRC in accordance federal regulations.

MEMA may request federal assistance for a major LV/HC ethanol incident through the Regional Response Team (RRT). Requests will be coordinated in accordance with the National Incident Management System (NIMS) and the National Response Framework (NRF).

### ***iv. Carrier***

If the carrier does not make the initial notification, it is likely due to the carrier's crew being incapacitated by the incident. Therefore, the IC/UC or their designee should confirm that the carrier has been notified about the incident and that the carrier acknowledges the notification. If this plan is activated, the IC/UC may request that the MEMA confirm that the carrier was notified and acknowledged the notification. Contact information for LV/HC ethanol carriers is provided in **Attachment 5**.

In addition, the carrier will have specialized knowledge and experience that will be critical for the response effort, and will also provide resources for the response, including personnel, equipment, and contractors with applicable expertise and experience.

### ***v. Public***

1. Notification of critical / vulnerable facilities within the area of concern will be made at the request of the Incident Commander and these notifications will be coordinated through the Emergency Communications and Warning Annex of the CEMP.
2. Public notification will be made at the request of the UC and coordinated by the Public Information Officer (PIO) as general accordance with the Emergency Communications and Warning Annex.

d. Activities

i. Primary Activities

The primary objective for a LV/HC ethanol incident is life safety; secondary objectives are the protection of property and the environment. To achieve these objectives, the primary response activities include fire control and spill control. **Figure 1** illustrates the progression of a “typical” LV/HC ethanol train derailment involving multiple tank cars where at one tank cars was breached in the accident. In nine of eleven recent accidents of this type where tank cars were breached, the ethanol caught fire.

1. Firefighting

It is usually better to control and contain a LV/HC ethanol fire and let it burn out. Fire suppression should only be attempted for life safety (i.e., rescue), and only if an offensive strategy can be implemented safely. As **Figure 1** illustrates, the Incident Commander has up to approximately two hours to implement an effective offensive firefighting strategy; however, the offensive strategy should not be implemented if there are not adequate water, AR-AFFF concentrate, and trained firefighters available for the estimated size and needs of a given incident. Note that due to the potential environmental impacts of an ethanol release and since ethanol is relatively clean burning, allowing ethanol to burn off is often preferred if it catches fire.

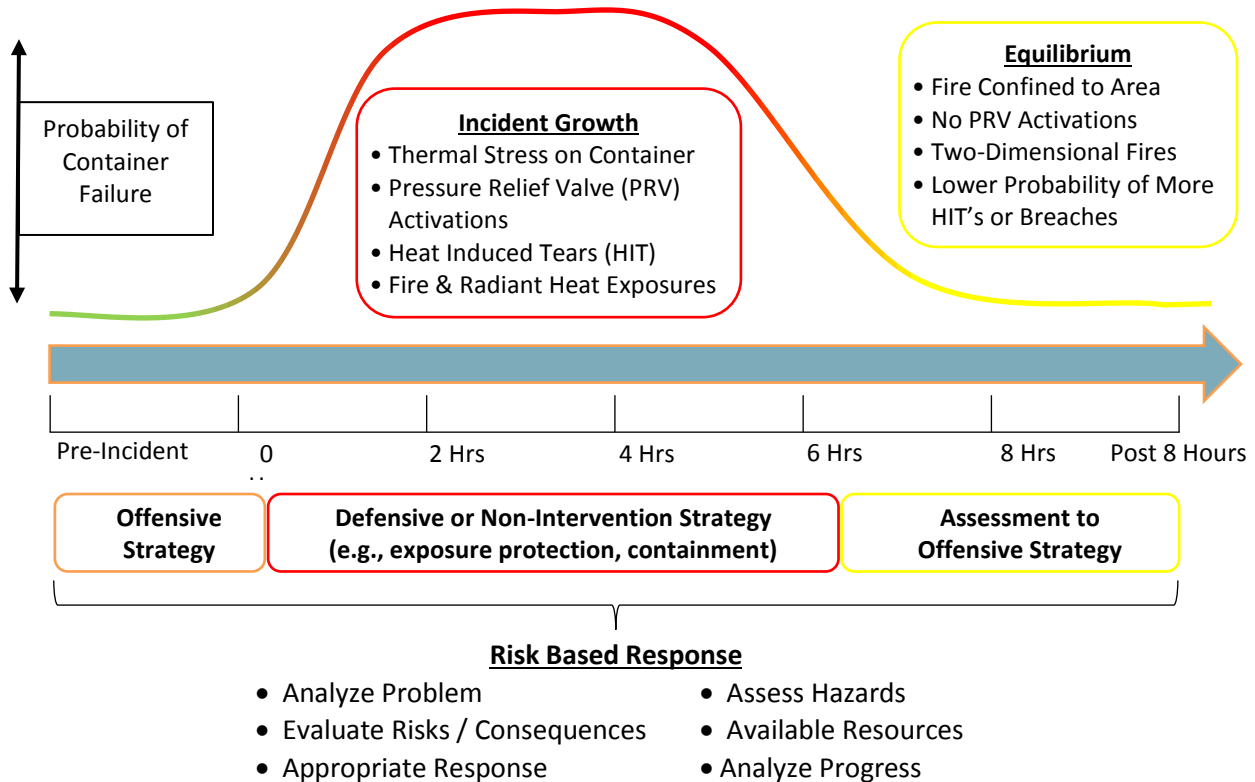


Figure 1 – Response Time Line for Typical Railroad Incident

After one or more tank cars become involved in a fire, a defensive or non-intervention strategy (i.e., control and contain) is recommended. In addition, the defensive strategy should include spill control, as discussed in the following section.

Based on previous incidents, after approximately six to 12 hours, most or all of the ethanol will have burned, infiltrated into the ground, and/or become sufficiently diluted with water. At this point it may be appropriate to implement offensive tactics to extinguish any remaining fire. However, the purer the ethanol burns the cleaner or less visible the flame, so thermal imaging devices or other means (such as straw brooms held above suspected areas) should be used to detect areas that may still be burning.

As noted above, due to the potential environmental impacts of an ethanol release and since ethanol is relatively clean burning, allowing ethanol to burn off is often preferred if it catches fire. Furthermore, conducting an *in situ* burn of ethanol to dispose of it, after a fire has been extinguished, requires numerous agency approvals and may not be feasible before environmental damage is done.

Although the available amounts of AR-AFFF foam and other resources may not be sufficient to put out a LV/HC ethanol fire, this foam may can be used in other ways to control an incident. For example, if ethanol enters a storm drain or sewer, AR-AFFF foam can be used to suppress vapors in the lines and minimize the potential for igniting the vapors and causing additional damage.

### 2. Spill Control

Spill control at an LV/HC ethanol incident consists of stopping leaks, preventing new leaks from forming, and containing and collecting ethanol that was released. For a LV/HC ethanol incident, state agencies and spill response contractors will be instrumental in controlling spills. Specifically, the HMRT are trained and equipped to stop leaks and MassDEP technicians are trained and equipped for spill containment and collection, so both agencies will be needed for an incident. In addition, MassDEP will provide technical and scientific support and sensitive receptors information to the UC at a LV/HC ethanol incident.

Additionally, the carrier responsible for the incident is required by federal regulations to provide spill response contractors who are trained and equipped to contain and collect the released ethanol. If the carrier is unable to hire an appropriate contractor or respond in a timely manner, MassDEP may hire one of its on-call spill response contractors to conduct response actions. Spill response contractors also typically provide monitoring equipment, temporary storage tanks and containers, and other support equipment. These contractors may also arrange to properly dispose of the collected ethanol, impacted soil and water, and used absorbents and personal protection equipment (PPE) under direction of the MassDEP.

**ii. Secondary Activities**

1. Security

Security includes establishing and maintaining a perimeter, crowd control, and traffic control, and these functions are described with additional guidance in Section IV C.1.h of the CEMP Hazardous Materials Annex.

2. Public Information

Public information for a LV/HC ethanol incident, including warnings and on-going service announcements and/or information sharing, will be coordinated through either the on-scene PIO or the SEOC, in accordance with MEMA's public information procedures. In addition, the UC must approve information disseminated regarding the specific incident. During certain complex events, PIOs from the state level may be requested to be on-scene. In the event that PIOs are requested, these requests will be coordinated through the SEOC.

Public Information will be tailored to the public's needs and accessible modes of communication. Some cultures may be sensitive to government authority or reluctant to heed advice to leave their homes. Rapid involvement of foreign language media outlets and community or religious leaders may be needed to effectively communicate to specific populations.

3. Evacuation/Shelter-in-Place

When a LV/HC ethanol incident impacts or has the ability to impact the nearby population, a shelter-in-place or evacuation decision must be made. Section IV C.1.i of the CEMP Hazardous Materials Annex describes the evacuation and shelter-in-place options in more detail and provides additional guidance.

4. Clean-up, remediation, and recovery

Once the response phase of a LV/HC ethanol release is complete, recovery actions and remediation activities will begin. Depending on the incident, the recovery action process is usually overseen by MassDEP, as described in Section IV D of the CEMP Hazardous Materials Annex.

**e. Transportation**

Responding agencies are responsible for providing their own transportation resources and meeting their own transportation needs. Transportation needs that exceed these capabilities will be routed at the IC's/UC's discretion through the SEOC as mission tasks

**f. Communication**

Primary communication between the Incident Command Post, the local EMAs, and SEOC is via radio, telephone, and e-mail. It is imperative that these systems be activated and/or installed as soon as practicable after the Incident Command Post (ICP) has been established. If the incident warrants it, MEMA's WebEOC should be utilized to record and share information and guide support activities.



If communication systems cannot be established due to a lack of infrastructure, the IC/UC or their designated representative will route a mission task to the SEOC to establish the required communications.

Mission tasking is accomplished primarily via telephone or radio (verbally), but may also be accomplished via MEMA's WebEOC. Verbal mission taskings are recorded in WebEOC at the SEOC.

**g. Personnel, Equipment, and Resources**

When this plan is activated, the IC/UC will typically request additional personnel, equipment, and resources by submitting mission tasks to the SEOC. Prior to the activation of this plan, additional personnel, equipment, and resources may be requested via the Fire District Control Point or directly from MassDEP or the carrier.

***i. Personnel***

Additional personnel that may be needed for the initial response will typically come from implementing mutual aid agreements and the Fire Mobilization Plan. In addition, the carrier and their spill response contractors, as well as MassDEP spill response contractors if mobilized, will provide properly trained and equipped personnel with needed expertise and experience in spill control to support the response effort.

***ii. Foam Caches***

Massachusetts has established foam caches with AR-AFFF attack foam trailers at multiple locations around the Commonwealth. The list of current foam caches and a map showing the distribution of these caches are presented in Attachment 7. A local FD will access foam cache(s) through their Fire District Control Point.

Each cache has a foam trailer that typically contains 300 to 500 gallons of AR-AFFF concentrate. These trailers also have high volume foam eductors and the required hose connections to maintain the large water flows. When mobilized, a trailer will respond with trained personnel for the foam application. Additional amounts AR-AFFF concentrate in portable containers (5-gallon pails, drums, and totes or trailers) may also be available from other sources (vendors and industries) in Massachusetts.

Furthermore, the Massachusetts Port Authority Fire Department (Mass Port FD) has vehicles equipped with AR-AFFF concentrate and trained personnel at the Fire-Rescue Headquarters at Boston Logan International Airport. The Mass Port resources include Engine 5 (2005 Pierce Arrow Dash Pump and Roll Structural/ARFF 1250gpm vehicle) with 220 gallons of AR-AFFF concentrate and Foam Trailer 1 with 450 gallons of AR-AFFF concentrate and 4450 pounds of dry chemical extinguishing agent. Engine 5 can apply foam via its turret at a rate of 250 gallons per minutes (gpm) and Foam Trailer 1 has two 500-gpm monitors for foam applications, although water will need to be supplied by other fire engines. In addition, Mass Port FD has a stockpile of 14 55-gallon drums of AR-AFFF concentrate at the Fire-Rescue Headquarters at Boston Logan International Airport. The Mass Port FD resources would be provided by requesting an AR Foam Task Force from Massport Fire through the Metro Fire (District 13) Control Point.

**iii. Spill Response Resources**

Equipment and supplies for spill containment and collection are available from DEP and federal agencies and from spill response contractors. The MassDEP and their contractor will be able to provide equipment and resources for a LV/HC ethanol incident response. Additional resources, including trained personnel may also be available from MassDEP, as well as from the USEPA and USCG, and from the spill response consultants and contractors with whom these agencies have established service agreements.

Other spill response personnel and resources will be available from the carriers and their spill response contractors and consultants. Many of the carriers' spill response contractors are recognized by the USCG as "oil spill response organizations (OSROs)" for various scenarios and discharge volumes. The contractors that are classified as OSROs means that the USCG confirms that these contractors have the required minimum numbers of personnel and quantities of equipment available within specified time frames, based on specific scenario(s) identified in the USCG classifications. Note that barge companies that transport ethanol are required by the USCG to have contractual agreements with OSROs that meet specified minimum response requirements within USCG-designated time frames.

Some spill response contractors also have specialty equipment that may be needed for a LV/HC ethanol incident response, such as the different specialty valves attachments that are needed for transloading from railroad tank cars made by different manufacturers. These spill response contractors also have the required hoses and pumps needed for transloading, as well as tank trucks and/or frac tanks for receiving and removing the ethanol as it is pumped out of rail cars.

**iv. Specialized Equipment**

With their own resources or through their contractors, carriers can provide specialized equipment that may be needed for the LV/HC ethanol response effort. Railroads have locomotives and crews to remove uninvolved cars and their contractors have heavy lift equipment needed to roll and/or lift derailed tank cars and rerailed and/or remove the tank cars involved in an incident. Railroad specialists are trained to identify risks associated with rerailed or moving loaded or partially loaded railcars. Note that transloading product may not be necessary for rerailed and may complicate the incident mitigation and/or cleanup and restoration of rail service.

Barge companies have access to tow boats and the equipment needed to move a barge to a safer location, as needed. The barge companies also have contractors who may be able to stop and/or patch leaks to stop the flow of ethanol.

**h. Demobilization/Recovery**

For a land-based incident (i.e., one involving a railroad or railroad equipment), the IC/UC will demobilize the response effort and enter the recovery phase as immediate hazards to the public and environment cease or are no longer considered to be significant. The RP and their contractors will provide technical expertise to the joint decision-making of the IC/UC, specifically with regards to the need for continued and/or scaling back response efforts at the incident scene, such as required assistance during up-righting and/or removal of damaged railcars and

security at the scene as the response effort is reduced. Note that the MassDEP MCP governs state participation in the recovery process, including long-term monitoring and remediation.

#### **4. ROLES AND RESPONSIBILITIES**

Section IV C of the CEMP Hazardous Materials Annex describes the command and control structure and agency responsibilities for HAZMAT response operations. The following sections discuss the command and control structure and agency responsibilities as these specifically apply to the LV/HC ethanol incident response.

##### **a. On-scene Command and General Staff**

###### ***i. Fire Department***

The Fire Chief of the local FD or her/his designee will typically be the initial IC; however, the senior firefighter may have the role of IC until properly relieved by the Fire Chief or her/his designee. The IC will establish the UC and an ICP at the scene of the incident as early in the incident as practicable. Note that for a barge incident, the USCG will be the IC until the UC is established, and the USCG will set-up the ICP.

A “Quick Reference” card for responding to a LV /HC ethanol incident is provided in **Attachment 2** for use by the IC/UC.

###### ***ii. Local / State Police***

Local police and the Massachusetts State Police will support the incident response by providing the security functions (see Section 3.d.ii.1), as necessary.

A more detailed description of the Massachusetts State Police’s support role is provided in Section IV C.2.b.3 of the CEMP Hazardous Materials Annex.

###### ***iii. Massachusetts Department of Environmental Protection***

MassDEP works in conjunction with the Executive Office of Environmental Affairs to coordinate efforts of MAESF 10 and MassDEP technicians are trained and equipped for spill containment and collection. In addition, MassDEP’s on-call spill response contractors may be activated to conduct response actions, if the carrier is unable to hire an appropriate contractor or respond in a timely manner.

A more detailed description for MassDEP’s support role is provided in Section IV C.2.b.2 of the CEMP Hazardous Materials Annex.

###### ***iv. Regional HAZMAT Response Teams***

The Regional HMRTs provide support to contain, confine, and control the ethanol release(s), as requested. A more detailed description of the HMRT is provided in Section IV C.1.f of the CEMP Hazardous Materials Annex.

##### **b. Municipal EMAs and Agencies**

###### ***i. Logistics Support***

The response effort for a LV/HC ethanol incident is expected to last up to 72 to 96 hours before the hazards from the incident are sufficiently reduced and the incident can enter

remediation and recovery phases. The local emergency management agency (EMA) and other municipal agencies can provide logistics support for the response to a LV/HC ethanol incident. Specifically, the local EMA can interface with MEMA to coordinate regional and state resources and also assist in coordinating local support actions, such as evacuations. In addition, the local Department of Public Works (DPW) can provide support for road closures (e.g., personnel, barriers) and equipment and materials for spill containment, including, but not limited to, front-end loaders, bulldozers, soil and sand, sand bags, and plastic sheeting.

**ii. Water/Wastewater Agency**

As noted above ethanol readily mixes with water, but the denaturant will separate and float on the water. Therefore, the release from a typical railroad tank car (30,000-gallon capacity) may result in 28,500 gallons of ethanol entering the water and 1,500 gallons of denaturant (i.e., gasoline) floating on the water.

The ethanol will rapidly affect the entire water column, so surface water and groundwater (well) sources that are used for drinking, process water, aquaculture, or cooling water may be impacted by released ethanol. If there is a potential for a spill to impact any of these water sources, the municipality or firm that uses the water needs to be notified of the potential impacts, so they can take the appropriate actions to stop drawing water from the source and/or treating water that is used.

Ethanol that enters a storm water drain system or a sewer system poses a danger from flammable liquid and vapors in the lines. In addition, the ethanol may disrupt the proper functioning of a receiving wastewater treatment plant (WWTP) because the ethanol may kill the bacteria used in wastewater treatment. Therefore, the municipality or firm that runs the WWTP should be notified if ethanol enters storm water drain systems or sewers.

**c. Carrier**

The carrier who has a LV/HC ethanol incident is financially responsible for the incident response and its clean-up and remediation. Also, the responsible carrier will provide technical and tactical support, including equipment and personnel, to the response effort and other carriers may make their resources available upon request, as described in Sections 3.g.ii and iii.

**d. MEMA – State Emergency Operations Center**

The MEMA SEOC will provide a supportive and coordinative role in LV/HC incident responses as needed. This will include logistics and resource support, situational awareness management and dissemination, Incident tracking and documentation, and communications coordination. These roles are defined further in the CEMP.

MEMA SEOC will coordinate with the Incident Command Post through the relevant Regional Emergency Operations Center (when appropriate).

**e. Massachusetts Emergency Support Function (MAESF) Responsibilities**

Other state and regional agencies will support the response effort for a LV/HC ethanol incident, as needed. Depending on the response needs and potential impacts from the incident, MEMA may stand up other MAESF's for support. Key MAESF's that MEMA may stand up include:

**i. MAESF – 4 Fire Fighting**

- Detects and suppresses fires
- Develop strategies for initial response
- Coordinates incident management teams to assist in command and control operation
- Provide HazMat support to contain, confine, and control release as requested
- Coordinate Response of HMRT and MDU
- Execute site management and site safety functions

**ii. MAESF – 6 Mass Care**

- Manages and coordinates sheltering and feeding for affected population

**iii. MAESF – 8 Health and Medical Services**

- Assessment of health and medical needs
- Provision of emergency medical services
- Coordination of patient and dependent care evacuations

**iv. MAESF – 10 Environmental Protection and Hazardous Materials**

- Direct, coordinate, and integrate the overall state hazardous materials response in the affected area(s)
- Provide coordinative bridge between the On Scene Coordinator, the district HMRT, and overall response activities
- Ensure a successful transition from response to recovery guidance under the MCP
- Provide technical, scientific, and equipment support

Other MAESFs will be included as needed. Additional information on the support roles for other state and regional agencies is provided in Section IV C of the CEMP Hazardous Materials Annex or in the CEMP.

**f. Federal Agencies and Other Resources**

As noted in Section IV C.2.c of the CEMP Hazardous Materials Annex Federal responsibilities are outlined in the NRF and the NIMS. Federal resources are available specifically for incidents that expand beyond available local, state, and mutual aid resources.

Specifically, the USEPA will likely be involved in the response effort for a LV/HC ethanol incident if there is a release of a significant amount of ethanol and/or a fire; the USCG will be involved in the response to a marine incident. The USEPA and USCG not only can provide technical and scientific support, but they also have established contracts with spill response contractors, who maintain minimum staffing levels and stockpiles of spill response equipment that may be employed. The MassDEP is expected to be the primary point of contact with these agencies.

**5. DIRECTION AND CONTROL**

Direction and control of the LV/HC ethanol incident will be managed on scene using the Incident Command System (ICS), as discussed in Section IV C.1.a of the CEMP Hazardous Materials Annex. An UC will be established at the ICP when a LV/HC ethanol incident involves several jurisdictions and/or several agencies from the same political jurisdiction and, upon request or arrival, state agencies may

form a UC with the local on-scene IC. The UC allows the agencies with responsibilities for a LV/HC ethanol incident to establish a common set of incident response objectives and strategies, as discussed in Section IV C.1.b of the CEMP Hazardous Materials Annex.

State agencies will provide personnel and resources to support the LV/HC response effort, as requested. Personnel from operating departments/agencies assigned to LV/HC incident response responsibilities will remain under the control of their own departments/agencies, but will function under the technical supervision of the direct report within the ICS.

## **6. ADMINISTRATION AND LOGISTICS**

### **a. Staffing**

Responding agencies are responsible for providing the appropriate personnel, equipment, and training.

### **b. Pre-Event Planning and Contracts**

Advanced planning for LV/HC incident response involves pre-identifying sources for resources needed to respond and recover from an emergency incident.

Responsible Parties (i.e., carriers) are responsible for maintaining vendor contracts for LV/HC incident response, containment, and recovery. These carriers are identified in **Attachment 5**.

Local jurisdictions and state agencies may also engage in the following pre-event contracts to provide an effective response to typical LV/HC ethanol incidents:

- Spill response, containment, and cleanup
- Emergency worker base camps and typed support packages;
- Designated community shelter;
- Transportation support;
- Debris/waste removal and disposal services;
- Other supplies, equipment and human resource needs;
- Personnel; and
- IT and communications.

Furthermore, a LV/HC ethanol incident will require a large number of resources and generate significant media attention. Therefore, advanced planning should identify pre-designated staging areas for responders and their equipment and supplies, as well as identify pre-designated press areas for the media crews and equipment that may arrive.

### **c. Mutual Aid**

The process for requesting mutual aid from entities either within or outside of Massachusetts is described in the "Mutual Aid" section of the State CEMP Basic Plan.

### **d. Appendix Review and Maintenance**

MEMA is responsible for coordinating the development and maintenance of the Statewide LV/HC Ethanol Incident Response Appendix. The identified state agencies retain the responsibility to maintain their relevant plans and provide the appropriate personnel and training to undertake a LV/HC incident response.

This Appendix will be reviewed biennially by participating agencies and organizations in a manner conforming to the review and maintenance guidelines contained in the State CEMP Basic Plan.

**e. Forms and Record Retention**

Field reporting forms and all necessary federal disaster reporting forms and guidance are located in the SEOC and distributed when necessary. Copies of all documentation are retained in accordance with State record retention policies.

**f. Logistics**

The SEOC Operations and Logistics Sections will coordinate resource support for MAESF responsible agencies to implement this Appendix. In addition, responsible MAESF agencies are responsible to identify and address department specific resource needs to support the implementation of this Appendix. Logistics support that may be needed for prolonged events includes, but is not limited to, the following:

- Refueling
- Waste containment
- Power / recharging
- Replacement equipment (pods)
- Portable toilets
- Wash Stations
- Water
- Warming or cooling centers

**7. AUTHORITIES, RESOURCES, AND REFERENCES**

**a. Authorities**

- The Federal Civil Defense Act of 1950 (Public Law 920, 81st U.S. Congress) as amended by Public Law 96-342 (September 1980).
- The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.
- Title 40 of the Code of Federal Regulations Part 110 [40 CFR 110] and 49 CFR 130
- The National Response Framework.
- Homeland Security Act of 2002.
- Homeland Security Presidential Directive 5, Management of Domestic Incidents.
- Homeland Security Presidential Directive 8, National Preparedness.
- Public Law 104-321, granting the consent of Congress to the Emergency Management Assistance Compact.
- Comprehensive Emergency Management Plan, Massachusetts Emergency Management Agency, January, 2011.
- Massachusetts Legislature included Section 24 in Chapter 242 of the Acts of 2012
- Massachusetts Regulations Code 310: Massachusetts Department of Environmental Protection 40.0000 Massachusetts Contingency Plan (310 CMR 40.0000)

**b. Resources and References**

In addition to the references provided in the CEMP and in the Hazardous Materials Annex to the CEMP, selected resources and references for additional information on ethanol, including references with specific information for ethanol firefighting and spill response, are provided in **Attachment 8**.

**8. ATTACHMENTS**

1. Acronyms and Abbreviations
2. "Quick Reference" Guide for Ethanol Incident Response
3. Ethanol and Ethanol Spill Response
4. Large Volume Ethanol Carriers
5. Railroad and Marine Freight Profiles
6. Maps of Common Transport Routes and Potential Exposed Populations and Facilities
7. Massachusetts Foam Caches
8. Selected References



## Attachment 1 - ACRONYMS AND ABBREVIATIONS

The following acronyms and abbreviations are used in this Appendix.

ACP	Area Contingency Plan
AR-AFFF	Alcohol-Resistant Aqueous Film-Forming Foam
CEMP	Massachusetts Comprehensive Emergency Management Plan
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
DFS	Massachusetts Department of Fire Services
DPH	Massachusetts Department of Public Health
DPW	Department of Public Works
EMA	Emergency Management Agency
Ethanol	Denatured ethanol (i.e., ethanol with 3% to 5% gasoline added)
FBI	Federal Bureau of Investigation
FD	Fire Department
FRA	Federal Railroad Administration
gpm	gallons per minute
HAZMAT	Hazardous materials
HHFT	High Hazard Flammable Trains
HIT	Heat induced tears
HMRT	Hazardous Material Response Team
HTUA	High Threat Urban Areas
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
LFL	lower flammable limit (same as lower explosive limit)
LV/HC	Large Volume/High Concentration
MCP	Massachusetts Contingency Plan
MassDEP	Massachusetts Department of Environmental Protection
MAESF-4	Massachusetts Emergency Support Function 4 – Firefighting
MAESF-10	Massachusetts Emergency Support Function 10 – Environmental Protection and Hazardous Materials
MEMA	Massachusetts Emergency Management Agency
MEP	Massachusetts Environmental Police
mph	miles per hour
MTBE	methyl tertiary butyl ether

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## Large Volume/High Concentration Ethanol Incident Response Appendix

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NIMS	National Incident Management System
NRC	National Response Center
NRF	National Response Framework
NFPA	National Fire Protection Association
NRT	National Response Team
OSRO	Oil Spill Response Organization
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIO	Public Information Officer
PPE	Personal Protective Equipment
PRV	Pressure Relief Valve
RP	Responsible Party
RRT	Regional Response Team
SEOC	State Emergency Operations Center
THIRA	Threat Hazard Identification and Risk Assessment
UC	Unified Command
UFL	upper flammable limit (same as upper explosive limit)
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
WWTP	Wastewater Treatment Plant

**Attachment 2 - "QUICK REFERENCE" GUIDE FOR ETHANOL INCIDENT RESPONSE**

## **INCIDENT COMMANDER'S QUICK REFERENCE**

### **Contacts for Incident Support**

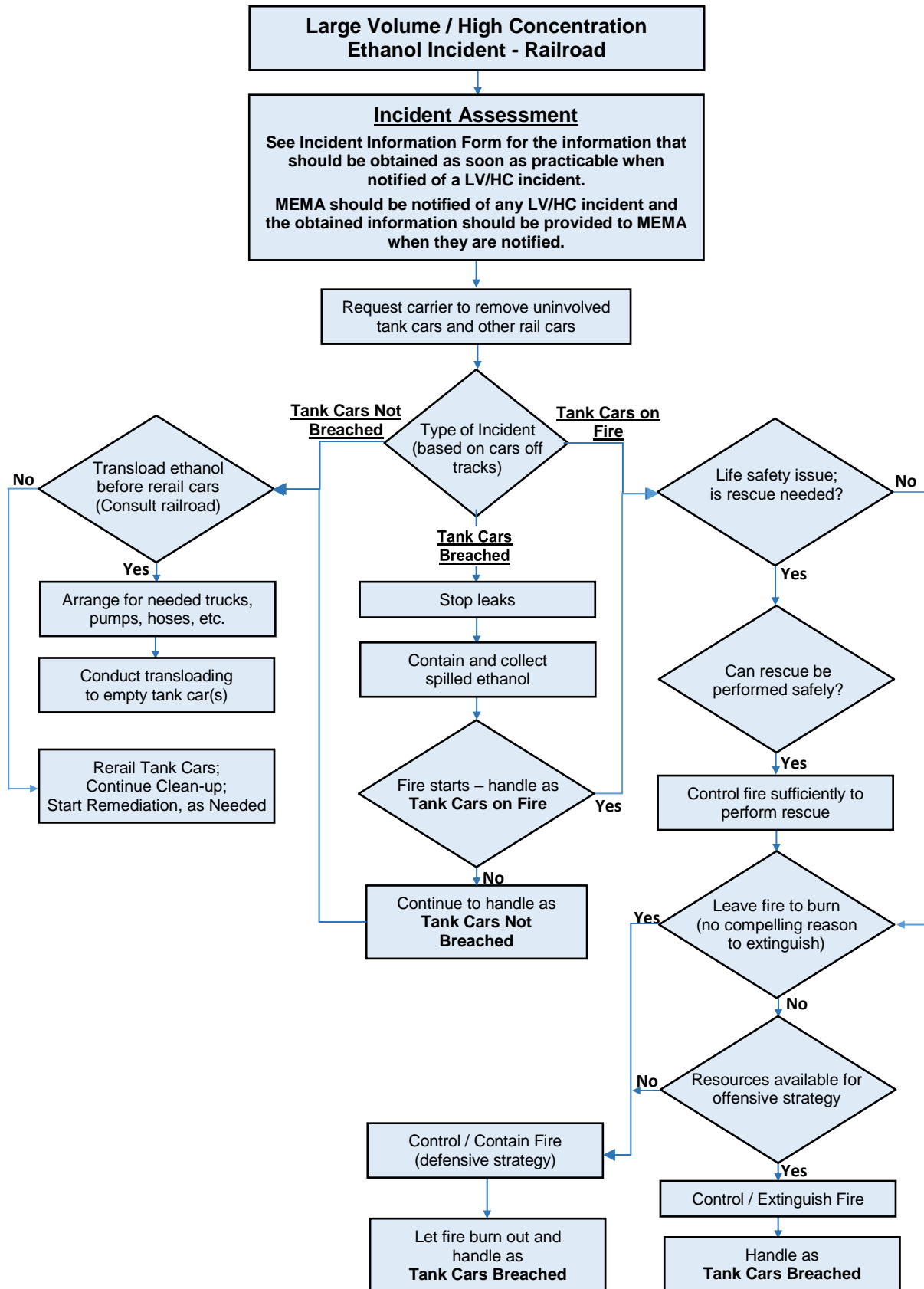
- MA Department of Environmental Protection (MassDEP) 1-888-304-1133
- Fire District Control Point (###) ###-####

### **Critical Information for an Ethanol or Denatured Ethanol Incident**

1. It is usually better to control and contain a LV/HC ethanol fire and let it burn out. Fire suppression should only be attempted for life safety (i.e., rescue), and only if an offensive strategy can be implemented safely.
2. Placards on ethanol shipments may be 1987 (denatured ethanol; 95% to 99% ethanol), 3475 (ethanol and gasoline mixture; up to 94% ethanol), 1170 (ethanol or ethyl alcohol; 100% ethanol), or 3065 (alcoholic beverage).
3. After railroad tank cars breach and ethanol starts burning, there are less than two hours when offensive firefighting strategies can be effectively implemented.
4. Response effort for a LV/HC ethanol incident is expected to last up to 72 to 96 hours before the hazards are sufficiently reduced and the incident can enter remediation and recovery phases.
5. Large quantities of Alcohol Resistant Aqueous Film-Forming Foam (AR AFFF) and huge amounts of water are needed to fight an ethanol fire and AR-AFFF is effective only when using a Type II discharge scenario to minimize plunging or submergence.
6. 500 gallons of foam concentrate mixed at 3% (mixed with 16,300 gallons of water) can handle a spill about 75 feet by 75 feet (5,600 square feet) and requires a foam application rate of 1,100 gallons per minute (gpm) for 15 minutes.
7. Ethanol will mix completely with water and is a good electrical conductor, so electrocution and ignition hazards (e.g., static electricity) may be present.
8. Ethanol vapors heavier than air (vapor density 1.59); ethanol is easily ignitable in open air with a flammable range of 3.3% (LFL) to 19% (UFL).
9. Ethanol burns with a nearly invisible flame and has less visible smoke than burning hydrocarbons, such as gasoline or crude oil.
10. Radiant heat flux from a burning ethanol fire can be 2 to 5 times greater than radiant heat flux from a gasoline fire.
11. Ethanol spills should be prevented from entering storm water systems, sewers, and waterways, as well as basements and confined spaces.
12. Ethanol can be contained on land by diking and/or damming with dirt, sand, plastic sheeting, or portable containment systems. Fire-resistant booms laid on the ground may be used to contain burning ethanol. Note: containment booms are ineffective on water because ethanol does not float.
13. Oil-only absorbents will not work with ethanol or denatured ethanol.
14. Surface and underground (well) water sources, such as used for public drinking water, industrial process/cooling water, or agriculture, can be severely impacted by an ethanol release. Rapid notification to shut down these water withdrawals is critical to protecting these systems' infrastructure.
15. Ethanol that gets into storm water systems or sewers can damage wastewater treatment plants because the ethanol may kill the bacteria used in wastewater treatment.

**See the Large Volume/High Concentration Ethanol Incident Response Planning Guidance for additional information.**

Large Volume/High Concentration Ethanol Incident Response Appendix



**Incident Information Form**

**Do Not Delay Notifications While Obtaining the Information**

<b>Incident Information</b>		<b>Date:</b>	<b>Time:</b>
Carrier Name:			
Carrier Contact:			
Address or Location:			
Nearest City:		Distance:	
<b>Involved Parties:</b>		<b>Individual Reporting</b>	<b>Incident Commander</b>
Name:			
Position:			
Telephone Number:			
Organization:			
<b>Incident Details</b>			
Type of Units:		Type of Product:	
Number of Units:		Number of Units Breached:	
Estimated Quantity Spilled:		Is flow stopped?	YES NO
Is Spill Contained? YES NO If NO, Direction and Speed Spilled Product Flowing:			
Spill Enter Water or a storm drain or sewer system (the System)? YES NO			
If YES, Name of Water Body / System:			
If YES, Estimated Quantity in Water / System:			
If YES, Direction and Speed in Water / System:			
Injuries? YES NO	If YES, Number:	Fatalities? YES NO	If YES, Number:
Is there fire? YES NO If YES, Number of Units Involved:			
Evacuation necessary? YES NO If YES, Distance/Area Evacuated:			
Additional Information/Comments:			

## Attachment 3 - ETHANOL AND RESPONSE TO ETHANOL SPILLS

### 1. General Conditions

- a. Ethanol (ethyl alcohol), as referred to in this Guide, is typically denatured ethanol with 2% to 5% (but may be as high as 7%) gasoline added as the denaturant.
- b. High concentration ethanol includes denatured ethanol (93% to 97% ethanol; 3% to 7% gasoline) and E-85 motor fuel (85% ethanol; 15% gasoline).
- c. Placards on shipments of high concentration ethanol may have label 1987 (denatured ethanol; 95% to 99% ethanol) or 3475 (ethanol and gasoline mixture; up to 94% ethanol); ethanol that has not been denatured may have label 1170 (ethanol or ethyl alcohol; 100% ethanol) or 3065 (alcoholic beverage).
- d. Ethanol is blended into nearly half the gasoline produced in the United States, including most of the gasoline used in Massachusetts.
- e. Ethanol-blended fuels, including E-85, are available in Massachusetts.
- f. Ethanol use continues to increase, as well as fuel stations offering E-85.
- g. Large volume transportation of high concentration ethanol within the Commonwealth occurs primarily via rail (railroad tank cars) and water (barges), and to some extent via road.
- h. Railroad tank cars used to transport ethanol are often the DOT 111 or CPC 1232 design; newer, safer type DOT 117 tank cars are being phased in for general use for transporting ethanol.
- i. Transloading of ethanol, where ethanol is moved from a railroad tank car to a tanker transport (i.e., tractor-trailer tank trucks) on a rail siding, occurs on rail sidings that may have minimal fire control equipment.
- j. The fittings for transloading from a railroad tank car are not uniform and tank cars from different manufacturers require different fittings (five or more different fittings are currently in use). Tank car information to determine the appropriate fitting is discussed in **Attachment 6**.
- k. Depending on the type and scope of the incident, supplemental state resources may be required to assist in a responding to an ethanol release.

### 2. Properties of Ethanol

- a. A colorless liquid with a characteristic alcohol odor.
- b. A polar solvent that is completely miscible (soluble) in water.
- c. A good electrical conductor, so electrocution and ignition hazards (e.g., static electricity) may be present.
- d. Ethanol and gasoline may separate on contact with water (surface water, groundwater, or firefighting water); ethanol mixes with water and gasoline does not (often remains on the water surface)
- e. Diluted ethanol has higher flash points: 20% ethanol in water has a flash point of 97° F; 10% ethanol in water has a flash point of 120° F.
- f. Flash point is 55° F for pure ethanol, which decreases, and may be as low as -5° F when gasoline is added.
- g. Diluted ethanol (20% ethanol in water) has a flash point of approximately 97° F
- h. Vapors are heavier than air (vapor density 1.59) and hang low to the ground.
- i. For ethanol vapors in air the lower flammable limit (LFL) is 3.3% and the upper flammable limit (UFL) is 19% (i.e., the flammable range is 3.3% to 19%).

- j. Below an outside temperature of approximately 51° F, vapor pressure is outside the flammable range (i.e., ethanol cannot evaporate rapidly enough to achieve a vapor concentration within the flammable range).
- k. Specific gravity is 0.79 (liquid density is 6.5 pounds per gallon).
- l. Breakdown products from aerobic degradation include:
- m. Breakdown products from anaerobic degradation include:

### 3. Firefighting

- a. Ethanol and ethanol fuel blends have different properties than gasoline and require different firefighting techniques and equipment than gasoline or other hydrocarbons.
- b. Under fire conditions, high-concentration ethanol has less visible smoke than a gasoline fire and ethanol burns with a virtually invisible flame after the denaturant (typically gasoline) burns off.
- c. Radiant heat flux from an ethanol fire can be 2 to 5 times greater than the heat flux from a gasoline fire.
- d. Only Alcohol Resistant Aqueous Film-Forming Foam (AR AFFF) and copious amounts of water are effective fire suppression techniques for fire involving ethanol.
- e. AR-AFFF appears to be effective only when using a Type II discharge scenario (i.e., fixed discharge applied to a vertical surface so as to provide a more gentle application that minimizes plunging or submergence).
- f. Massive quantities of foam concentrate and water and large application devices are required to handle a serious ethanol fire.
- g. 500 gallons of foam concentrate mixed at 3% (mixed with 16,300 gallons of water) can handle a spill about 75 feet by 75 feet (5,600 square feet) and requires a foam application rate of 1,100 gallons per minute (gpm) for 15 minutes. **Attachment 7** includes a list of AR-AFFF needs (concentrate and water amounts and application rates) for ethanol fires covering 100 square feet to 6,000 square feet.
- h. Foam does not work if material is too hot, so if foam is to be applied to an ethanol fire, surfaces may need to be cooled first.
- i. In general, do not expect a local airport Aircraft Rescue and Firefighting vehicle to effectively fight an ethanol fire; the FAA requires airport firefighting vehicles to carry straight AFFF for aviation fuel fires, not AR foam. Note that the Massachusetts Port Authority Fire Department has one fire engine (Engine 5) and a foam trailer (Foam Trailer 1) that have AR-AFFF foam concentrate and these units are located at Boston Logan International Airport.
- j. Large foam caches of AR AFFF that may be critical to successful fire control are strategically located throughout Massachusetts in readily transportable large volume containers (see **Attachment 7**).

### 4. Spill Response

- a. Ethanol and ethanol fuel blends have different properties than gasoline and require different spill response techniques and equipment than gasoline or other hydrocarbons.
- b. Stop leaks if you can do it without risk.
- c. Ethanol is water miscible. Once ethanol enters waterways it is not recoverable by emergency responders; gasoline used to denature ethanol will separate in water and the response needs to use the techniques for responding to hydrocarbon (i.e., non-polar solvent) spills).



- d. Spills should be prevented from entering storm water systems, sewers and waterways, as well as basements and confined spaces.
- e. Ethanol can be contained by diking and/or damming with dirt, sand, or portable containment systems.
- f. Vacuum trucks will not work to recover ethanol once it has enter water. Vacuum trucks may be effective in recover ethanol that has accumulated in depth and containment and confinement areas established by emergency responders.
- g. Absorb ethanol or cover with dry earth, sand, or other noncombustible material.
- h. Absorb with ethanol with water-absorbent materials (cat litter, pads, pillows, socks, booms, etc.) – universal absorbents may be effective (check with manufacturer); “oil only” absorbents, pads, and booms will only collect the gasoline component.
- i. Due to the flammability of ethanol, use clean non-sparking tools to collect absorbed material.
- j. Determine if sensitive water intakes (e.g., drinking, process, aquaculture, or cooling water), as well as wastewater treatment plants (WWTP), are threatened because ethanol rapidly affects the entire water column of the receiving water body; warn owners/operators of sensitive water intakes and WWTP that may be threatened.
- k. Aeration of water bodies may be effective in increasing the dissolved oxygen in the water and increasing biological degradation of ethanol, but aeration needs to be kept in the spill plume and guidance for optimizing aeration (air volumes, bubble size, contact time) is not available.
- l. Water quality monitoring should occur in all standing water bodies and in downstream locations to confirm dissolved oxygen levels are adequate.

## Attachment 4 - MAPS OF COMMON LV/HC ETHANOL TRANSPORTATION ROUTES

**Maps of Common LV/HC Ethanol Transportation Routes provided by MEMA separately, due to their size. Massachusetts OLIVER Layers to identify potentially exposed populations and facilities**

### State Facilities

State Lease Facilities Max 20000  
DCAM Lease Facilities Max 20000  
State Lease Facilities Min 20000  
DCAM Lease Facilities Min 20000

### Cultural Resources

**Schools:** Pre-kindergarten to High School Buildings  
**Schools:** Pre-kindergarten to High School Labels

### Infrastructure

**Acute Care Hospitals:** Acute Care Hospitals Buildings  
**Acute Care Hospitals:** Acute Care Hospitals Labels  
**Dams:** Dams (by Hazards Code)  
**Dams:** Dams (by Hazards Code) Labels  
**Fire Stations:** Fire Stations  
**Fire Stations:** Fire Stations Labels  
**MassDOT Roads:** Major MassDOT Roads: Major MassDOT Routes  
**MassDOT Roads:** MassDOT Roads: MassDOT Roads by Road Type  
**Long Term Care Residences:** Long Term Care Residences  
**Long Term Care Residences:** Long Term Care Residences Labels  
**Police Stations:** Police Stations  
**Police Stations:** Police Stations Labels  
**Prisons:** Prison Buildings  
**Schools:** College and University Buildings  
**Schools:** College and University Buildings Labels  
**Schools:** Pre-kindergarten to High School Buildings  
**Schools:** Pre-kindergarten to High School Labels  
**Town Halls:** Town Halls  
**Town Halls:** Town Halls Labels  
**Trains:** Railroads: Railroads – Active Service  
**Trains:** Railroads: Railroads by Type of Service

### Physical Resources

Public Water Supplies: Public Water Supplies

### Regulated Areas

**Surface Water Protection Areas:** Zone A  
**Surface Water Protection Areas:** Zone B  
**Surface Water Protection Areas:** Zone C

**Wellhead Protection Areas: IWPA's**  
**Wellhead Protection Areas: Zone I's**  
**Wellhead Protection Areas: Zone II's**

## Attachment 5 - CARRIERS OF LARGE VOLUME/HIGH CONCENTRATION ETHANOL

### 1. Railroads

Emergency Contact Numbers for Massachusetts Common Freight Carriers (i.e. railroads)

- **Bay Colony Railroad (BCLR)** ..... Dispatcher: (239) 275-9043  
..... 24-hour Emergency Number: (855) 300-6193
- **Connecticut Southern Railroad (CSO)** ..... 24-hour Emergency Number: (866) 527-3499
- **CSX Transportation (CSXT)** ..... 24-hour Emergency Number: (800) 232-0144
- **East Brookfield and Spencer Railroad (EBSR)** ..... Office: (508) 885-4664
- **Fore River Transportation Corporation (FRVT; operates on the Massachusetts Water Resources Authority [MWRA] tracks)** ..... MWRA Security Center (877) 697-6972
- **Grafton and Upton Railroad (GU)** ..... Dispatcher: (508) 450-4169
- **Housatonic Railroad (HRRC)** ..... Dispatcher: (860) 824-0850  
..... or Headquarters: (860) 824-7936
- **Massachusetts Central Railroad (MCER)** ..... 24-hour Contact Number: (978) 355-0029
- **Massachusetts Coastal Railroad (MC)** ..... Office: (508) 291-2116
- **New England Central Railroad (NECR)** ..... 24-hour Emergency Number: (866) 527-3499
- **Pan Am Railways (ST)** ..... 24-hour Emergency Number: (800) 955-9208
- **Pan Am Southern (PAS)** ..... 24-hour Emergency Number: (800) 453-2530
- **Pioneer Valley Railroad (PVRR)** ..... Emergency Number: (413) 568-3331
- **Providence & Worcester Railroad (PW)** ..... 24-hour Number: (800) 447-2003 x400  
..... Dispatcher: (508) 755-4000 x400

### 2. Tug and Barge Companies

For information on the carrier for an incident on a navigable water, such as a barge incident, contact the U.S. Coast Guard (USCG) at the USCG Command Center telephone: (617) 223-5757. All shipments of “certain dangerous cargoes,” such as ethanol, are required to provide the USCG with notice of scheduled arrivals at least 24 hours, but not more than 96 hours, before arriving at the terminal for a cargo transfer.

## **Attachment 6 - RAILROAD AND MARINE FREIGHT PROFILES**

### **1. Rail Freight Profile**

Ethanol tank cars may be in a unit train (i.e., a train consisting of 100 or more ethanol tank cars) or a general consist (i.e., a freight train with mixed freight cars that includes one or more ethanol tank cars).

Information on the contents of the cars and the car location in a general consist is on the Waybill (i.e., shipping papers) and the train conductor and the railroad dispatcher have copies of these papers.

Tank cars used to transport ethanol are typically the DOT 111, CPC 1232, or AAR T108 design.

The fittings for unloading railroad tank cars are not uniform; different manufacturers use different fittings and there are five or more different fittings currently in use.

To determine the correct outlet fittings for a tank car, the tank car manufacturer and number is needed. This information is located on the Builders Plate, which is located above the cars wheels near the Brake End (B End) of each tank car.

### **2. Barge Freight Profile**

Tank barges are non-self-propelled vessels that have minimal or no crew accommodations onboard.

Tugs push or tow tank barges through the water.

Tank barges typically have cargo capacities of 420,000 to 630,000 gallons.

**Attachment 7 - MASSACHUSETTS FOAM CACHES**

*Insert Append Att 7 Mass Foam Resources.xls*

## Attachment 8 - SELECTED REFERENCES

Listed below are selected references that were used to develop this Appendix to the CEMP Hazardous Materials Annex.

### National

Biofuels: Release Prevention, Environmental Behavior, and Remediation, Interstate Technology & Regulatory Council (ITRC) Biofuels Team, September 2011

Field Guide to Tank Cars, Association of American Railroads, Transportation Technology Center, Inc., Bureau of Explosives, 2010

Fuel Ethanol: Guideline for Release Prevention & Impact Mitigation, Renewable Fuels Association, March 2013

Large Volume Ethanol Spills – Environmental Impacts and Response Options, Shaw’s Environmental and Infrastructure Group for the Massachusetts Department of Environmental Protection, July 2011

Responding to Ethanol Incidents, International Association of Fire Chiefs, March 2008

Quick Reference Guide: Fuel Grade Ethanol Spills (including E85), National Response Team, 2010

Unit Train Derailment Site Case Study: Emergency Response Tactics, International Association of Fire Chiefs for the Renewable Fuels Association, March 2015

United States Hazardous Materials Instructions for Rail, Association of American Railroads, Bureau of Explosives, January 2011

### Massachusetts

Ethanol Response Plan, Franklin Regional Council of Governments

Large Volume Ethanol Spills – Environmental Impacts and Response Options, Massachusetts Department of Environmental Protection, July 2011

Large Volume / High Concentration Ethanol Incident Response Planning Guidance, Massachusetts Emergency Management Agency, June 2016

Massachusetts Fire and EMS Mobilization Plan, Massachusetts Department of Fire Services, January 2010 (Updated 2015)

Massachusetts Contingency Plan, Massachusetts Department of Environmental Protection

Plymouth to Salisbury, Massachusetts Area Contingency Plan, United States Coast Guard, March 2011

Rhode Island and Southern Massachusetts Area Contingency Plan, United States Coast Guard, December 2010

Safety Impacts of Ethanol Transportation by Rail, Massachusetts Department of Transportation, March 2013