

Hazardous Materials Roundtable

October 26-27, 2021

Chantilly, VA

Sponsored by the U.S. DOT Pipeline and Hazardous Materials Safety Administration (PHMSA), the FEMA U.S. Fire Administration (USFA), and the International Association of Fire Chiefs (IAFC)

The Roundtable's positions do not necessarily reflect the views of PHMSA or USFA



PHMSA
Pipeline and Hazardous Materials
Safety Administration



Hazardous Materials Roundtable Meeting Report

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I. EXECUTIVE SUMMARY

Hazardous materials emergency response is a complex and evolving public and non-public safety service provided throughout the United States today. While the level of services provided may vary between communities and states, there is universal acceptance that hazardous materials preparedness (i.e., prevention, planning and response) is a required public safety function. To help guide this critical public safety function, the International Association of Fire Chiefs (IAFC) has convened periodic Roundtable meetings for hazardous materials (hazmat) response technical specialists and subject matter experts. In these Roundtable meetings, participants identify critical issues and suggest plans of action to strengthen hazmat preparedness throughout the country.

Roundtable members include representatives of federal, state, and local governments; fire and emergency service agencies; private industry; and other key stakeholders from the hazardous materials community.

After an eight-year break in Roundtable meetings, the absence of national Roundtable guidance was identified as a significant gap in stakeholder input and was considered to be a serious loss to national hazmat preparedness efforts. In 2019, the U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) and the U.S. Fire Administration (USFA) partnered with the IAFC to reconvene the Roundtable process with a two-day meeting on February 5 and 6, 2019, at the IAFC Headquarters in Chantilly, Virginia. A number of the major issues identified in that meeting were then further examined by Roundtable member teams in three concurrent assessment efforts in 2021. The three assessment efforts focused on developing possible action options (1) to improve LEPC/TERC performance; (2) to improve risk-based response and preparedness; and (3) to improve hazmat prevention and mitigation programs (the report of these three assessment efforts is located in the appendix of this report). The analysis of hazmat issues initiated in 2019 was continued at the Roundtable meeting held on October 26 and 27, 2021.

The Roundtable program involves a continuous assessment of hazmat preparedness issues, and the reports of the Roundtable meetings form a living document that tracks with and reflects this continuing assessment. Several key themes emerged from the 2019 and 2021 meetings and are reflected in this report, including the following:

- Leadership at the local and state level is critical in developing both the systems and partnerships necessary for a safe and effective response to the wide variety of and ever-changing hazardous materials risks and threats in the modern age.



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- Building an integrated planning and response capability to better protect local communities requires the support and direct involvement of the “whole community,” including responders, planners, regulators, government, industry and the public. Of particular importance are those with expertise in hazard identification and communication, hazardous materials development, manufacture, transportation, storage, and use.
- The application and use of risk-based planning and response processes based upon current national consensus standards provides a safe and effective foundation for emergency preparedness activities. Nonetheless, many issues and challenges remain to strengthen the nation’s preparedness capabilities.
- While there have been substantial improvements in hazmat preparedness over the years, challenges continue today in providing the hazmat response community the resources, staffing, and competency training needed to protect local communities.
- Local-based strategic planning is needed to identify, prioritize and fill capability gaps.
- There is a growing emphasis on the need to better address community hazard awareness, and to directly involve the public in community preparedness planning.
- The role of Local Emergency Planning Commissions (LEPCs) and Tribal Emergency Response Councils (TERCs) is a critical and foundational element in providing the hazard, risk, and capability assessments needed by the response community. These assessments should be followed by strategic planning at the community level to prioritize and fill capability gaps. Likewise, these LEPC/TERC efforts will require sustained support at the national, state, and local levels.
- There is a need to provide guidance to policy makers on the process of developing improved metrics to evaluate both the efficiency and effectiveness of local and regional hazardous materials preparedness capabilities, and the community’s progress in filling capability gaps.
- Driven by homeland security efforts, the last decade has seen sustained improvements in the gathering, coordination, and sharing of critical information throughout the emergency preparedness community. However, there remains a need for systems and processes within the hazardous materials preparedness community that can gather, analyze, package, and distribute critical information in a timely and “user-friendly” manner.



Many other issues of importance were discussed at the Roundtable meeting, and meeting attendees strongly recommended that the Roundtable meetings be continued on an annual basis as a service to support the nation’s hazardous materials community. Section II of this report lists the attendees at the 2021 meeting. Section III of this report briefly describes the methodology followed in the 2021 meeting, while Section IV of the report identifies the issues / observations and consensus recommendations made by the meeting attendees. Finally, the appendix to this report contains the analysis and findings of

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the three studies conducted prior to this meeting that proposed options of the Roundtable to consider to improve LEPC/TERC performance, to improve risk-based preparedness and response, and to improve hazmat prevention and mitigation.

NOTE: As used in this report, the terms “emergency preparedness” or “hazardous materials (hazmat) preparedness” encompass the planning, prevention and response phases of emergency management. Otherwise, the individual term or focus area (i.e., planning, prevention, or response) will be noted, as appropriate.

II. MEETING PARTICIPANTS

Special Acknowledgments

- Gregory Noll, member and past chairperson of the National Fire Protection Association (NFPA) Technical Committee on Hazardous Materials / Weapons of Mass Destruction Emergency Response and a member of the IAFC Hazardous Materials Committee, who acted as meeting leader and facilitator.
- The International Association of Fire Chiefs, who graciously hosted this Roundtable meeting at their Headquarters in Chantilly, Virginia.
- The U.S. Department of Transportation—Pipeline Hazardous Materials Safety Administration, and the United States Fire Administration—National Fire Academy, without whose sponsorship, this Roundtable meeting would not have been possible.

In Memoriam

We sadly mark the passing of Jim Jaracz, former assistant fire chief of Hobart, Indiana, and well-known fire safety and codes enforcement instructor with the National Fire Academy and other training institutions. Jim was a dedicated public servant and was one of the lead subject matter experts for the 2021 Roundtable and this report on improving national hazardous materials prevention and mitigation efforts. He will be missed by all who had the honor to work with him on this program.

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Disclaimer: Please note that governmental representatives observed the Hazardous Materials Roundtable process and provided agency subject matter expertise. They were not involved in drafting the report and neither they nor their agencies are responsible for any conclusions, suggestions, or recommendations contained within the report.

III. MEETING ANALYSIS AND DISCUSSIONS

The Roundtable meeting involved two days of facilitated group analysis reviewing historical trends and focusing upon current and emergent issues in hazardous materials preparedness. The following were the general discussion topics and order of discussions in the meeting:

1. Opening Discussion: How did we get to where we are today?
 - a. 2019 Roundtable meeting and report
 - b. 2020 Federal Hazmat Partners meetings to discuss federal hazmat issues identified in the 2019 report
 - c. 2021 Stakeholder analysis and identification of action options for the “big three” issues from 2019 report
 - d. 2021 Roundtable meeting
2. Discussion: What works and what doesn’t in today’s hazmat preparedness?
3. Discussion: What are the emerging risks and challenges that we will be facing in the future in hazmat preparedness?
4. Discussion: Continuation of Roundtable analysis of the 7 major issue areas identified in the 2019 Roundtable meeting
 - a. Need to improve hazmat planning and LEPC/TERC Performance
 - b. Need to improve risk-based response and preparedness
 - c. Need to improve hazmat preparedness/mitigation
 - d. Need to improve hazmat training
 - e. Need to improve standard of care
 - f. Need to improve hazmat funding
 - g. Need to improve hazmat information sharing
5. Next Steps Action Planning



During the discussion process, attendees identified a number of topics and issues, and were able to reach consensus on a number of recommendations. Those recommendations are provided below in Section IV: Meeting Observations and Recommendations. Most of the recommendations are potential action items that need to be pursued in the future. There was a strong consensus by all attendees that there is a need for continuing the Roundtable meeting format on an annual basis. This action would provide a continuing national forum to address both historical and emerging trends and issues impacting the nation’s hazardous materials community.

NOTE: As used in this report, the terms “emergency preparedness” or “hazardous materials (hazmat) preparedness” encompass the planning, prevention, and response phases of emergency management. Otherwise, the individual term or focus area (i.e., planning, prevention, or response) will be noted, as appropriate.

IV. MEETING OBSERVATIONS AND RECOMMENDATIONS

Below are the issues / observations and recommendations made by the participants in the 2021 Roundtable meeting. The Roundtable report is envisioned as a living document and the work in Roundtable meetings is intended to be a continuous process from one meeting to the next. Accordingly, in this meeting the discussions were conducted in the same topic sequence as in 2019 Roundtable report.

1. Improve Hazmat Planning and LEPC/TERC Performance
2. Improve Hazmat Prevention/Mitigation
3. Improve Risk-Based Response and Preparedness
4. Improve Hazmat Training
5. Improve Hazmat Standard of Care
6. Improve Funding
7. Improve Information Sharing

In 2019, Roundtable discussions focused on the seven topical areas listed above. In addition, during 2021 Roundtable stakeholders participated in six additional virtual analysis meetings to further explore possible action options to address needs in the first three topical areas. These findings and recommendations are documented in a separate document provided in the appendix to this report that is entitled Recommendations for Improving LEPC/TERC Performance, Improving Risk-Based Response, and Improving Hazmat Prevention/Mitigation. To avoid repetition, the findings of the 2019 Roundtable meeting and the focused 2021 sessions are only summarized in this report. It is recommended that the reader review these reports for a more detailed account of the discussions and analysis performed in those meetings. The meeting observations and recommendations described below focus primarily on the discussion on these topics that occurred in the 2021 Roundtable meeting as attendees continued the on-going Roundtable analysis.

It should be noted that all recommendations are made at a strategic level; follow-up meetings and activities may be required to develop individual improvement plans and tasks to address the respective recommendations.

IMPROVE HAZMAT PLANNING AND LEPC/TERC PERFORMANCE

In the 2019 Roundtable meeting, attendees made several recommendations to improve hazmat planning and Local Emergency Planning Committee (LEPC) and Tribal Emergency Response Commission (TERC) performance. These recommendations included:

- Foster better utilization and integration of the LEPC/TERC in the local planning process.
- Foster strategies to blend the various federal planning and reporting requirements that local planners must follow in order to better integrate planning efforts.
- Reduce the separation of hazmat- and environmental-related issues captured in the LEPC/TERC process and utilize the all-hazards, THIRA-based planning process as used in the emergency management community.
- Facilitate the selection and development of strong local leadership who can improve LEPC/TERC utilization and effectiveness.
- Increase emergency responder and industry participation in LEPC/TERC activities.
- Provide consistent and sustained funding streams to support LEPC/TERC activities in community planning efforts.
- Facilitate outreach to non-governmental organizations including academic communities, on their role in preparedness planning, and the resources that might be available to facilitate local / regional planning efforts.



In 2021 a working group of Roundtable stakeholders met to further assess the recommendations of the 2019 Roundtable to improve hazmat planning and LEPC/TERC performance. As the final product of this analysis, the working group developed the following action options for consideration by the nation's hazmat community, to help improve hazmat planning and LEPC/TERC performance. The reader is encouraged to review the full detailed analysis and rationale leading to these recommendations located in the appendix of this report on pages appendix 2 – appendix 19.

- *Assist LEPC/TERCs transition from hazmat-only to all-hazard preparedness as routinely utilized in emergency management*
Action options: Increase federal support/endorsement for the transition. Provide guidance/training for LEPC/TERCs on all-hazard preparedness and on how to better assess hazard risks in the community.
- *Improve use of hazard mitigation grant funding to help address hazmat-related risks.*
Action options: Ensure hazmat is an eligible risk in FEMA mitigation grants and provide guidance/training on how to include hazmat in mitigation grant applications.

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- *Improve community awareness/education.*

Action options: Provide guidance/training on managing LEPC/TERC public education programs and ensure federal public messaging supports LEPC/TERCs.

- *Improve LEPC/TERC membership and leadership.*

Action options: Provide guidance/training to community leaders on best practices for increasing LEPC/TERC membership, and on how to best implement the concepts and recommendations outlined in ASTM E3241, Standard Guide for Coordination and Cooperation between Facilities, Local Emergency Planning Committees, and Emergency Responders.

- *Improve LEPC/TERC funding.*

Action options: Provide guidance and best practices for combining LEPC/TERC efforts with other agencies to share available federal funding streams, as well as guidance and best practices on securing alternative local LEPC/TERC funding streams.

The 2021 Roundtable attendees reviewed and discussed all the above recommendations and provided the following refinements and additional recommendations to improve hazmat planning and LEPC/TERC performance.

- Strong concurrence on the need for better utilization and integration of the LEPC/TERC into the local planning process, and the transition of LEPC/TERC mission from hazmat-only to all-hazard preparedness.
- Improved integration of environmental concerns and protocols with hazmat and all-hazard concerns and protocols outlined in FEMA's Threat and Hazard Identification and Risk Assessment (THIRA) doctrine and processes. The LEPC/TERC mission should reflect an all-hazards approach that is integrated into the overall THIRA-based, community planning process. This is critical, both because local focus and concern is naturally all-hazards-based, and because all-hazards planning efforts facilitate more coordinated emergency preparedness efforts.
- There is a need for enhanced national and state-level training efforts to teach prospective members on the role of LEPC/TERC at the local level. Examples of current program best practices that could be leveraged include: the importance of leadership and direction provided by the SERC at the state-level; higher-education emergency management degree programs already in-place at four-year and graduate levels; development of a new SERC and LEPC/TERC courses at the National Fire Academy; and international certification programs that could be adapted.
- Competing planning requirements at the national level may be inadvertently undermining or confounding local preparedness efforts. This can be a significant challenge at the local level if there are competing hazard priorities between what local jurisdictions want or need to



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address, and what federal support or grant funding will allow. This suggests that there may be a need to simplify and integrate federal and or state systems that provide guidance and funding to local preparedness efforts. Deference in support and funding should be given to locally derived strategic plans which address local hazard concerns, local risk reduction and prevention needs, LEPC and local government preparedness priorities, and local response community training and response priorities.

- Support the need for clearer and improved metrics of success for LEPC/TERC performance. Historically, federal programs have focused on attempting to solve “the last major incident,” as compared to addressing issues, risks and capability gaps that are identified through a THIRA-based assessment process and are tied to measurable improvements in community safety and risk reduction.
- Much of the current federal doctrine on hazmat community preparedness is based upon the visions and experiences of the 1980’s and 1990’s, combined with the experiences of the “last major incident.” While other governmental sectors (e.g., DHS, DOD) have migrated towards the vision of all-hazards preparedness in the post 9/11 world, the environmental community and many of its stakeholders have been slow to embrace actions that could enhance coordination and communications and improve community preparedness. It should be noted that in most states, the agency assigned responsibility for emergency management at the county-levels has also been designated as the administrative agency responsible for LEPC/TERC activities. While many county-level agencies responsible for LEPC/TERC activities have embraced the all-hazards approach, due to federal grant requirements, there remains a disconnect between the hazmat responder community and the modern emergency management approach.
- In 2006, Congress authorized the Department of Homeland Security (DHS) to establish the Chemical Facility Anti-Terrorism Standards (CFATS) program. The CFATS program identifies and regulates high-risk chemical facilities to ensure security measures are in place to reduce the risk of certain hazardous chemicals. The information gathered from this program can be disseminated to community planners by the Protective Security Advisors (PSA) following a demonstrated “need to know” process. It is recommended that local LEPC’s establish and maintain a working relationship with their community PSA.

IMPROVE HAZMAT PREVENTION/MITIGATION

In the 2019 Roundtable meeting, attendees made several recommendations to improve hazmat prevention/mitigation. These recommendations included:

- Integrate hazmat accident prevention into community risk reduction processes and the emergency preparedness system.
- Develop better guidance and training for local officials on hazmat transportation and facility accident prevention and risk assessment.
- Include hazmat prevention and mitigation activities in federal disaster funding programs.

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In 2021, a Working Group of Roundtable stakeholders further assessed the recommendations of the 2019 Roundtable to improve hazmat prevention/mitigation. As the final product of this analysis, the Prevention Working Group developed the following action options for consideration to help improve hazmat prevention/mitigation. The reader is encouraged to review the full detailed analysis and rationale leading to these recommendations which is located in the appendix of this report on pages appendix 36 – appendix 47.



- *Improve local hazmat prevention/mitigation policies and metrics*
Action options: Ensure federal agencies establish parallel and consistent policies for measuring local hazmat prevention and risk-reduction initiatives and provide guidance on metrics and hazard risk indicators that could be used in local prevention and mitigation programs.
- *Improve local zoning, transportation routing and land use planning*
Action options: Develop new training and guidance on conducting commodity flow studies. Provide guidance to local zoning boards and related community planning groups on using Tier II/risk management program (RMP) and other data sources for evaluating local hazmat risks.
- *Mitigate risks from natural disasters*
Action options: Expand federal disaster recovery and mitigation grant requirements and instructions to include hazmat facility and infrastructure risk reduction and mitigation.
- *Improve hazmat facility operations, inspections and code enforcement activities*
Action options: Evaluate the ability to apply federal risk mitigation grant funding to hazmat facilities and develop standards and training for inspectors and code enforcement personnel on hazmat risk identification and assessment.

The 2021 Roundtable attendees reviewed the above recommendations and provided the following refinements and additional recommendations to improve hazmat prevention/mitigation.

- Federal, state, local, and tribal risk reduction priorities should be expanded to include prevention and mitigation. Risk mitigation measures are often rated as a lower priority need when compared to more immediate, short-term planning and response measures because it is more difficult to develop metrics to quantify success for mitigation actions. Securing funding for local hazard mitigation activities, including plans review, inspections, and public education measures are often viewed as lower priority tasks. Attendees recommended the inclusion of phase-factor analyses (e.g., Haddon Matrix) in prevention and mitigation risk assessment guidance and standards, to improve development of effective intervention strategies. The Haddon Matrix is the most commonly used paradigm in the injury prevention field. The Matrix considers factors related to personal attributes, vector or agent attributes,

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and environmental attributes before, during and after an injury or death. By utilizing this framework, one can evaluate the relative importance of different factors and design interventions.

- National planning guidance needs to recognize and emphasize that risk assessment is essential for effective community hazmat prevention and mitigation. The natural nexus between response, planning, and prevention lies in the hazard and risk assessment process. If the process starts with an identification of hazards and the assessment of risks, then the next logical step is to consider whether to prevent, reduce, manage the risk (e.g., replacement or installation of countermeasures), or plan on how to respond to the risk. Under this process of risk assessment, planning, prevention, and response requirements are all based on the same objective of risk reduction. The THIRA process previously discussed is an example of the integration of response, planning, prevention and mitigation.
- National requirements for hazmat planning need to strongly discourage “cookie cutter” plan development. Planning processes that start with a requirement to simply “develop a plan” based solely upon an external planning requirement often do not consider that the risks identified as part of a planned response can often be better managed or mitigated by preventative interventions. This is especially true when planners do not recognize the inter-relationships between prevention, mitigation, planning, and response.
- Roundtable attendees strongly endorsed the importance of training inspectors and code enforcement personnel in hazmat risk recognition and identification, to strengthen early identification of risks that can be addressed by timely prevention interventions.

	Host	Agent	Environment
Pre – event	Alcohol Use, Education, Enforcing Laws Risk-taking behavior, Medications, Cognitive function,	Technology of safety measures – Brake systems, air bags, tether systems, tire quality, Load weight, Ergonomic controls, Center of gravity, Speed capability	Visibility of hazards, Road condition, Weather, Speed limits, Intersections, Coefficient friction, Signalization Drunk driving laws
Event	Seatbelt use Age, Sex, Bone Density , Stature	Speed of impact, Direction of impact, Vehicle size, Automatic restraints, Airbag, Whiplash lessening seats and head rests,	Speed limits of traffic, Recovery areas, Guard rails, Characteristics of fixed objects, Median barriers, Roadside embankments
Post - event	Age, Sex, Medications, Preexisting medical and physical conditions, Social situation	Non collapsible vehicles , Accessibility to evacuate, Alert systems,	911 access, EMS response, Location & quality of ED, Access to definitive care, Access to rehabilitation care

IMPROVE RISK-BASED RESPONSE AND PREPAREDNESS

In the findings of the 2019 Roundtable, attendees made several recommendations to improve the application of risk-based hazmat response and preparedness. These recommendations included:

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- Ensure that the delivery of hazmat emergency response services is based upon a risk-based response (RBR) process using science- and evidence-based data, in accordance with current hazmat regulations, standards, and local hazmat standard of care.
- Given the decrease in the number of hazmat and weapons of mass destruction (WMD) incidents over the last decade and the corresponding decrease in actual incident response experience, facilitate the delivery and adoption of more risk-based training and exercise opportunities for responders.
- Foster determination and delivery of local and regional emergency response capabilities that are based upon a risk-based evaluation process and are administered at the local level.
- Expand current doctrine on response priorities and strategies to include controlling incident impacts upon critical infrastructure processes and systems (e.g., transportation systems, business disruption, etc.).
- Disseminate information and training materials on emerging hazmat and weapons of mass destruction risks and response protocols to the response community in a timelier manner.



In 2021 a Working Group of Roundtable stakeholders further assessed the recommendations of the 2019 Roundtable to improve risk-based hazmat response and preparedness. As the final product of this analysis, the work team developed the following action options for consideration by the nation's hazmat community. The reader is encouraged to review the full detailed analysis and rationale leading to these recommendations located in the appendix of this report on pages appendix 20 – appendix 35.

- *Strengthen national recognition and support for RBR*
Action options: Ensure RBR is included in federal, voluntary consensus standards, and professional trade association references. This should include the development of consensus-based information and clarification of what is and what is not RBR.

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- *Improve science and evidenced-base data for RBR*

Action options: Establish single on-line point of access for information on current hazmat research of importance to applying RBR to current and emerging issues, and establish a technical expert body to translate emergent scientific findings into brief and easily understood protocols for hazmat response and planning.

- *Improve risk-based response (RBR) training strategies*

Action options: Similar to the concept of incident command structure (ICS) training (e.g., ICS-100, ICS-200, etc.), establish an on-line RBR curriculum center that helps to coordinate the development of basic, intermediate and advanced RBR training. Tasks should include: (1) the development of high-end, realistic simulations for RBR training; (2) ensure that RBR curricula includes different formats and options to meet the training needs and learning methods of emergency responders; and (3) ensure that federal online training is properly coordinated with state, local, and tribal department training officials who are responsible for responders' hazmat training competencies.

- *Recognize the secondary and tertiary impacts of staffing reductions, especially in the volunteer responder community, and its impacts upon incident response safety and effectiveness.*

Action options: Continue to support federal and state level initiatives directed towards the recruitment and retention of personnel staffing volunteer and career response agencies. The level of staffing and competence of initial emergency responders has a direct and significant impact upon the safety and effectiveness of initial response operations.



The 2021 Roundtable attendees reviewed and discussed the above recommendations and provided the following refinements and additional recommendations to improve risk-based hazmat response and preparedness.

- Attendees concurred on the need to clarify what is RBR and what is not RBR and to help ensure that response personnel are able to apply risk-based response skills and competencies more effectively at hazmat incidents.

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- Training as well as doctrine is seen as key to helping responders understand how to apply effective risk-based decisions during hazmat incidents. Many attendees recommended building a national curriculum to support RBR, and strongly urged that any curriculum be delivered in various formats and options.
- Attendees strongly recommended that all current federal planning and response guidance and rules be updated to include a full incorporation of risk-based preparedness methods and processes in the material.
- Attendees noted that while the number of “working” (i.e., serious or impactful) hazmat incidents have decreased, the need for and challenge of hazmat RBR training has increased. An increasing number of newer and less experienced emergency responders often do not have the opportunity to develop the incident-based experience that is important in applying an RBR decision-making process. While this is an evolving challenge in all response areas, it is an acute issue in hazmat response because of the great need for technical skills, as well as incident analysis and decision-making competencies. These training challenges also exist with public education efforts on hazmat risks and the public’s responsibilities for self-protection.



IMPROVE HAZMAT TRAINING

Attendees of the 2019 Roundtable meeting made several recommendations to improve risk-based hazmat response and preparedness. These recommendations included:

- Ensure that training and exercise doctrine and requirements incorporate the following elements:
 - **Funding requests** based on hazards, risks, and performance gaps
 - Address **both** ‘basic concepts’ **and** evolving trends /issues
 - Skills & competencies based on **national consensus standards**
 - **Instructors trained and certified** based upon national consensus standards
 - Curriculum integrates **principles of RBR**
 - Based on **target audience needs** and offering a variety of delivery methods
 - **Integrate disciplines** in training deliveries
 - **Quality assurance and quality control (QA/QC)** measures in place

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- Provide tools and information to assist emergency planners and responders in screening, evaluating, and using online hazmat information and training sources accessible through social media.
- The key Federal Partners (PHMSA, FEMA, EPA, etc.) should establish a Hazmat/WMD Training Coordination Group to facilitate improved communications and coordination between the key stakeholders within the training community. This should include the grantors, grantees, training providers, and representatives of the hazmat emergency preparedness community.



The 2021 Roundtable attendees reviewed and discussed all the above recommendations and provided the following refinements and additional recommendations to improve hazmat training.

- The modern emergency services audience includes a wide range of learners from different generations with different learning styles and preferences. To be effective, modern curricula for these audiences must include a wider range of formats and training approaches than is found in traditional emergency services training. These approaches should be diverse and include classroom, on-line deliveries, “micro” sessions, and other emerging formats. Curricula, delivery systems, and tracking of student training records must also be adjusted to accommodate these new training approaches.
- The reduced number of serious incidents and generational turnover in emergency services is resulting in less field experience for many responder training audiences. As a result, it is recommended that new responder training for RBR decision-making include more advanced and immersive simulations, such as virtual reality, that are sufficiently realistic to address the increasing lack of experience.



- An additional challenge for modern responder training systems is dealing with the limited time many students have for the training. For volunteer organizations, the competing time demands of families and jobs reduce the time available for training for topics that are beyond the basic and most common incident response scenarios (e.g., vehicle accidents and small residential fires). For career and combination organizations, expanded missions and limited budgets often reduce the amount of time available for

training “stand downs,” as well as backfill and overtime. As a result, supervisors and training officers must often make difficult choices between competing training needs and priorities. This is especially challenging when the training priorities arise from competing federal or authority having jurisdiction (AHJ) requirements.

- Attendees also voiced concerns on the need to better measure the quality of training. Most training curricula and training requirements focus on meeting baseline content or performance standards, and there are few additional standardized metrics that reflect higher level or advanced skill training deliveries.

IMPROVE HAZMAT STANDARD OF CARE

In the 2019 Roundtable meeting, attendees made several recommendations to improve hazmat standard of care. These recommendations included:

- The concept of “standard of care” is commonly applied in the Emergency Medical Service (EMS) and medical communities and should be articulated at a national level within the hazmat emergency planning and response communities as well. “Standard of Care” for hazmat preparedness would refer to the level of protective service that is provided and level of hazmat risk considered acceptable within the AHJ or local community. The local “Standard of Care” should also include the metrics for measuring and communicating the accepted level of hazmat service to be provided at the AHJ or local community level.
- Provide guidance and risk-based tools that can be used to facilitate the assessment of local emergency preparedness programs in assessing and managing their hazmat hazards, risks, and capabilities.
- Hazardous materials response teams (HMRTs) and Hazmat Technician-level responders are most effective when employed as a health and safety resource as compared to strictly a hazmat response resource.
- Encourage the updating of federal regulations for hazmat emergency response to reflect current response issues, scenarios, and related challenges more accurately.

Hazardous Materials Roundtable Meeting Report

The 2021 Roundtable attendees reviewed and discussed all the above recommendations and provided the following refinements and additional recommendations to improve hazmat standard of care.

- Standard of care concepts should apply to response training as well as hazmat response.
- The authority having jurisdiction (AHJ) is responsible for determining the level of hazmat services to be provided in the local community.
- Standards of care should apply to assessment of the LEPC service provided to hazmat preparedness in the local community as well as assessment of response service to be provided.
- Open and transparent communications with the public regarding the level of hazmat preparedness services required and that will be provided is essential.
- Several Roundtable attendees recommended looking at the processes outlined in *NFPA 1710 and 1720 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career and Volunteer Fire Departments* as a guide for procedures for developing hazmat response standard of care.
- Guidance and rules may be needed to help resolve any conflicts between AHJ determinations of standard of care for the local community and the level of fire brigade service approved by OSHA for a private facility within the local community jurisdiction.



IMPROVE HAZMAT FUNDING

In the 2019 Roundtable meeting, attendees made several recommendations to improve hazmat funding. These recommendations included:

- Provide guidance and tools to assist local jurisdictions in identifying and utilizing supplemental sources of both hazmat and all-hazards funding to support local hazardous materials preparedness.
- Provide enhanced flexibility on the application for and use of hazmat grant funds, providing that a connection between the funding stream and the project goals and objectives can be validated.

The 2021 Roundtable attendees reviewed and discussed all the above recommendations and provided the following refinements and additional recommendations to improve hazmat funding.

Hazardous Materials Roundtable Meeting Report



- When federal grant funds are distributed down through state and regional organizations, there are often impediments in terms of diverted costs or added limitations in how the funds are used that reduce the effectiveness for the responder end user.
- Some states, such as Georgia, provide a playbook for how to apply for each type of funding available. This was viewed by attendees as very helpful, and it was recommended that similar playbooks be provided nationally.
- Attendees strongly recommended a federal playbook of hazmat grants, perhaps placed on grants.gov.
- Ultimately the determination of what levels of emergency services are needed is made by the local level (AHJ). In order to meet this responsibility, it is important that elected officials be better informed of the operational needs and capabilities presented by hazmat risks and be better able to appreciate the seriousness of gaps that their jurisdiction may have in the delivery of local emergency services.

IMPROVE HAZMAT INFORMATION SHARING

In the 2019 Roundtable report, attendees made several recommendations to improve hazmat information sharing. These recommendations included:

- Support the timely and effective dissemination of critical information on emerging threats, risks, and agency capabilities to facilitate both short-term and long-term hazmat/WMD emergency preparedness activities.
- Foster improved communications at the local / regional level of emerging threats, risks, operational, and support capabilities.
- The Hazardous Materials Roundtable Report should be viewed as a “living document.” In order to ensure its long-term success, the Roundtable meeting should be conducted on an annual basis to ensure that organizational relationships are maintained, and an Improvement Plan (IP) to prioritize, respond to, and address the stated recommendations can be developed and implemented. Given the broad range of stakeholders involved in the process, Roundtable participants should consider designating one organization to serve as the Secretary of the Roundtable Report, so as to facilitate long-term continuity.

Hazardous Materials Roundtable Meeting Report

The 2021 Roundtable attendees reviewed and discussed all the above recommendations and provided the following refinements and additional recommendations to improve hazmat information sharing.

- Attendees felt that one effective strategy for improving hazmat information sharing would be to revitalize the Hazmat Fusion Center.

Considerations discussed were:

- The original vision of a Fusion Center was too large and tried to provide something for everyone within the fire service hazmat response community.

While the need and concept are valid, the focus should be more narrow and focused upon sharing information both to and from the emergency response community to those federal agencies with a role in hazmat preparedness, and other related stakeholders.

- Given that PHMSA is the primary funding, the initial focus of the Fusion Center should be on hazmat transportation incident preparedness. Given PHMSA's role in hazmat transportation data collection and analysis, this will facilitate the process of local personnel having access to data and the data analysis function.
- The concept of the Hazmat Fusion Center should not be confused with the national network of fusion centers that is focused on law enforcement and intelligence community needs.



V. NEXT STEPS

The 2021 Hazmat Roundtable was a continuation of over twenty years of meetings addressing national challenges in hazardous materials emergency preparedness. The vision of the Roundtable initiative is to be an on-going national forum to identify strategic-level issues in hazardous materials emergency preparedness. The purpose of the forum to facilitate the national changes needed to address those issues in the planning, prevention, and response programs of the nation's emergency preparedness community.

Future Roundtable meetings will continue to build on this work as a living vision of the strategic improvements needed nationally and will also concurrently begin to foster and encourage specific tactical actions and programs by participating Roundtable organizations that will help achieve those strategic goals.

Membership in the Roundtable process will continue to evolve, based upon changing national level needs and gaps. The use of Work Groups such as used in 2020 and 2021 to focus on specific mission areas or issues will also continue as a mechanism of developing action plans for specific issues identified in the Roundtable process. While future Roundtable meetings may have different cross sections of participants attending a given meeting, it is envisioned that all persons participating at any time in the Roundtable effort will continue to be considered part of the national Roundtable Team and will have continuing opportunities to provide input and participate in the program. The nation's hazardous materials community is indebted to the work of all of the attendees of this meeting and of all previous Roundtable meetings.



APPENDIX: REPORT OF THE PRE-MEETING FEASIBILITY STUDIES

The following pages contain the report of the pre-meeting feasibility studies that were performed to prepare options for consideration at the 2021 Roundtable meeting on how best to improve LEPC/TERC performance, to improve risk-based response and preparedness, and to improve hazmat prevention and mitigation. The report explains the detailed analysis and rationale behind the recommendations offered in the 2021 Roundtable meeting.



**Recommendations for
Improving Local Emergency Planning
Committee (LEPC) Performance, Improving
Risk-Based Response, and Improving Hazmat
Prevention/Mitigation**

*Recommendations for Consideration
at the 2021 Hazmat Roundtable Meeting*

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Introduction

The 2019 Roundtable attendees identified a number of issues impacting hazardous materials preparedness that they felt merited national attention. After the 2019 Roundtable, the U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) facilitated several virtual discussions of the issues identified in the 2019 Roundtable with a group of federal agency and non-government organization partners who have hazardous materials preparedness missions and programs.

In these discussions, three issues were selected for more in-depth analysis in order to propose concrete action options for consideration at the 2021 Roundtable. The three issues selected were:

- (1) Improving LEPC Performance;
- (2) Improving Risk-Based Preparedness and Response; and
- (3) Improving Hazmat Prevention/Mitigation.

Each of these issues is presented in a separate section of this report. The action options for each of these three issues are the centerpiece of this work and are presented at the beginning of each section. The action option findings are followed by an in-depth account of the analysis and discussions that resulted in the action options. Finally, the appendix lists the participants in the federal hazardous materials partners group and in each of the three groups who worked on analyzing the problems and developing the action option proposals presented here for consideration.

Improving LEPC Performance

Executive Summary and Recommended Action Options

LEPC Performance Problem Assessment

The 2019 Roundtable attendees expressed concerns about uneven LEPC performance and support for local hazmat preparedness. Among the discussion points were that LEPCs should be better integrated into local planning, potentially with a broader focus on all-hazards community risks and needs. Attendees noted the importance of strong leadership, and the need for increased emergency responder and industry participation. They also felt that LEPCs should reflect the “whole community” concept, need better, more consistent funding and noted that an untapped resource included outreach to the academic and philanthropic communities for LEPC support.

The 2021 workgroup assessing LEPC performance issues concurred with the 2019 Roundtable findings, and also noted a number of additional LEPC issues and barriers that may merit discussions. Workgroup members noted that many LEPCs nationally were in a transition from hazmat only to all hazard preparedness, but that this transition was slow and additional support was needed. The need for strong leadership and more robust membership in under-performing LEPCs was noted, and that improving community awareness and education regarding hazmat and all hazard risks and the LEPC role in preparedness may be key. Concurrent with building stronger membership and support, it was felt that LEPCs should embrace the concepts and processes outlined in *ASTM Standard E3241-20 – Standard Guide for Coordination and Cooperation Between Facilities, Local Emergency Planning Committees, and Emergency Responders*. Finally, there was a strong consensus that LEPCs also need to expand their preparedness mission to do more in the hazmat prevention/mitigation area, especially using information provided to LEPCs about hazmat present in the community (Tier II reports, etc.) to better identify, evaluate and mitigate potential risks to the community.

Recommended Action Options

1. **Help LEPCs Transition from Hazmat-Only to All-Hazard Preparedness**
 - 1.1 **Increase federal support/endorsement** for LEPC transition. Provide assistance and/or direction from EPA and other members of federal hazmat community to State

Emergency Response Commissions (SERCs) and LEPCs to support a transition from hazmat-only to all-hazard preparedness. Key elements include recognizing the importance of SERC leadership in this transition, and federal recognition of expanding the SERC and LEPC missions from hazmat-only to a broader, all-hazard integrated preparedness process.

1.2 Provide all-hazard guidance and training programs for SERCs and LEPCs on how to undertake an all-hazards preparedness process that would include examples of best practices, planning and preparedness procedures, recommended planning and preparedness team composition, and all-hazard planning tools and resources. **NOTE:** Training programs and information can be provided through a range of delivery options including in-classroom, on-line, virtual, etc. It is the Working Group's intent that a wide range of delivery options be considered, based upon identified knowledge and skill gaps, training technology, and delivery options.

1.3 Provide guidance and training programs to improve assessment of risks and to assist LEPCs on the special challenges of identifying prevention and mitigation concerns regarding Tier II materials. These materials should include identifying critical target hazards within a community including the products involved, the type of containment systems and processes in place and assessing the actual release risks upon evaluation of the containment systems as well as the materials themselves. In short, these programs should be focused towards supporting a more accurate risk-based preparedness process.

2. IMPROVE ACCESS TO HAZARD MITIGATION GRANTS

2.1 Ensure that hazardous material is an eligible risk under FEMA mitigation grants, and that LEPC coordination is a requirement in federal mitigation planning.

2.2 Provide guidance and training for LEPC members on how to best to incorporate hazardous materials risks into the FEMA hazard mitigation grant application process, including which eligible hazards, mitigation options acceptable for funding, documentation requirements and procedures to follow, and best practices and examples of successful LEPC hazmat mitigation grant applications.

3. IMPROVE COMMUNITY AWARENESS AND EDUCATION

3.1 Provide guidance and training programs to instruct LEPC members on how to set up and manage an LEPC public education program. Competencies should include public messaging techniques and audience targeting. Competencies should also include procedures for using diverse media and social media mediums, and best practices examples of other successful LEPC public education programs.

3.2 Provide public education materials and media kits to SERCs and LEPCs to raise public awareness of the need for all-hazard preparedness. Materials could accompany grants to help fund informational campaigns.

3.3 Ensure federal public messaging includes emphasis on LEPCs. Federal and state agencies with on-going national emergency preparedness public education campaigns should include references to LEPCs in their public messaging programs pertaining to local-level emergency preparedness.

4. IMPROVE LEPC MEMBERSHIP AND LEADERSHIP

4.1 Provide federal guidance to SERCs on strategies and best practices to increase the commitment and involvement level of LEPC members. Such strategies may include exploring a regional approach rather than local LEPC format in areas where appropriate,

4.2 Provide best practices examples, guidance and training materials for LEPC leaders on best practices and tips/techniques to improve the effectiveness of LEPC activities. Guidance should also be provided on ASTM standard E3241, to help improve LEPC member engagement and involvement. Online discussion groups for LEPC leaders could also be provided to allow sharing of ideas and even mentoring by experienced LEPC leaders.

5. IMPROVE LEPC FUNDING

5.1 Provide guidance to LEPCs on combining all-hazard preparedness efforts with other local preparedness groups to access disaster preparedness funding for some LEPC activities.

5.2 Provide alternative funding best practices examples and guidance for LEPCs on techniques for securing alternative funding for programs and provide online venues for alternative funding lessons learned sharing.

Improving LEPC Performance

Background Discussions and Analysis

The workgroup met in two virtual meetings to analyze problems impeding LEPC performance and to propose action options to address those problems. The first was on May 17, 2021, and the second was on July 6, 2021. In each of these discussions, the workgroup addressed the following 8 areas of issues:

1. LEPC focus on hazmat only versus “all hazard” preparedness.
2. Improving LEPC hazmat accident prevention/mitigation.
3. Improving community awareness/education.
4. Use of Tier II reports and improving hazmat risk assessment.
5. Improving LEPC membership and leadership.
6. Implementation of the ASTM standard E3241 for coordination and cooperation between facilities, LEPCs, and emergency responders.
7. Improving LEPC funding.
8. How LEPCs can demonstrate success

1. LEPC FOCUS - HAZMAT ONLY VS. ALL HAZARD PREPAREDNESS.

Diverse opinions were expressed on the question of whether LEPCs should focus on all-hazard preparedness versus hazmat only. The current mandate under the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 is to focus on hazmat preparedness, but it was noted that many communities have already expanded that role to all hazard preparedness. Communities moving to all-hazard issues are doing so in part to better address community needs, stakeholder input and the integration of hazmat risks into overall community risk reduction efforts.

It was argued that to be successful, LEPCs should be relevant and address real problems in the community, which often can involve multiple risks or concerns of which hazmat is only a part. LEPCs need to “know their customer”- if the local customers want LEPCs to attend to all-hazard problem scenarios, then those LEPCs should do so and transition more to all-hazard risks and issues. If a mature local all-hazard planning process already exists, then LEPCs should look to blend in with that. LEPCs can also be a neutral forum for preparedness decisions. If the community has concurrence on the requisite capabilities, gaps and risks, then the LEPC’s measure of success is how well the LEPC is addressing and filling those gaps. In the discussion, it was felt that if the community needs are protection from all-hazards and not just hazmat, then LEPCs need to be oriented to all-hazards.

The transition from a “hazmat only” to all-hazards” program can be challenging. It may be hard for those LEPCs who have been working only on hazmat for 3+ decades to undertake the broader

goals of all-hazard preparedness. From a policy perspective, many state SERCs provide direction and support to LEPCs, which can help if the SERC is also embracing all-hazard preparedness. In some states, the SERC is less of a factor and the LEPCs “do their own thing” perhaps with guidance from federal and professional associations which can sometimes support all-hazard preparedness philosophy. From a planning standpoint, if an LEPC looks at who should be involved in the planning process (industry, fire service, community, etc.) and potential incident consequences (critical infrastructure impacts, public protective actions, etc.) of an incident, many of these points then lead naturally to an all-hazard planning process even if the LEPC doesn’t call it that.

In general, it was noted that LEPCs are moving, albeit slowly, towards the direction of allhazards planning, and any additional assistance that can be provided to help in that transition will be invaluable.

The workgroup addressed a range of action options that might help the LEPC community address the challenge of all-hazard preparedness needs vs traditional LEPC hazmat focus. It was noted that some LEPCs are undertaking the transition to the more modern and comprehensive all-hazard approach to community preparedness. It was recognized that LEPCs currently focused only on hazmat may face many challenges as they undertake a transition to all hazard preparedness.

The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help LEPCs address those challenges.

Policy - Possible formation of an interagency federal body to develop a new set of LEPC mission requirements that would blend EPA EPCRA-based local hazmat preparedness requirements with FEMA, DOE, DOT, and other agency all-hazard local preparedness recommendations. The intent would be to have a single integrated set of federal recommendations for local all-hazard preparedness work that would be endorsed and sponsored by all federal agencies and programs as a united body.

Guidance - Guidance should be developed to provide LEPCs with a track to follow in negotiating the transition to all-hazard preparedness. Such guidance could be based upon a compilation of best practices and lessons learned by those LEPCs already addressing hazmat as part of all hazard preparedness in their communities.

Training - A suite of training programs should be developed to help LEPC members understand all hazard preparedness, such as understanding disaster risks and potential disaster-caused hazmat releases and understanding possible broader LEPC roles and responsibilities in disaster planning and response. Such training should be delivered in blended forms of instructor-based training materials provided to SERCs and State training offices, and online training offered by different federal agency online delivery systems.

Tools and Resources - Job Aids for LEPC all-hazard planning and risk assessment should be developed to provide appropriate assistance to community response organizations in their

planning for response operations during all-hazard incidents, and to help LEPCs better support local requests for financial support for recovery operations.

1. IMPROVING LEPC HAZMAT PREVENTION/MITIGATION

When hazmat risks are identified, the first and best option for any community to fill capability gaps is prevention/mitigation. The goal of prevention/mitigation is to try to prevent the accidents from occurring or to mitigate the danger. Prevention/mitigation is the key to reducing accidental releases of hazardous materials and to saving the community from the costs and losses stemming from hazardous materials emergencies. Prevention/mitigation is not only an issue for fixed facilities. Consideration must be given to prevention/mitigation efforts within the control of the community. Planning, zoning, building codes, transportation route controls and a host of other options can be evaluated by the community.

It was noted in the discussions that the LEPC's primary mission of community right-to-know does not directly encompass preparedness and risk reduction per se, and a significant portion of LEPCs are not so engaged. Prevention and mitigation are very important to the community however, and many LEPCs have taken the initiative to address doing community risk assessments and taking preventative and mitigative actions. Many LEPCs use TIER II submissions and other data on hazardous materials facility and transportation corridors for preparedness planning as well, although utilizing process safety management (PSM) and other risk-based analytical tools is not commonly done.

Participants stressed that while regulatory compliance is important, the bottom line is identifying and addressing the actual risks that are present in the community. It was noted that there are many best practices among those LEPCs addressing actual risks, such as LEPCs working with FEMA to address hazmat mitigation in communities with substantial oil and gas development.

The discussion concluded that this was an important area of potential growth for those LEPCs who are not addressing either risk assessment or risk prevention and mitigation, and that support should be provided to help those LEPCs to undertake this work to better protect their communities.

An important question is how LEPCs demonstrate success. The foundation of success starts with the process of risk identification. Regardless of whether LEPCs embrace all-hazards planning or not, identification of risks is the crucial first step. This is discussed further in the last section.

Workgroup members explored a range of optional actions that should help improve LEPC prevention and mitigation service. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that were discussed in the meetings.

Policy - Recommend to SERCs that they facilitate or allow LEPCs to expand their base mission from a community Right-to-Know focus to a broader risk assessment and community risk reduction mission. It is important to note that almost all risks faced in a community can have a

hazardous materials component. The use of a Chemical Operations Support Specialist can be a resource in identifying and providing critical information to responders, planners, key leaders and decision-makers.

Guidance - Guidance should be developed to provide LEPCs with best practices in how to collaborate with facilities to assess the performance of process control and storage systems, the identification of risk scenarios that could be prevented or mitigated, and how to work together to reduce those risks.

Training - Training programs should be developed to instruct LEPC members on the types of hazards and risk-based scenarios that are possible and the impact of mitigation approaches such as containment systems and processes, inventory reduction, and mitigation measures such as security, water spray systems, and containment / confinement options.

Tools and Resources - Creation of Job Aids for LEPCs articulating common scenarios, critical incident factors, and prevention measures. Given the mission of the U.S. Chemical Safety Board (CSB), this may be an area where the CSB's technical expertise could be leveraged.

2. IMPROVING COMMUNITY AWARENESS/EDUCATION

It was noted in the discussions that one of the principal concerns facing LEPCs is low public interest in hazardous materials risks in the community and in the work of the LEPC. It also was noted that public interest increases when the LEPC is working on things that are relevant to the community (e.g., meth lab preparedness, or wildfire preparedness). Conversely, public interest is low when the LEPC work is not seen as relevant.

It was acknowledged that public indifference to hazmat risks is understandable given the success of prevention and codes enforcement, as well as the decreasing incidence of significant hazardous materials emergencies. But it is also recognized that while the frequency of incidents may have decreased, risks to the community remain and public indifference can be a barrier to better planning, prevention and mitigation measures.

Public awareness of threats is important to community preparedness. Low public awareness of the need for hazardous materials preparedness can further undermine local governmental support for LEPC programs, can foster lower attention to individual safety at home and in public spaces, and can decrease safety precautions in the workplace.

Finally, it was noted that good support is needed from both the State and federal government in providing tools and assistance needed to heighten public awareness of the importance of LEPC work, and of the continued risks presented by possible hazmat releases.

LEPCs, SERCs, States and the federal government need to have high expectations for the participation of the general community members such as small businesses and non-regulatory public entities in their own preparedness. It was noted that success in this endeavor requires education on risks and the expectations of the community on general preparedness capabilities.

The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that may also help LEPCs address those challenges.

Policy- Federal agencies and states with public education campaigns - including those agencies without a direct emergency preparedness mission, should be encouraged to routinely refer positively to the important work of LEPCs in any public messages addressing disaster, all-hazard or hazmat emergency preparedness. The goal would be to raise the general public understanding of risks and the perception of LEPCs as an important resource in preparing for those risks.

Guidance - Guidance should be developed to provide LEPCs with samples and examples of successful LEPC public education and awareness programs and outreach efforts. Such guidance should include candid lessons learned and tips/techniques from LEPC public education professionals with successful experience in raising public appreciation of LEPC emergency preparedness services. In addition, FEMA is currently seeking input on the Key Planning Factors and Considerations for Response To and Recovery From a Chemical Incident (Chem KPF), as well as the Chemical Operations Support Specialist (NIMS 509) position.

Training - Online public education training programs should be prepared for LEPC members in the steps and procedures to follow to set up and implement an LEPC public education program. The training could be offered online at appropriate federal online training systems and release to SERCs for within state deliveries. The online service could include national “chat rooms” for LEPC members to share ideas on public education techniques supporting LEPC emergency preparedness work.

Tools and Resources - Public education materials and kits should be prepared and provided free to LEPCs through SERC distribution that could include professional media spots and other promotional materials. The goal of the materials would be to raise positive public awareness of the need for LEPC work and the “hidden risks” of hazardous materials whether at facilities or in transportation. Key to the effectiveness of such materials would be a positive message and treatment for safety approaches that avoid any negative treatment of facilities or industries as sources of uncontrolled risks.

3. TIER II REPORTS AND IMPROVING HAZMAT RISK ASSESSMENT

One of the gaps noted is not assessing the likelihood of the release of Tier II chemicals based upon a variety of response scenarios, including assessing the probability of containment system failure.

Under the Emergency Planning and Community Right-to-Know Act (EPCRA), LEPCs annually receive Tier II information from facilities in their jurisdiction. It was recognized that in planning, LEPCs often use this information to determine vulnerable zones that are based on the known hazards and potential behavior of the material. LEPCs also have the authority under EPCRA to obtain Tier II and other emergency preparedness information from a reporting facility. The

objective of these requests is to ensure that both prevent the community from being in the position of not having key information on the risks in the community.

While this information provides an awareness of what hazardous materials may be on-site above their threshold planning quantity, this is different than evaluating the actual probability of a release based on historical releases, containment system failures or accidents impacting the containment system. Preparedness planning should not be based on abstract calculations that do not reflect and can underestimate the reality of the risk, nor alternatively should they be based on the last worst-case event in the community. Instead, there is a need for better metrics to measure the degree of actual risk of release, and to thereby measure the success of preparedness programs to reduce that risk to an acceptable level. A sophisticated evaluation of accidents at similar facilities and similar operations across the country should be undertaken; however, it is also critical that extreme weather events (e.g., hurricane, floods, tornado) as a cause of accidents be considered.

It was acknowledged that addressing the risks and pushing for action to reduce the risks can be difficult for LEPCs, as LEPCs typically do not have any regulatory authorities. However, LEPC's do have the ability to raise issues of concern, such as the strengths or weaknesses of the physical containment systems, inspection reports of storage facilities, and regulatory citations. In the discussions, it was felt that when these efforts of LEPCs are based on realistic assessments of threats that truly put the community at risk, the resulting risk reduction can provide a very significant improvement in community safety.

The planning process involves assessing and then improving the community's capabilities to deal with the risks that are present. This burden does not fall solely on any one segment of the community. Success is not measured in the severity of the incident, the success of the response, the number of incidents prevented (recognizing that is unmeasurable), but rather on progress in identifying and filling capability gaps.

The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help LEPCs address those challenges.

Policy - Policies and regulations requiring TIER II reports should be expanded to include some additional categories of information. Examples are the training and response capabilities of the facility, the accident prevention programs at the facility, and the general awareness and capabilities of the community to participate in mitigation efforts. TIER II reports already contain some information on the overall quantity, type of container(s) and location of the hazardous materials, but additional details such as the age of the containment system (and whether the system meets current practices), recency of maintenance and service, inspection reports, and perhaps even a "risk rating" of vulnerability to breach and the impacts.

Guidance - Guidance should be developed to provide LEPCs with examples and techniques on how to use the TIER II report information to assist assessments of risk in emergency preparedness, such as sharing relevant information with land use planning groups, working with emergency planning groups to assess realistic risks presented by relevant portions of the

information, and using the information to critically review hazmat transportation routes within the jurisdiction.

Training - Training and information materials should be developed to instruct LEPC members with procedures and recommended tips/techniques for assessing risk of release of the hazardous materials in TIER II reports. Various training delivery modes should be evaluated based upon the technical content and target audience. Leveraging information from the CSB and the process safety management (PSM) community can also be helpful in both understanding and evaluating the level of risk to the community.

Tools and Resources - An online reference data site should be developed as a job aid for LEPC members and emergency response planning. The online job aid should explain different hazardous material accident prevention programs and mitigation efforts such as containment systems and should also explain the common failure risks that may merit attention in emergency planning. The information should be prepared for non-engineering audiences and designed to be easily understood without technical knowledge of the mechanics or chemistry of the containment system.

4. IMPROVING LEPC MEMBERSHIP and LEADERSHIP

In the discussion, all concurred that highly motivated members are very important to the effectiveness of LEPCs and that strong leadership in the LEPC chair role can often be the key to LEPC success. Effective leadership is very important in motivating members. LEPC performance can be dramatically improved by selecting an LEPC chair and leadership team that is highly motivated, that is highly knowledgeable of hazardous materials preparedness and the responsibilities of LEPCs, and that has the ability to engage all stakeholders.

It was noted that the level of participation can differ significantly from one LEPC to another. The effectiveness of the LEPC can vary based on who is showing up on regular basis, whether there are limitations on the availability of industry representatives when the industries span different LEPC jurisdictions, and variations in the technical expertise of members because of professional time conflicts

An additional factor impacting LEPC performance is whether the LEPC has a focus on hazmat only that separates its activities from other all-hazard planning occurring in the jurisdiction. If the fire and emergency services and industry representatives are actively engaged in all-hazard planning work outside the LEPC that includes hazmat, this may limit their availability to participate in LEPC meetings.

One of the keys to LEPC success is creating an environment where LEPC members build strong personal relationships. If members get to know each other, their knowledge and skills and their roles, it facilitates the development of a trust-based environment for both preparing for and responding to emergencies. Members should be encouraged to engage in collaborative work

outside of the meetings and build the strong relationships needed for the close partnerships that will be needed in an emergency.

It was noted that some of the greatest impediments to LEPC effectiveness and to member commitment are the conflicting time demands that members have which can limit their availability and involvement. Consolidating preparedness at a broader, regional level can sometimes overcome this impediment. One strategy to address this is consolidating planning at a regional level. Consolidating to regional planning often seems to work better and maintain members commitment better than trying to spread members time across multiple local planning groups. Regional-based planning can also support regional response plans in jurisdictions where some of the higher technical response expertise resides at the regional level rather than the local level.

The workgroup discussed possible actions that should be undertaken to help the LEPC community address the challenge of improving LEPC leadership and membership. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help LEPCs address those challenges.

Policy - It may be helpful for federal and state policies to encourage a regional focus rather than local LEPC format where appropriate, to help reduce time demands on LEPC members and increase the commitment and involvement level of LEPC members. Federal and state agencies should identify and encourage promising local LEPC leaders identified by the SERCs or through organizations such as the National Association of SARA Title III Program Officials (NASTTPO). Building upon FEMA's "whole community" concept, the goal should include increasing diverse and underrepresented groups in LEPC membership. Representatives from populations that are at greater risk due to a lack of resources or other disadvantages should be sought.

Guidance - Guidance should be developed for LEPC leaders on best practices and tips/techniques to create an environment to foster strong relationships and working partnerships among LEPC members. Online discussion groups for LEPC leaders could also be provided to allow sharing of ideas and even mentoring by experienced LEPC leaders.

Training - Practical and time efficient training should be developed to help new LEPC members better understand the roles and perspective of fellow members from other disciplines, so that a mutual understanding can be fostered that will lead to strong relationships. Such training should include an introduction to values and professional perspective of their new preparedness partners from other disciplines, as well as an overview of their work and response roles. For example, an introduction to the emergency management discipline for new LEPC members unfamiliar with emergency management would include a brief history of emergency management in the U.S, and the values, terminology and traditions of the profession as well as work protocols and emergency management roles in disaster response, etc. There could be similar introductions to the other services (fire service, EMS, law enforcement, etc.) In addition, grant and philanthropic resources should be made available and sought to promote and train new and diverse LEPC leaders.

Tools and Resources - Job aids for LEPC leaders that would address job requirements, best practices in meeting those job requirements, and tips/techniques from other successful LEPC leaders on how best to address different challenges in LEPC management.

5. IMPLEMENTATION OF THE ASTM STANDARD E3241 FOR COORDINATION AND COOPERATION BETWEEN FACILITIES, LEPCS, AND EMERGENCY RESPONDERS

The ASTM Standard E3241 - Standard Guide for Coordination and Cooperation Between Facilities, Local Emergency Planning Committees, and Emergency Responder, was discussed in detail. Excerpts from a summary of the standard are included at the end of this document. This seminal standard focuses on improved coordination and cooperation in the relationships between facilities, LEPCs and emergency responders. It was recognized that good partnerships between these groups are critical to effective and seamless local hazmat preparedness. It was noted in the discussion that the Standard is based on the idea of give and take between industry, LEPCs and emergency responders. The standard recognizes the different role of these three groups (for example, the standard reinforces that industry has responsibility for safe handling and prevention within their systems) and how they need to interact and support one another in coordinated emergency preparedness.

It was also noted that in many local communities, mutual understanding and cooperation between these three groups is often limited. It was acknowledged that much work is needed to ensure awareness and better understanding of planning, prevention and response. At the street level there often continues to be confusion within the different groups about each other's roles - confusion about why industry is asking the fire service about issues, about why industry is being asked about their preparedness, etc.

There is a need to improve each group's understanding of the other group's roles and responsibilities, and about how well each group is doing in its responsibilities. This is also true about other groups that are peripherally involved in emergency preparedness, such as transportation system coordinators, land use planning/zoning groups, or citizen groups that need to be better included in these partnerships.

The workgroup discussed possible actions that should be undertaken to help foster better mutual understanding and working partnerships at the local level between industry, LEPCs and emergency response organizations. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that may help LEPCs address those challenges.

Policy - Consider available options to improve information sharing from local industries with hazardous chemicals about their accident prevention plans, training and response capabilities and better participation by those industries with LEPCs and local emergency services in all-hazards preparedness planning.

Guidance - Guidance should be developed to provide LEPCs with best practices, lessons learned, and recommended procedures to establish and build closer preparedness partnerships with local industries, local emergency response organizations and the members of the community.

Training - Training should be developed for industry audiences on the roles, common practices, and values of the LEPC and the emergency response communities, to help the industry audience better understand these communities and what these communities expect of industry as partners in local emergency preparedness. Such training could be prepared as online training and offered both at federal training websites commonly used by industry and at industry-specific training websites.

Tools and Resources - Checklists and job aid tips for routine and regular outreach contacts to industry personnel in the local community, checking on any emerging risk issues and regularly reinforcing LEPC expectations of industry's participation in local preparedness.

6. IMPROVING LEPC FUNDING

In the discussion, it was noted that there continues to be a lack of consistent and sustained funding streams to support LEPC activities in community planning efforts. While that lack of funding, at least of federal funding, is universally recognized, it was pointed out that some LEPCs have been successful at seeking alternative funding. For example, some LEPCs have formed non-profit organizations to do many things including seeking funding, and some have been very creative in seeking financial assistance from private organizations and other non-governmental sources.

It was recognized that local governments usually can't provide the financial support needed, although they can often provide other non-cash resources. And it was recognized that the trend for HMEP funding, one of the primary sources of federal support for local hazmat program, will continue to focus on transportation risks.

As a result, it was felt that new strategies need to be pursued by LEPCs to develop alternative funding sources not dependent upon the federal government but with sufficient stability to effectively support strengthening LEPCs work in hazmat preparedness and protecting local communities from hazmat risks.

The workgroup discussed possible actions that should be undertaken to help the LEPC community address the challenge of improving funding for LEPC operations. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help LEPCs address those challenges.

Policy - City/County Manager professional associations and Governor's Associations should be urged to articulate national policies supporting local and state funding of LEPCs as a budget component of other local emergency services funding and support.

Guidance - Best practices guidance should be developed to provide LEPCs with examples of different funding models, based upon the lessons learned from other LEPCs that have successfully secured alternate funding.

Training - Training should be developed on techniques and procedures for securing funding from the private sector and associations for LEPC operations and LEPC related programs. Such training should be offered online concurrently on different federal online training delivery systems and offered as hand off instructor-led course packages to be released to SERCs and State training offices for state-sponsored instructor-led deliveries. It was noted that the National Fire Academy – Hazardous Materials Curriculum is currently in the process of developing an LEPC Course focused on fire department participation.

Tools and Resources - Reference documents should be prepared and released to SERCs and LEPCs that describe the wide variety of private sector funds and charitable organizations in existence nationally that can be approached by LEPCs for funding. Such a catalog should include a description of each fund or funding organization, a history, if any, of prior LEPC or emergency services funding or donations by that fund or organization, contact persons, and types of applications or documentation needed to apply for such funding. The catalog should be updated annually and maintained at the federal level as a non-print online resource for routine use by SERCs and LEPCs.

7. DEMONSTRATING SUCCESS

LEPC's have made valuable and substantial contributions to chemical safety within their communities. Nonetheless, LEPCs must measure their progress and determine if the actions they are taking continue to achieve the desired outcomes. This approach is based on the Awareness and Preparedness for Emergencies at Local Level (APELL) Handbook issued by the UN Environmental Program.

The LEPC may be evaluated by local government entities, including the mayor, the city council, or similar community groups, in order to determine an appropriate level of funding as well as whether the work of the LEPC deserves the time and attention of the membership. For example, industry may want to know if the chemical information (and often, the financial support) they provide is being used wisely and efficiently. Individual citizens may wonder if the LEPC's work is effectively protecting the community. Federal agencies may use indicators of success to support grant funding and other decisions related to LEPCs. Clear metrics are needed that can facilitate the study and evaluation of local LEPC activities and how they have led to better protection of the community from chemical risks. All these and other issues can provide the reason to measure the progress of your LEPC.

Often success is measured by the last community emergency. Case studies show that this often devolves into a 20/20 hindsight evaluation of preparedness and capabilities. As that is obviously unfair, we propose an alternative that is focused on improvement of community emergency preparedness capabilities. The process is straightforward:

- What are the hazards and risks in the community?
- What are the capabilities in the community to manage these risks?
- What are the gaps and limitations of the current program?
- What is the strategic plan to address these capability gaps?

Measuring progress in filling capability gaps allows you to take a step-by-step approach to reducing the likelihood of accidents and improve preparedness and response capabilities. Depending upon local hazards, risks, capacities and conditions, there are several possible goals and metrics that can be applied to the activities of LEPCs. One size does not fit all. The advantage of this program for LEPCs is the ability to set goals and measure progress in a way that is specifically relevant to the community the LEPC serves.

How to Measure Progress

Many LEPCs expect a checklist of what they should be doing. However, it is much more effective for LEPCs to have their own vision of success based upon the threats, risks, capacities, and conditions in the community they serve. That vision should be clearly articulated in writing and come from a group discussion of the concerns and motivations that caused the participants of the LEPC to become engaged.

It may be that none of the LEPC members believe the vision is obtainable given current resources. That does not matter as long as the LEPC members understand its mission is to make progress towards the vision. The vision of success is an aspirational goal and should set the long-term objectives for the work done by the LEPC.

Some LEPCs have adopted a vision of success along the lines of an engaged community with a broad safety and preparedness culture as shown by:

- Robust emergency planning and personal preparation
- Effective and safe response
- Hazardous materials accidents prevented.

Obviously, this or any vision of success cannot be achieved in one or two steps. It is, instead, achieved through a progression of activities designed to achieve milestones along the path to success. To define these steps, LEPCs should establish both short-term and long-term goals that it believes will lead to achieving the vision of success. These goals should be a product of clear discussion and agreement among the LEPC membership.

Achieving a goal or outcome requires measuring the results from activities in a way that is relevant to the goals. These results are called targets or metrics. When the LEPC sets a goal it should be paired with what the LEPC is going to measure that shows progress towards the goal and when you have achieved the goal.

The following examples might help clarify the outcome/output distinction and the role of targets.

1. If your community has recently had a chemical release that led to injuries and deaths, community leaders or the LEPC/TEPC could establish a goal: no more injuries and deaths from a chemical accident in this community. That is a clear goal, perhaps overly ambitious in the eyes of some people, but one that is

- understandable and sensible in the context of your community's recent history.
- a. There are a variety of possible metrics/targets: no deaths or injuries this year, no accidental releases this year, and/or a 30% reduction in the number of accidental releases this year.
 - b. A range of products and/or activities can be undertaken by the LEPC to meet the metric/target for the goal. They could include:
 - a revised emergency plan,
 - exercises to test the emergency plan,
 - training for local responders,
 - outreach materials for local citizens to ensure that they know the appropriate steps to take if there is an accidental release,
 - improved warning and notification systems to ensure that citizens are aware of a release,
 - establishing a continuous dialog with industries in your community on risk reduction and accident prevention, and so forth.
 - c. The LEPC then looks at the metrics/targets, including trends and changes over time, to determine if the outputs are productive and useful in achieving the goal.
2. An LEPC might have as a goal to improve community awareness on the hazardous materials hazards present in the community, including awareness of the appropriate actions to be taken in the event of an accident. The target goal could be a specific annual increase in the number of citizens familiar with local chemical hazards. Measuring success could involve interviewing citizens annually or citizen performance in exercises or other tests of emergency plans. "Activities or outputs" to achieve this goal could be public meetings at which chemical hazard information is shared, printed materials with maps showing the location of specific chemicals, and video materials for use on television programs, online and/or at public meetings.
3. Another possible goal is to ensure that all facilities in your community that are subject to EPCRA are in full compliance with the law. Targets goals could be an annual increase in the number of facilities that have submitted information or a reduction in the number of facilities found to be in noncompliance during inspections. Activities to accomplish these targets could include an annual campaign focused on a specific industry sector, or a public campaign through industry and trade organizations urging all facilities to submit the required information.
4. A specific preparedness goal might be for all students and teachers in local schools to be familiar with what actions they should take if there is a chemical release in the community with a possible impact on the school. A possible target could be the number of students/teachers who take the appropriate action during an exercise. As activities the LEPC could conduct training on hazard awareness, shelter in place, develop print and audio/visual materials, and/or prepare signs to

post at strategic points.

Excerpt from ASTM E3241

The standard can be accessed online at <https://www.astm.org/Standards/E3241.htm>

Preparedness includes awareness and education for all community members that should be impacted by a hazardous materials accident, and creating expectations for the actions of all community members should an accident occur. The point of preparedness is to minimize the impact of a chemical accident through the actions of all community members, rather than the actions of only facility and response agencies. These actions, when coupled with accident prevention and consequence reduction strategies, reduce the potential for hazardous materials accidents and minimize the consequences of those that do occur.

There is great potential benefit to facilities, communities, LEPCs and emergency responders in developing a common understanding of the chemical hazards and accident preparedness capabilities present in their communities. The common understanding can significantly minimize the consequences of hazardous chemical accidents. Coordination and cooperation must fit into the process for improving community preparedness.

Preparedness is based first on the community developing a broad awareness and understanding of the risks that are present, locally. Next comes a community-wide evaluation of which community members are most vulnerable to risks, the mechanisms or pathways of risks, and the existing capabilities to address those risks should an accident occur. The capabilities being evaluated include more than the ability of the first responders to take actions. It includes the capabilities of all community members to take appropriate actions.

Since all communities have capability gaps when evaluated against the risks present in the community, the subsequent step is strategic planning to fill those capability gaps with prioritization for these efforts developed by the community members. Again, improved preparedness is the goal, not simply focusing on response capacity.

Filling capability gaps requires the use of all the regulatory and social tools available to the community and its partners. All community members have a stake in accident prevention, consequence reduction and improving the collective ability to communicate and respond. Improvements are made through increased awareness, education, training, cooperative programs, and practice. Addressing the identified capability gaps can include a broad range of options such as accident prevention to creation of expectations for the actions of community members to be able to shelter, evacuate and provide aid to others. Stakeholder engagement is critical to successfully closing capability gaps.

Accomplishing these tasks is a community-level activity. While it should be led by an emergency manager or local emergency planning committee, the key to successful preparedness planning is broad coordination and cooperation involving all community members. Facilities must be part of the preparedness effort because of their greater expertise on the properties of the hazardous chemicals

present at their plants, knowledge of their operating systems and procedures, hazards assessments, their emergency plans, and emergency response capabilities.

Improving Risk-Based Preparedness and Response

Executive Summary and Recommended Action Options

Risk-Based Preparedness and Response Problem Assessment

The 2019 Roundtable attendees expressed concerns about uneven risk-based response (RBR) processes during emergency responses involving hazardous materials. They felt more effort is needed to ensure that local/regional response capabilities and hazmat response services utilize a risk-based process. It was also noted that there are different perspectives of what RBR is, and how it can be applied in planning, prevention and response situations. Given the decrease in serious hazmat/WMD incidents, RBR training and exercises take on more significance. Participants felt that current priorities for RBR decision-making should be expanded to include controlling impacts on critical infrastructure systems. Finally, they called for more timely release of information and guidance addressing emerging threats and risks.

The 2021 workgroup assessing the need to improve RBR concurred with the 2019 Roundtable findings, and also noted a number of additional RBR issues and barriers that may merit national corrective action. Workgroup members expressed concern that RBR processes are inconsistently implemented in local jurisdictions and members felt that they need to be better championed and promoted nationally. They also felt that there is a continuing need for better science- and evidenced-based data on emerging threats, and that such data needs to be translated into more concise and usable reference information for easier application into RBR decision-making processes.

Another expressed concern was the need for improved RBR training and curricula delivery strategies. New RBR training should be designed to compensate for the decrease in serious and complex hazmat calls managed by today's emergency responders by development of better simulations, the use of more modern learning formats to better reach younger response audiences and should be delivered in better coordination with state and municipal emergency response training systems. Finally, workgroup members also felt that a major national impediment to effective RBR preparedness is the reduction in local capabilities to perform initial Operations level response, which stems from national reductions in the number of serving volunteer

firefighters and from concurrent staffing challenges in the career staffed emergency services. Stronger regional Technician level systemic support, especially in rural areas, and other support services to local communities to strengthen local initial response capabilities were recommended.

Recommended Action Options to Improve Risk-Based Preparedness and Response

1. STRENGTHEN NATIONAL SUPPORT FOR RBR

1.1 Ensure RBR is included in all federal and association references and guidance regarding emergency preparedness. This would include FEMA disaster preparedness guidance, NIMS documentation, etc., and would also include all federal incident decision making training.

1.2 Develop consensus clarification of the definition of RBR in NFPA 470 – Standard for Hazardous Materials Emergency Response. This should clarify what is and what is not RBR, to help mitigate any current confusion or misunderstandings about what constitutes effective RBR decision-making. Guidance should be provided that is endorsed and promulgated by all national organizations in the hazmat community.

2. IMPROVE SCIENCE- AND EVIDENCED-BASED DATA FOR RBR

2.1 Establish a single online point-of-access website for information on current federal, industry and academic research activities exploring hazmat data of importance to RBR incident decision-making. This single access point should be concurred upon and financially supported by agencies of the federal hazmat community in partnership with other stakeholders.

2.2 Establish a technical expert body associated with the single point-of-access (above) that will apply a consensus process to translate emerging scientific findings into brief and concise protocols. The concise protocols should be designed to be easily referenced when appropriate and easily understood when applied during an incident response. Upon validation, the protocols should be available on the single point-of-access website, as well as distributed directly to appropriate federal, association and industry organizations providing hazmat preparedness guidance.

3. IMPROVE RBR TRAINING STRATEGIES

3.1 Establish an online RBR curriculum center in which instructors, curriculum designers and training system managers can share ideas, lessons learned, and information about available resources to improve RBR instruction in existing incident response training nationally. **NOTE:** Training programs and information can be provided through a range of delivery options including in-classroom, on-line, virtual, etc. It is the Working Group's intent that a wide range of delivery options be considered, based upon identified knowledge and skill gaps, training technology, and delivery options.

3.2 To compensate for smaller numbers of serious/complex hazmat incidents and the reduced hazmat incident scene experience of students, ensure that RBR training includes high quality realistic incident scene simulations with extensive size-up drill and practice. The training should encompass a range of risk-based scenarios, including low frequency / high consequence and high frequency / high consequence scenarios.

3.3 To accommodate the different learning styles of the next generation of emergency responders, ensure that RBR training includes an appropriate variety of methodologies (including options such as shorter online training segments, more self-directed learning curricula, etc.) to better fit younger generation learning preferences.

3.4 Ensure all online federal training deliveries are properly coordinated with state and dept training officials. To accommodate local officials responsible for the proper training of responders (fire chiefs, departmental training officers, State fire training system managers, etc.), ensure that any student enrollment in nationally offered RBR training is coordinated with the student's local supervisor and/or training officials.

- 4. STRENGTHEN RESPONSE SYSTEMS** One challenge impacting RBR capability is the potential weakening of the nation's initial Operation-level response capability because of reductions in the number of volunteers and reduced staffing of career personnel.

4.1 Ensure that the federal hazmat response community collaborates with the Congressional Fire Caucus and related fire/hazmat-centric advocacy groups to champion efforts to address this challenge, such as more fire grants to communities, tax deductions for fire service work, etc.

4.2 Develop guidance for community leaders on the recruitment and retention of volunteers, including sharing best practices lessons learned and tips/techniques from communities who are successfully maintaining a strong volunteer service.

Improving Risk-Based Preparedness and Response
Background Discussions and Analysis

The workgroup met in two virtual meetings to analyze problems impeding RBR implementation and to propose action options to address those problems. The first meeting discussing RBR problems was on July 8, 2021, and the second meeting proposing action options was on August 5, 2021. In each of these discussions, the workgroup addressed the following 4 areas of issues:

1. Why Risk-Based Response (RBR)?
2. Emerging Threats and the Need for Science- and Evidence-Based Data for RBR Applications.
3. Challenges in local response organization and staffing gaps that can impede application of RBR concepts.
4. Challenges in changing emergency services demographics and gaps in responder knowledge and skills that can impede the application of RBR.

1. WHY RISK-BASED RESPONSE?

There was a strong and universal confirmation of the importance of Risk-Based Response (RBR) as a key to effective and safe management of hazmat incidents. *National Fire Protection Association (NFPA) 470 – Standard for Hazardous Materials Emergency Response*, defines the Risk-Based Response Process as follows: Systematic process, based on facts, science, and the circumstances of the incident, by which responders analyze a problem involving hazardous materials/weapons of mass destruction (WMD) to assess the hazards and consequences, develop an incident action plan (IAP), and evaluate the effectiveness of the plan.

The 2019 Roundtable stressed that the nation’s hazmat emergency response services should use a risk-based response (RBR) process at hazmat incidents, using science-based and evidence-based data in accordance with current hazmat regulations, standards and the hazmat standard of care. RBR is focused on making decisions based upon assessment of the hazards and risks of a specific incident or planning scenario. RBR is often viewed as a contrast to procedure-based response processes which involves following pre-determined and somewhat generic steps based upon the type of incident or type of hazardous material involved. This is not an “either / or” choice of processes. While there are instances where procedure-based response processes can bring constancy to response-based operations, total reliance on a generic procedure-based response can often result in a less than needed response or in an excessive response.

Conversely, RBR provides a consistent process for the analysis of an incident to ensure that the emergency response effort is appropriate and well targeted to the facts, science and circumstances of that incident. By its very nature, RBR requires that decision-makers be knowledgeable, as RBR decisions should be based on an actual evaluation of the facts, science, and circumstances of the incident and not just upon generic principles, tasks or general incident conditions. RBR response involves knowing and understanding the science behind the hazards and behavior of both the products and containers involved, and how this behavior might endanger life, property and the environment. Finally, RBR requires that decision-makers have the insight and judgment to assess the physical conditions of the incident scene, the surrounding physical environment, and the life, property and environment exposures. These conditions need to be integrated in RBR with an understanding of the material to make well informed and well targeted response plans. RBR replaces a “one size fits all” response posture that can result in a poorly conceived incident mitigation plan.

RBR is fully written into national training standards and is integrated into many training programs and jurisdictional SOPs, including response community voluntary consensus standards (e.g., NFPA) and National Fire Academy curricula. But additional factors remain that need to be addressed in order to improve the application of RBR in emergency preparedness and response across the country. These challenges include the following:

- *RBR is not always consistently implemented in local jurisdictions across the country.* In some jurisdictions and local response communities, the RBR “label” may get erroneously applied to all response procedures and protocols regardless of whether the protocol truly embraces a risk evaluation process. There needs to be a wider understanding of what is and what is not RBR, both to demystify RBR for local responders and to ensure that training and local response protocols correctly support and foster effective RBR.
- *The concept of incident analysis (i.e., size up process) itself is foundational to all fire service response operations; RBR is the integration of analysis, response operational planning, implementation and evaluation for hazmat and other risk-based response scenarios (i.e., Analyze, Plan, Implement, Evaluate or APIE Process).* While there have been individual champions of risk-based principles within the response community (e.g., Gordon Graham, Ludwig Benner, NFPA Hazardous Materials Response Committee, International Association of Fire Chiefs (IAFC) Hazardous Materials Committee, etc.), RBR has not had the benefit of universal championship across the federal, state and local emergency response communities that has been provided to other concepts such as 2 in 2 out, Incident Command System (ICS), Firefighter cancer, etc. There needs to be stronger and more outspoken support for RBR at the federal and national level as well as within the professional community at the state and local level, in order to better ensure that RBR is well implemented in all appropriate incident responses involving hazmat.
- *Although there has been a notable reduction in the number of serious incidents involving hazmat as the primary risk, there has concurrently been a growing recognition that hazmat is often present as one of the secondary or tertiary risks in more commonly occurring incidents such as fires, traffic accidents, construction accidents, residential*

collapses, disaster rescue operations, natural disasters, and even domestic incident responses in settings that contain drugs, improperly maintained chemicals, and other risks. Risk evaluation should be an inherent element of all size-up processes, not just incidents initially labeled as hazmat. Years ago, the emergency services learned that ICS needed to be used by responders routinely in simple fire incident responses so that everyone was effective in their roles under ICS in major incidents involving complex coordination and incident management. In the same way, it may be effective to consider supporting good RBR risk analysis by responders at all incidents however minor and regardless of whether they are hazmat incidents, so that responders are ready to effectively perform that level of risk analysis at major incidents.

- *Other areas of emergency preparedness, such as hazmat planning and local risk prevention efforts, also need to have a risk-based foundation for preparedness initiatives.* For example, risk preparedness that is based only on the quantity of hazardous chemicals present in a jurisdiction and not also on the soundness of the containment system and the principles of process safety management may miss risks to the community from smaller quantities of material stored in poorly maintained or inappropriate containment systems. A knowledge base in basic risk evaluation principles must also be provided to non-responders who participate in local community risk preparedness through planning or other roles, including LEPC activities.

Workgroup members explored a range of action options that might help improve consistent national implementation of RBR. The principal action options proposed by the workgroup to address this issue are listed above in section 1. Below are additional possible action options and elaborations of options that should help address those challenges.

Policy - Identify a federal agency or other recognized body that could champion the application and use of RBR preparedness and analysis nationally. Although RBR as a concept is well established in the emergency services voluntary standards, this interagency body could be a forum for the work to introduce RBR terminology and principles into all federal standards and operating guidance for emergency preparedness. For instance, integrating RBR language into NIMs nomenclature, would improve understanding and would increase use of RBR principles in emergency preparedness. Also, such a body could also be the forum to review existing federal, state and local training for soundness in RBR instruction and to provide national guidance on what is and what is not RBR in local training and response.

Guidance - Provide guidance and best practices samples of the application of RBR principles in emergency preparedness functions other than response, such as in risk assessment in prevention and in risk-based community planning.

Training - Online training should be developed and made available nationally for emergency planners and LEPC members that will help them understand RBR response and the risk assessment and response capabilities that need to be provided in planning to ensure proper risk-based response.

Tools and Resources - An online catalog of existing response training courses currently in use by Hazardous Materials Emergency Preparedness (HMEP) grantees could be developed that includes in the course descriptions how RBR training is addressed in each course. The catalog content could be developed by having HMEP grantees submit the information online for the courses they are offering (in a way that involves minimal time to input). The catalog structure could be set up to be easily searchable by different characteristics that the HMEP training community indicates would be of interest (length of course, instructor dependency, recency of updates, types of activities, use of commercial media, etc.). The catalog would be a living document, would capture which courses are being used in the HMEP program, would capture how RBR is being trained in the curricula, and would provide information to training managers on courses being offered by their peers that they might like to consider adopting.

2. EMERGING THREATS AND THE NEED FOR SCIENCE- AND EVIDENCE-BASED DATA FOR RBR

In the July 8, 2021, meeting, all attendees concurred that the collective “body of knowledge” pertaining to hazmat emergency response has grown significantly over the last three decades. As was said in the meeting, the good news is that there is a large and growing body of information for responders, and the bad news is that there is a large and growing body of information for responders. In many respects, the fundamental issue is the ability of emergency planners and responders to access the requisite information in a timely and effective manner, and then provide that critical information to the target audience.

As noted in the 2019 Roundtable report and reiterated in the meeting, emerging national trends and issues present new challenges for the hazmat/WMD planning and response communities.

Recent examples include:

- Structural firefighting and cancer exposures
- Energy storage systems
- High hazard flammable liquid trains (HHFT) transporting crude oil and ethanol
- Increased utilization of liquefied natural gas (LNG) and compressed natural gas (CNG) as a fuel.
- Lithium-ion batteries (propylene carbonate, lithium hexafluorophosphate, hydrogen fluoride)
- Class B firefighting foams used for vapor suppression (PFOS-based, C8-based, C6-based, etc.)
- Evolving terrorism threats, including biological (Ricin, Abrin, Saxitoxin, Tetrodotoxin, and botulinum toxin), radiological (low level medical isotopes), and chemical (binary devices, pharmaceutical-based agents, and fourth generation agents)

While avoiding being focused on the “threat du jour,” sustained efforts are necessary to (1) anticipate possible new response challenges associated with these and similar developments, and

(2) rapid development and release of recommended information and guidance to the emergency preparedness community. Meeting attendees noted that one of the challenges for responders is simply accessing and assimilating the large volume of information that is now available, especially for those responders with less than a technician level focus on hazmat as a response priority.

Sometimes, the information on emergent risks or dangerous behaviors of materials that is critical for all responders to know is buried in scientific reports that few responders would be able to access or read. There needs to be a standardized system that translates the “500-page report” into the “5 nuggets” that responders need to know. The scientific information needs to be tied more directly to possible changes in tactics and response doctrine. Such an information system should validate the “5 nuggets” with a body of expert responders because it needs to be recognized that the behaviors of materials in controlled experiments are different from behaviors in the street, and extrapolations of anticipated behavior from the lab to the street need to be done by experienced response experts.

Several meeting attendees pointed out that, at a minimum, rapid release of information is needed on the risks and health dangers of emergent chemicals and materials, even if more mature data on behavior and recommended response protocols may take longer to develop. This is especially important for emergency personnel in smaller and rural jurisdictions who may be first responders to incidents. They often have training limited to the First Responder Awareness or Operations level and need to know basic risks rather than more advanced response techniques and procedures. For these audiences, this information should be available in easy-to-use online form as some kind of updated reference to supplement the information in the Emergency Response Guidebook (ERG).

Attendees commented that there are also emergent and ever-changing chemical analysis capabilities becoming available to first responders in the field that previously only existed in laboratory environments. Emergent data on new incident-based testing and monitoring tools and processes should be carefully validated by a team of technical specialists and subject matter experts (preferably with incident response experience). This would be very important to ensure that any updated tools or procedures for chemical analysis identified in a lab environment are practical and useful in an incident response environment.

There was a strong concurrence in the meeting that all this information needs to be disseminated promptly to responders in routine, predictable, and easy to use channels. Several attendees expressed the desire for some sort of clearinghouse or single access point of information, or multiple concurrent channels of information dissemination that the response community can count on to use. Options discussed included FEMA’s CBRN program, the IAFC’s concept of a HazMat Fusion Center, the Inter-Agency Board (IAB), or the Roundtable itself. Ultimately, this needs process needs to be integrated into systems that already exist at state and local levels, including SERCs, LEPCs and State/Major Metro Fire Training Offices, as well as professional associations and voluntary consensus standards organizations.

The idea of having a single body reviewing the different federal agency and academic community research activities was supported by many of the meeting attendees for another reason. It was recognized that the diverse ongoing research efforts by the federal and academic communities that potentially impact responders and RBR are not coordinated, because the different agencies have different missions being supported by their specific research interests and budgets. For example, PHMSA is doing some important research on availability of electronic shipping information that has the potential of significantly improving RBR by providing information immediately as part of the response. PHMSA is also researching new materials like metal foam which has the potential to offer lightweight high thermal and energy absorption capacity in packaging and are doing a lot of work in understanding lithium battery issues with a complete life cycle approach. This is an example of one agency's current research activity that can have an important impact on RBR, and it is presumed that there are many different federal and academic offices and agencies pursuing other research related to emergency preparedness.

Since such research initiatives are not naturally coordinated across different agencies, it could be a significant challenge to monitor and collect the research information that needs to be translated into data that would be usable and helpful to RBR. The difficulties of blending disparate research findings from different federal research projects were highlighted in Special Report 283 of the Transportation Research Board of the National Academies entitled "Cooperative Research for Hazardous Materials Transportation".

Many attendees felt that the challenge of so many diverse research efforts argue for a single body with a mission to track, monitor, and collect into one place the research findings of the broad federal and academic communities that may have different important impacts on the emergency preparedness community and RBR. The different suggestions for bodies that might perform this mission were the same as mentioned above for RBR information dissemination.

Meeting attendees explored a range of action options that might help improve provision of the scientific data needed for effective RBR. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help LEPCs address those challenges.

Policy - As described above, there needs to be a federal, association and academic interagency body (either reconstituting the IAB or forming another similar body) that will undertake the goal of consolidating information about research studies of current and evolving hazmat/WMD risks, properties, and behaviors. The body could reach out to the broader community of researchers and track and report on the wide range of research projects and work as it is on-going. The body could also provide a single website with information about the different research projects, including information on findings, information on status of current research, and information on proposed research that is under consideration. This body should be sufficiently resourced to meet its mission and goals.

Guidance - The above interagency body could form a subcommittee to translate research findings into the more concrete "nuggets" of information that responders need to know. These "translations" would need to be validated by a panel technical specialists and subject matter

experts to avoid any inadvertent over-stating or under-stating risks or considerations to be taken during response. The new information should be housed at the same single site as the on-going research reports and should concurrently be disseminated into the emergency services community through voluntary standards bodies, through professional literature, and directly to SERCs, LEPCs, and emergency service state and local training offices.

Training - Training materials on new hazmat risks and response protocols that were identified in research should be prepared and disseminated in forms that are easily incorporated into existing training. The material should be released to the nation's emergency service training community in multiple optional formats, including short online clips, power points with training guides, video clips, print handouts, and any other formats as requested. The goal will be to expedite the inclusion of the new information quickly into the diverse training materials used in the different emergency service training organizations around the country.

Tools and Resources - Once vetted by the interagency body described above, any new scientific information on hazmat/WMD risks and response protocols should be quickly added to the online ERG and other electronic tools used by responders in the field. Concurrently, outreach should be made to industry offices responsible for industry SDSs on the chemicals in question, to ensure that online SDSs for the chemicals are updated as well.

3. CHALLENGES IN LOCAL RESPONSE SYSTEMS ORGANIZATION AND STAFFING GAPS THAT CAN IMPEDE RBR

There was strong consensus that staffing challenges in the emergency services community represents one of the major impediments to consistently applying an effective risk-based response capability at the local level. Staffing challenges include both the significant reduction in volunteer responders that is occurring nationally, as well as reductions in budgets and staffing in combination and career fire departments. Budget cuts often take the form of reductions in special operations teams and have included hazmat response program reductions. The staffing shortages directly impact the availability of responders to attend training sessions and often limit the number of responders available to handle the response, especially in low staffing rural volunteer departments. In recognition of these issues, PHMSA has expanded their HMEP grant awards to now include backfill and overtime, where appropriate.

It was noted that most hazmat incidents can be handled by responders trained to the First Responder Operations level (although this may presume that properly trained Operations level responders are in fact present and available in the local jurisdictions.) More complex hazmat incidents are initially handled by Operations level responders usually employing defensive strategies until a Hazmat Technician level response capability arrives to continue and complete the mitigation of the incident. While not every community requires a local response capability at the Hazmat Technician level (e.g., Hazmat Response Team (HMRT), every community should have access to that capability within a predetermined timeline (e.g., HMRT on-scene within 2 hours). Various options can be employed at the state and regional levels to meet this basic

benchmark, including the use of Regional HMRTs, resource typing of HMRTs to outline desired operational capabilities, etc.

Discussions focused on low frequency / high consequence scenarios, especially in localities where technician-level support is not accessible within a timely manner, or if local responders are not trained to the Operations level or have insufficient numbers of appropriately trained personnel to support the initial response. In cases where technician-level support is not available within an acceptable time frame (e.g., many states use a 2-hour timeframe for the response of a HMRT), local responders must continue to manage the incident until the arrival of additional responders. Response scenarios above their training and competency levels can sometimes result in the assumption of increased risks and potential losses by hazmat responders especially if a RBR process is not employed.

In some communities, especially smaller rural communities with predominantly volunteer fire protection, the local response capability may not be robust enough to conduct effective defensive operations until the Technician level support arrives. In other jurisdictions, the broader emergency response system may not be robust enough to provide timely Technician level support to the local Operations level response. Examples of gaps in the local response system that can impede safe RBR include:

- Hazmat response teams that lack an understanding of federal and state regulations that regulate response to such incidents (ex. Occupational Safety and Health Administration (OSHA) regulation 1910.120(q)) and further lack a working knowledge of voluntary consensus standards which provide guidance on various response criteria to include personnel training competencies and qualifications, equipment, etc.
- Plans and protocols developed at the local level may meet the regulatory requirements (i.e., check off the box), but are not operationally effective in outlining the processes and procedures for analyzing a hazmat problem and determining the appropriate level of response.
- Personnel trained at various hazmat response levels (ex. Operations, Technician) who lack or don't avail themselves to ongoing training to maintain operational proficiencies.
- Local volunteer departments which are severely understaffed may not be able to effectively perform all defensive operations at an incident to conduct a safe initial response.
- Failure of Operations level personnel to recognize that the hazardous materials incident is beyond their capability and requires Technician level response capabilities support.
- Communications systems, especially in rural areas, that are spotty in the area of the incident, resulting in disrupted communication capability delaying requests for support through local dispatch. This situation can also impact access to electronic data needed for RBR assessment which is dependent on cellular (mobile) device connectivity.
- Inadequate local equipment, including PPE, that is needed for a complex Technician level response.

Meeting attendees explored a range of action options that might help address challenges in local response systems that can impede RBR. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help LEPCs address those challenges.

Policy - Despite programs such as the FEMA Staffing for Adequate Fire and Emergency Response Grants (SAFER) Grants, there is a continued need for federal and state leadership to help address the nation's emergency services staffing challenges. Examples of support from federal, state and even local governments include tax deductions for local employers who would release employees (perhaps 4 hours a week) to participate in training as volunteer firefighters and in providing service work to a local volunteer fire department. Another possible area of support might be federal, state, and local governments providing tax credits or deductions to income tax to volunteer responders as a form of compensation for time spent in local volunteer service during incident response and during training. Finally, federal and state providing significant income tax credits and reductions for paid firefighters to make existing pay levels more attractive for recruiting and retaining paid responders.

Guidance - Lessons learned and best practices in recruitment and retention of volunteer and career firefighters should be developed and provided. The best practices should detail the recruitment and retention procedures and policies that have been used successfully by jurisdictions, and should include assessment of possible contributing factors such as positive staff and management relations, level of positive departmental and community relations, local community perception of need for the response services (perhaps stemming from recent incidents) and local community engagement in partnering with responders in community risk reduction activities.

Training - Training and workshop outreach presentations should be prepared and disseminated to SERCs to help them educate and persuade state and local jurisdictions to support and provide adequate funding for robust hazmat technician level response capabilities at the regional level within the state. Similarly, the materials would include tools to help SERCs teach LEPCs (especially in areas of low LEPC activity or low Operations-level response capability) the importance of well-designed and well-practiced procedures for local initial defensive response to hazmat incidents and rapid notification and calls for regional and state technician-level support.

Tools and Resources - Public education materials and kits should be prepared and provided free to states and to local jurisdictions that would stress the importance of fire, hazmat and other emergency preparedness, would champion the heroic role of volunteer and paid emergency services personnel, and would stimulate recruitment by calling for volunteers to join the local emergency services.

3. CHALLENGES IN CHANGING EMERGENCY SERVICES DEMOGRAPHICS AND GAPS IN RESPONDER KNOWLEDGE AND SKILLS THAT CAN IMPEDE RBR

Challenges in Changing Emergency Services Demographics These discussions focused on the unique learning styles and information access preferences of younger generations that differ significantly from older generations that have made up the emergency services community. It was noted that younger generations (Gen Y persons 25-29 years old and Gen Z persons 6-24 years old) are more comfortable with internet-based data sources and individual online training methodologies than are older Baby Boomers and Gen X (41-50 years old) responders whose training has been primarily instructor-led classrooms with coaching and team exercise methodologies. Some of the pros that were discussed for online training and online information were speed of dissemination of info, training on demand and at the student's convenience, easy access when needed, shorter training intervals with reduced time footprint, and other considerations. Cons discussed were isolated online training that does not support team participation, reduced application of content learned to wholistic incident analysis, reduced coach or supervisor confirmation of competency, integrating the requisite skill competencies with the knowledge requirements, and other considerations.

Gaps in Responder Knowledge and Skills One of the principal gaps discussed was the lack of actual hazmat incident scene experience of responders, thereby significantly increasing training and exercise requirements. This reduction in experience was seen to present a serious gap in responder knowledge and skill to correctly size up and analyze risk in incident scenes, and to correctly plan, implement and modify as necessary incident action plans. In the meeting discussions, this gap was seen to be exacerbated by the generational turnover that is happening in the emergency services such that experienced persons with high institutional knowledge are leaving and are being replaced by younger responders with much less hazmat response experience and less expected opportunity to gain that needed experience as serious/complex hazmat incidents continue to reduce.

Another gap in responder hazmat knowledge and skills that was discussed was the gap that can stem from the overall reduction in the volunteer fire service. As previously discussed, reductions in the number of volunteers can result in a "beggars can't be choosers" situation where part-time participants in a small local volunteer fire department with sometimes inadequate or incomplete training may be some of the few members responding to an incident scene. The need is great to ensure proper training for these audiences, but the challenge is to deal with the competing training that is needed for these audiences. Training for small fire response and vehicular accident response (which are often the more common bread and butter calls) will often bump full hazmat operations-level training for these volunteer audiences, especially in areas where hazmat incidents are rare.

RBR Special Training Considerations

In the discussions and in the submissions after the meeting, several issues about training were highlighted that may merit consideration. They are:

- Need better approaches to replicate “hands on experience”. Traditional simulation training usually falls short of replicating reality successfully, but more realistic replication may be critical to effectively compensate for the lower levels of actual incident experience that many responders face.
- Traditional course training formats are usually directed towards older generation learning processes rather than newer generation learning style needs. The new generation tends to like smaller increments of training and more online instruction. But the newer generation short online training must still include application (learn, do, learn, do, etc.). It is not sufficient to just give information with just simple didactic testing (which happens in a lot of online programs). Methods need to be included that lead the student to properly use and apply the information in work/response related exercises and simulations.
- Online training that is offered nationally needs to be better coordinated with and controlled by the learner’s employer (i.e., fire department or the local jurisdiction having authority). Under OSHA regulatory requirements, the employer has the responsibility to ensure that the employee is trained to perform any risk-laden job safely (i.e., for responders, that they can perform all their assigned responsibilities safely and effectively). Often, federal and other national online training offerings are made directly to responders rather than through or in coordination with the responder’s employer. The result can be confusion at the local level about who is properly trained for which roles and responsibilities, which can potentially introduce enhanced risk during a response. It is also recommended that providers of national online training consider coordinating that training with the employers of their students for liability protections, so that if a student is subsequently injured or causes damage to the public during a response then the liability and responsibility for the loss stays within the local jurisdiction.
- State fire training offices often have the responsibility to provide fire service training and certification for many of the volunteer fire service responders within their state. It is recommended that national providers of online hazmat and emergency services training, such as federal training offices providing such training, be sure to coordinate and integrate the content of training delivered to a volunteer fire service student with the approved curriculum and standards for that student’s state. It is also recommended that the state or local department training manager responsible for certification of that student receive reports of the training and appropriate completion documentation. Such coordination would both enhance the effectiveness nationally of online training programs and would help avoid inappropriate conflicts between federal courses offered directly to responders and similar courses being offered by the responder’s state or local training programs.

Meeting attendees explored a range of action options that might help address RBR challenges from changing emergency services demographics and from endemic gaps in local responder knowledge and skills. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help LEPCs address those challenges.

Policy - A federal forum should be established in which curriculum planning for hazmat/WMD course development should be coordinated, and partnerships between different federal offices should be fostered to collaborate on training course development and delivery. This forum could be an element within the Federal Hazmat Partners Working Group that initially met earlier this year, a training subcommittee of the National Response Team (NRT), or any other interagency body that would be acceptable to those federal agencies and entities with hazmat/WMD training and related missions. This forum could regularly conduct a review of training program efforts to ensure that RBR based material is integrated into the training programs in a coordinated manner to increase awareness and application of RBR principles. This forum could be a key to helping avoid redundancies and gaps in federal training efforts.

Guidance - Guidance should be developed for the nation's hazmat training community on how to develop better simulation-based exercises in hazmat courses. Better application exercises in instruction might be one of the keys to strengthen student understanding of how to apply the content of the course to real world responses. The guidance would help trainers understand why application exercises are stronger than simple didactic questions in helping students learn and use the material being taught. The guidance should include best practice from different training programs that have exemplary application exercises in the material and should include good guidance for trainers on how to best critique student performance in exercises and how to coach and guide students to better application of the course content, when needed.

Training - Federal agencies and offices providing online hazmat training should combine their programs into one single major "one-stop shop" site for delivery to all local responder students. The site should be part of a free-to-use new training delivery system that would include automatic pre-established connections between federal and all state and local training offices who are responsible for the training and competency of local responders. The automatic pre-connections should ensure that the course content is already properly supportive of each student's state and metro required curricula and should provide that each student's training completions are automatically provided to the student's local training manager and employer. Such a system was previously proposed nationally as "EZ training" by NFA for ICS and hazmat training, and the idea was enthusiastically supported by the dozen state fire training offices who worked with NFA to design the proposal. The partnership that could be built with this idea between the federal, state and local hazmat community for integrated online hazmat training and information dissemination could provide powerful support for hazmat preparedness nationally.

Tools and Resources - Federal investment should be made to develop model simulation curricula that includes high end realistic and immersive hazmat exercises designed to compensate for the reduced response to actual hazmat incidents. The exercises should include drill and practice on routine incident scene size up at the Operations level and more complex

incidents at the Technician level. The material should be placed in the same one-stop shop recommended above, for state, major metro and local emergency services to access and secure the exercise materials, including 3d equipment, for use in their respective curricula. All training material and equipment should be in the public domain.

Improving Hazmat Prevention/Mitigation

Executive Summary and Recommended Action Options

Hazmat Prevention/Mitigation Problem Assessment

The 2019 Roundtable attendees expressed concerns that opportunities for hazmat prevention and mitigation were often being missed at the local level. There was a strong consensus that hazmat prevention needed to be better integrated into the local community risk reduction process and into the emergency preparedness system. They noted the need for better guidance and training on HM transportation and facility accident prevention and risk assessment, and also that hazmat prevention and mitigation measures should be better included in federal disaster funding programs.

The 2021 Work Group assessed the need to improve hazmat prevention/mitigation and concurred with the 2019 Roundtable findings. The Work Group also noted a number of additional issues and barriers to hazmat prevention/mitigation that may merit corrective action. Workgroup attendees felt that few jurisdictions fund hazmat prevention efforts because funding tends to go to those activities that are viewed as a higher priority due to their immediacy or perceived risk exposure. There is a need for stronger local policies and program leadership in this area to help jurisdictions better understand the value and long-term benefits of good hazmat incident prevention.

Participants also felt that many local hazmat risks can be better managed through improved hazmat prevention zoning, transportation routing, and land use planning. Another concern expressed is that disaster preparedness efforts often underestimate the risks of local hazmat releases during disasters, and the need to strengthen planning and preparedness in this area. Finally, concerns were expressed regarding lost opportunities for avoiding hazmat emergencies due to the absence of prevention and mitigation efforts. Participants felt that additional efforts are needed to improve local hazmat operations, facility inspections, and code enforcement.

Proposed Action Options to Improve Hazmat Prevention/Mitigation

1. IMPROVE LOCAL HAZMAT PREVENTION POLICIES AND METRICS

1.1 Ensure that Federal agencies with missions that include hazmat preparedness collaborate to establish parallel policies for measurable local hazmat prevention and risk-reduction initiatives as a requirement in their respective hazmat regulatory and grant support programs.

1.2 Provide guidance for local community leaders that provides simplified metrics and hazard risk indicators to help them better understand the hazmat risks in their communities. Distribute the guidance to State Fire Marshal offices, SERCs, LEPCs, and local emergency preparedness agencies. Include presentation materials designed to help audiences better understand hazmat risks for use in local community meetings.

2. IMPROVE LOCAL ZONING, TRANSPORTATION ROUTING, and LAND USE PLANNING

2.1 Develop new online and hands on training and informational programs on commodity flow studies, how to conduct them, and how to use the data results in hazmat preparedness. The training should be appropriate for multiple audiences, including LEPC members, local fire and emergency services personnel, and local community leaders. The training should be provided online nationally on federal sites and also distributed to SERCs, State Fire Marshal offices, and State Fire Training offices for concurrent deliveries in their respective online training systems. **NOTE:** Training programs and information can be provided through a range of delivery options including in-classroom, on-line, virtual, etc. It is the Working Group's intent that a wide range of delivery options be considered, based upon identified knowledge and skill gaps, training technology, and delivery options.

2.2 Provide guidance for local zoning and land use boards on how to evaluate hazmat risks in local zoning and land use decisions using Tier II/RMP and other data sources. The guidance should include best practices examples from other jurisdictions of zoning and land use solutions that help achieve development goals more safely while avoiding creating hazmat risks.

3. MITIGATE HAZMAT RISKS FROM NATURAL DISASTERS

3.1 Expand federal disaster recovery and mitigation grant requirements and instructions to include risk reduction and mitigation measures pertinent to hazardous materials facilities and related infrastructure. Potential mitigation activities might include enhanced environmental and watershed protections, alternative hazmat transportation route construction or construction of route protections, and construction of mitigation measures to reduce damage from releases.

4. IMPROVE LOCAL HAZMAT FACILITY OPERATIONS, INSPECTIONS, AND CODE ENFORCEMENT

4.1 Foster federal risk mitigation grant funding to small local hazmat facilities.

FEMA, EPA, USDOT and other federal agencies with hazmat risk reduction missions could work with the Small Business Administration and industry professional associations to explore strategies for federal risk mitigation grant funding support to small local facilities. Such strategies should focus on small facilities who (1) are critical to local small jurisdiction economies, (2) have hazmat processes and systems that need updates or special maintenance to prevent or reduce the risk of hazmat accidents, and (3) do not have the resources to fund these updates themselves.

4.2 Using consensus-based processes, develop competency-based standards and training for inspectors and code enforcement professionals

on performing identification and assessment of hazmat risks during inspections. Develop online training and job aids for inspectors and code enforcement professionals on the knowledge, skills and abilities (KSA's) called for in the standards. Offer the training and job aids nationally on federal websites and distribute the programs to SERCs, State Fire Marshal offices and State fire training offices for delivery in their online training systems.

Improving Hazmat Prevention/Mitigation **Background Discussions and Analysis**

The workgroup met in two virtual meetings to analyze problems impeding the delivery of local hazmat prevention/mitigation and propose action options to address those problems. The first meeting discussing hazmat prevention/mitigation problems was held on June 9, 2021, and the second meeting proposing action options was on August 10, 2021. In each of these discussions, the workgroup addressed the following 5 areas of issues:

1. The need for stronger local policies and program leadership in hazmat prevention/mitigation.
2. The need for better local hazmat prevention zoning, transportation routing and land use planning.
3. The need to mitigate risks from hazmat releases caused by natural disasters.
4. The need to improve environmental protections from hazmat; and
5. The need for improved hazmat facility operations, facility inspections and code enforcement.

1. Need for Stronger Local Policies and Program Leadership in Hazmat Prevention/Mitigation

Meeting attendees concurred that one of the continuing challenges to hazmat prevention and mitigation efforts is the lack of local leadership and local policies supporting prevention. This often is evidenced in decisions made about local resources, as competition for limited resources forces community leaders to prioritize other, more pressing needs. In the absence of a specific incident or event, it is often more challenging to acquire funding for low frequency / high consequence scenarios that have NOT occurred, as compared to the higher frequency, day-to-day response issues. It can be a very heavy lift for community and hazmat preparedness leaders to consider giving longer term prevention and mitigation initiatives a higher resource allocation priority over other, more immediate needs.

Attendees noted that hazmat prevention activities are often viewed as a lower priority given available resources. This reflects a lack of proactive initiative both in the emergency preparedness community and in local community leadership itself. Effective hazmat risk reduction is a whole community need and should be undertaken in partnership and collaboration throughout the community. Despite this point, it was argued that in many jurisdictions the community leaders are not aware of the value or need for hazmat prevention. They usually do not have any sort of shared understanding of the significant long-term cost savings and higher public protection factors the community can experience when serious hazmat risks are

minimized through prevention and mitigation work. As a result, there is often little support or interest in hazmat risk reduction and prevention/mitigation measures.

Attendees pointed out that this is also a problem with the community as a whole and not just community leadership. In short, prevention and mitigation of high consequence risk scenarios must be important to the community at-large, or it will be extremely difficult to get community leaders engaged. In local communities, the public is generally supportive of their community spending money on response to incidents (which everyone understands) rather than on prevention of other risks that are not at all on the public's radar screen. There is a clear need to cultivate political support, and it was acknowledged that it is not just the fire department who should be responsible for championing hazmat risk prevention and mitigation. LEPCs and others in emergency preparedness should do a better job explaining to community leaders the importance of actively mitigating and preventing risks, rather than always reacting to evolving events.

The attendees concurred that metrics must be developed that can better measure and communicate levels of hazmat risk in local communities. Objective, fact-based metrics should provide a better understanding of what a "good" hazmat prevention and mitigation program should look like, and that can help determine an acceptable level of risk within a local community.

Attendees noted that private sector leaders and executives of facilities and hazmat industries should be encouraged to be pro-active in taking preventative measures to ensure the safety of both the community and their operations. Attendees felt special attention should be given to smaller facilities with less complex operations and less resources, to encourage them to take proper preventative measures and not postpone maintenance and system upgrades needed for safe operations.

Finally, attendees concurred that local community leadership needs to be encouraged to ensure that the public is well-informed about hazmat risks and of needed prevention and mitigation measures, including safer behaviors of the public. It was noted that local community leaders, LEPCs, and the local emergency preparedness community should speak with one voice and should be encouraged to accurately convey the risks to a community in order to minimize conflicts or misunderstandings.

Meeting attendees explored a range of action options that might help improve local policies and program leadership in hazmat prevention/mitigation. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help address those challenges.

Policy - Federal agencies with missions that include hazmat preparedness (USDOT, EPA, FEMA, DOE, NIEHS, etc.) could collaborate to make similar policies for measurable local hazmat prevention and risk-reduction initiatives as a requirement in their respective hazmat regulatory and grant support programs.

Guidance - Guidance with simplified metrics and indicators could be prepared to help local community leaders, including elected officials, business, LEPC, and other emergency preparedness leaders, better understand the hazmat risks in their communities. The guidance could include sample assessments of different types of hazmat risks that are commonly observed in local communities. The guidance could be distributed through multiple channels to the local level, including SERCs to LEPCs and State Fire Marshal offices to local fire departments, etc.

Training - Online awareness-level training could be developed and made available nationally for local community and business leaders on understanding the importance and cost saving of reduction and mitigation of potential hazmat risks. LEPCs could coordinate promotion of the training to local leaders and could coordinate follow-up community leader discussions of what was learned in the training and how it might be applied to their community.

Tools and Resources - Public education materials that target raising the general public's awareness of the need for and importance of hazmat prevention could be developed and provided free to state and local jurisdictions, LEPCs, and local response organizations. The materials could also include options that highlight different types of risks, to enable local deliveries of the material to better focus on specific local areas of potential risk.

2. Need for Better Local Hazmat Prevention Zoning, Transportation

Routing and Land Use Planning

One of the most effective ways to manage hazmat risks in local communities is to prevent the problems from initially occurring. While there are challenges, effective risk-based hazmat zoning, land use planning, and hazmat transportation routing decisions can potentially reduce the risks posed by hazmat in the community.

Attendees felt that one of the biggest challenges in managing risks in transportation routing is the limited frequency in which many jurisdictions perform commodity flow studies. It was also noted that a number of emergency preparedness professionals are not familiar with the concept of commodity flow studies, and there is a need for additional training and education on the tool. It was also argued that any national training and planning solutions to this issue would be better approached with a broad partnership between federal, state and local preparedness organizations, the professional associations, and related industry, pipeline, and rail/highway carrier organizations such as the Transportation Community Awareness and Emergency Response (TRANSCAER) program.

Another major challenge impeding hazmat prevention/mitigation is local zoning and land use planning. Concerns were also expressed on local communities underestimating (or ignoring) potential hazmat risks in making local zoning and land use decisions. While local zoning officials are usually familiar with building codes and community growth priorities, they often do not understand or have access to information regarding potential hazmat risks beyond environmental impact study requirements. Political and financial pressures on zoning and land

use planning decisions can be very significant and the financial benefits of a proposed development often may outweigh any concerns about potential increased risks. An additional challenge is how to address grandfathered risks that already exist within a community.

Meeting participants concurred that improved hazmat prevention, zoning, transportation routing, and land use planning are among the keys by which local communities can manage hazmat risks. It was also noted that local communities may be vulnerable to increased litigation if these risks are not effectively evaluated and addressed. LEPCs and the local emergency preparedness communities should be in the hazmat risk prevention/mitigation business, and need to support better hazmat prevention zoning, transportation routing, and land use planning as an important means to that end.

Meeting participants explored a range of action options that might help improve local hazmat prevention zoning, transportation routing, and land use planning. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help address those challenges.

Policy - Facilitate increased opportunities for collaborative-based initiatives between the public emergency preparedness community, professional associations, and industry on information exchange and collaborative work to improve planning, response preparedness, and prevention/mitigation of hazmat transport risks. Several programs and initiatives already exist and could be used as an initial foundation.

Guidance - National guidance could be developed and provided through SERCs and LEPCs to local zoning and land use boards on how to evaluate hazmat risks in zoning and land use decisions. The guidance could also include best practices examples from other jurisdictions of zoning and land use solutions that help achieve development goals more safely while avoiding creating hazmat risks.

Training - New training programs should be developed on commodity flow studies. The training should blend different media formats and instructional approaches for different audiences. Case studies and best practices can be used to illustrate key points. In addition, information and training should be considered on the role of fire and emergency services agencies in dealing with land use, zoning and transportation routing issues.

Tools and Resources - Job aids and guidance documents could be provided to assist local jurisdictions and personnel in the different stages of commodity flow analysis, including

- planning,
- conducting a commodity flow study,
- collecting and interpreting the data, and
- assembling and communicating the findings and results.

3. Need to Mitigate Risks from Hazmat Releases Caused by Natural Disasters

Attendees concurred that the risk of hazmat releases from natural disaster scenarios has often been under-addressed in hazmat prevention/mitigation efforts. For example, it was noted that the Centers for Disease Control (CDC) reported in 2012 that “Natural hazards were the cause of approximately 16,600 hazardous material releases reported to the National Response Center (NRC) between 1990 and 2008 - approximately 3% of all reported hazmat releases. Large releases were most frequently due to major natural disasters. For instance, hurricane-induced releases of petroleum liquids from storage tanks account for a large fraction of the total volume of petroleum released during 'natechs' (understood here as a natural hazard and the hazardous materials release that results). Among the commonly released chemicals were nitrogen oxides, benzene, and polychlorinated biphenyls.

Attendees noted that modifying hazmat systems and facilities to be more resilient to natural disaster scenarios can sometimes be prohibitively expensive but preventing or mitigating hazmat releases from natural disasters is still an important community protection responsibility.

Attendees felt that a key issue that needs to be addressed is the inclusion of hazmat release risks in pre-disaster risk assessments and planning. In short, these are “incident within an incident” scenarios in which there are secondary and tertiary impacts from an over-arching incident or disaster, such as an earthquake, flood or hurricane. LEPCs and local emergency response organizations need to be trained to better champion the identification of and planning for hazmat risks in disaster preparedness planning, both at the local level and at the state and federal levels. For federal mitigation and recovery planning, local preparedness officers should work to include potential damage from hazmat releases during disasters into those plans, including plans for remediation of environmental damage, plans for transportation route modifications if needed, and plans to build better local hazmat containment systems where appropriate.

Another key local issue is the risk of hazmat release risk during disasters at local facilities. Attendees expressed concerns that many smaller local facilities do not always prepare as well as larger facilities for natural disasters and weather hazards common to their jurisdictions. It is important to help local facility managers better understand the dangers that the potential disasters may present to their facilities and communities, and preventative actions they might consider to help mitigate those risks.

Attendees felt that training and exercises (both tabletops and full-scale exercises) are very important to prepare communities to respond to cascading events such as those in disasters. These are keys to helping community and preparedness leaders better understand the potential risks of hazmat releases in their communities, that may be addressed through improved hazmat and disaster planning and prevention. Attendees discussed some of the current programs that might be considered to help address this need, including FEMA mitigation grants guidance and application analysis tools, the upcoming FEMA CBRN office revision to the Chemical Key Planning Factor (KPF) guidance document for response and recovery planners, and a variety of

tabletop and other training strategies that would be effective to foster improved planning and prevention of hazmat releases in disasters.

Meeting attendees explored a range of action options that might help address challenges presented by potential releases of hazmat during disasters. The principal action options proposed by the workgroup to address this issue are listed above. Below are additional possible action options and elaborations of options that should help address those challenges.

Policy - FEMA could explore expanding disaster recovery and mitigation grant requirements and instructions to include addressing more areas of hazmat risk reduction. Areas of potential mitigation work might include enhanced environmental and watershed protections, alternative hazmat transportation route construction or construction of route protections, and construction of mitigation measures to reduce impacts from releases at facility systems.

Guidance - Guidance could be developed for local jurisdictions on how to identify and apply for grants to support possible mitigation projects to protect against hazmat releases stemming from natural and technological disasters. The guidance could include optimal possible mitigation techniques for common local hazmat system and transport vulnerabilities to disasters and different cost and level of effort options to consider for each mitigation technique. The guidance could also include best practice samples of mitigation and prevention projects from other jurisdictions. Finally, the guidance could provide step-by-step instructions with samples of how to prepare and submit grant applications for the proposed projects. The guidance could be provided through FEMA to state and local disaster mitigation groups and to local LEPCs.

Training - Training could be developed on assessing the risk of disaster-related hazmat release in facilities, and hazmat storage systems, and on assessing the possible impact of disasters on local hazmat routing. The target audience for such training could be local codes enforcement personnel, LEPC members, and other local emergency preparedness personnel. The training could be a blended combination of online training and local team activities and could include detailed simulations of hazmat storage and facility systems and other situations, for skill building in identifying vulnerabilities needing prevention or mitigation interventions.

Tools and Resources - Checklists and other job aids could be provided to local jurisdictions to assist in doing pre-disaster assessments of potential hazmat risks. Alternative inspection checklists could be provided for common hazmat facility, processing, storage and handling, and transport systems that are present in jurisdictions and that can be inspected and assessed by local personnel doing risk assessments. The checklists and inspection/risk assessment job aids could be distributed from FEMA or other federal office through SERCs, state emergency management offices to LEPCs and local emergency preparedness organizations.

4 Need for Improved Hazmat Facility Operations, Facility Inspections, and Code Enforcement

Attendees noted that the keys to safe facility operations and prevention/mitigation of accidents are a combination of several factors, including facility design and condition, protection systems and the level of maintenance. Also, it was noted that the competency, training and experience of the individuals responsible for the operation and supervision of the systems or processes or the processes themselves can be very important. Facility inspections and effective code enforcement activities are key indicators for the community to identify facility hazards and risks, as well as the ability of both the facility and the community responders to respond to and manage problems and releases. Good inspections, internal audits and reviews, and code enforcement are essential to identify, prepare for, prevent or mitigate potential accidents with timely interventions and corrective actions.

Despite their effectiveness, monitoring, inspecting and coordinating with facility leadership and personnel can sometimes be challenging for local officials. Participants noted that local code enforcement personnel who conduct building and facility inspections often do not have a sufficient understanding of the possible and likely scenarios associated with hazardous materials facilities, and the hazards and risks stemming from inadvertent storage problems (such as storing two reactive chemicals next to each other). Gaps in the ability of local inspection personnel to recognize hazmat risks may be a significant and an unmet training problem. It was noted that while many inspectors know codes in general, they often do not have a basic understanding of hazardous materials to include process design, facility construction, and product behaviors as well as the knowledge or skills to recognize hazmat related problems when encountered. This potential training problem can be exacerbated by the fact that many inspectors are multi-tasked and performing the hazmat inspections as “other duties as assigned”.

Participants noted that the effective code inspector also needs the skills to build and maintain relationships with facility, transportation (i.e., rail, pipeline, etc.) and industry safety officials. Experience shows that collaborative efforts between industry, government and public safety are most effective, and allow code inspectors to blend the inputs from all parties involved in the risk assessment process. As noted previously, LEPCs are an important conduit for developing these needed collaborative relationships.

In the discussions, it was noted that large facilities often conduct audits and internal assessments of facility risks and the corresponding safety and emergency response capabilities that would be required. While the safety record of the hazmat industry has improved over the last several decades, these low frequency / high consequence incidents will significantly challenge the emergency response capabilities of most communities. It was noted that in some instances, inspection and audits activities may also focus more on “check off the box” activities, rather than the application and utilization of risk-based analyses. Regulatory compliance is not necessarily equivalent to a facility conducting continuous safe and effective process operations. Also, risks do not disappear because a facility is under the governmental reporting thresholds. These are fundamental training problems for both public sector inspection personnel and for private sector personnel responsible for facility safety.

Finally, it was noted that small facilities with less financial resources can have additional challenges that influence their ability to stay abreast of new practices and processes. These small facilities may not have specialists on staff to regularly identify and assess their internal capabilities to mitigate potential risks. In communities where hazmat facilities are a critical and essential element of the local economy, pressures from both sides of an issue can exert significant influence and pressure upon code enforcement personnel. Meeting participants felt that this emphasizes the need to enhance the skill and knowledge of code enforcement and compliance personnel through more extensive national training and job aid support.

Meeting attendees explored a range of action options that might help improve hazmat facility operations, facility inspections, and code enforcement. The principal action options proposed by the workgroup to address this issue are listed above, Below are additional possible action options and elaborations of options that should help address those challenges.

Policy - FEMA, EPA, USDOT and other federal agencies with hazmat risk reduction missions could work with the Small Business Administration and industry professional associations to explore strategies for risk mitigation grant funding support to small local facilities who (1) are critical to local small jurisdiction economies, (2) have hazmat processes and systems that need updates or special maintenance to prevent or reduce the risk of hazmat accidents, and (3) do not have the resources to fund these updates themselves. The strategies for financial support might include possible direct grant funding, loans, loan co-signing, and/or technical assistance in performing needed maintenance or updates.

Guidance - Guidance could be developed for local community managers, LEPCs, and emergency preparedness leaders on how to develop and implement more effective inspection and facility hazmat risk assessments. The guidance could include best practice examples from jurisdictions with high performing code enforcement inspection and hazmat prevention/mitigation efforts, and the guidance could include staffing strategies to maintain high performance in inspections. The guidance could be distributed through SERCs to LEPCs, and through State Fire Marshal offices to local emergency services departments.

Training - Consideration may be given to the development of competency-based standards that clearly outline the expected knowledge, skills and abilities required for inspectors and code enforcement professionals operating within the hazmat community. Based upon these KSA's, training and educational programs could be developed with a specific focus towards local code enforcement activities. Training activities could include: (1) delivery of Awareness and Operations-level training specifically targeted to codes and inspection personnel, (2) recognition of the hazards associated with the handling, manufacture and use of hazardous materials, focusing on the issues and errors in hazmat usage that might be encountered during routine building code inspections, (3) identification of hazards, risks and prevention/mitigation opportunities associated with specific operations in facilities, (4) assessment and enforcement of compliance with established authorities and codes, and (5) consultation with and making referrals to subject matter experts for unique applications of the codes. These training programs could be delivered through a range of delivery methods.

Tools and Resources - Job aids could be developed to provide worksheets, checklists, and cue reference cards to help code enforcement officials spot improper storage and use of hazmat

during code enforcement inspections. These materials could include visual examples of common hazmat storage and use errors, organized by common building or facility type to be inspected, to aid in using the reference material. The material could also provide tools to interpret less obvious potential hazards. The target audience for these job aids would include state and metro fire departments, LEPCs, State Fire Marshal offices, and other state and local organizations engaged in code enforcement and compliance inspections.

List of Participants

The following is the list in alphabetical order of participants in the problem analysis and action planning meetings for this project. Of special recognition are the PHMSA leadership team of William Schoonover, Aaron Mitchell, and Eddie Murphy, the project facilitator Gregg Noll, project lead experts Tim Gablehouse, Dr. Christina Baxter, Rick Edinger, Andy Byrnes, Dave Matthew, and Jim Jaracz, and Bloomsburie team Kinha Lester and Bill Lewis.

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