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First Responder Education and Training Specific to Gas Pipelines in Chester County, Pennsylvania

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c.a.s.e. Consulting Services



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Executive Summary

c.a.s.e. Consulting Services was contracted by Pipeline Safety Coalition, a Pennsylvania not-for-profit, to conduct a needs assessment and evaluation survey of first responders and community stakeholders in Chester County, Pennsylvania that addressed the level of knowledge with pipeline safety principles and pipeline incident training needs. This survey was then used to develop guidelines for a pipeline emergency response training curriculum that would be useful to both first responders and community residents living near pipelines in the County.

The specific objectives of this Pipeline Safety Coalition project included:

- Identify education and training needs of Chester County Emergency Responders (referred to as First Responders) with regards to gas pipeline incidents.
- Identify gas pipeline safety awareness and education needs among Chester County community residents.
- Gauge community interest and input in creating a first responder-resident cooperative support campaign such as: “Save a Face You Know” or “Think Globally Act Neighborly”
- Develop a blueprint for incorporating a pipeline first responder curriculum into County-wide trainings of emergency professionals, volunteers, and community members borrowing from existing curriculum created by PHMSA, the National Association of Fire Marshals, and the pipeline industry. Determine the feasibility of a web-based delivery of such a pipeline first responder curriculum, along the lines of an “Educating the Educators: Pipeline Procedure and Safety Education Program (PPSEP)”.

This study was funded by the U.S. Department of Transportation, PHMSA, Technical Assistance Grant Program (Grant No. DTPH56-12-G-PHPT05).

I. The National Need for Greater First Responder Safety Awareness and Training Specific to Pipeline Emergencies

Nationally, PHMSA recognizes that there is a dis-connect between safety awareness and the emergency response system training and operational capabilities specific to pipeline incidents throughout the local first responder community in the United States. In the past five years, the consequences of this disconnect for local communities and environments has become a part of national public discourse as pipeline disasters in San Bruno, California in 2010, in Allentown, Pennsylvania in 2011, and in Michigan in 2011 have increasingly found their way into the public consciousness through national news media reports (AP/Huffington Post, 2010; AP, 2011; InsideClimateNews 2012). While it is undeniable that local first responders in all of these incidents did what they could with the resources they had, the fact remains that in all cases the resources, including the knowledge of what to do in a pipeline emergency, specialized materials for controlling pipeline-specific fires and spills, and the direct communications with pipeline operators as well as among pipeline operators themselves to shut off emergency valves, fell short of requirements, and in some cases proved more costly, environmentally damaging, and threatening to the public's health had those resources and the knowledge been in place before the emergency (Senate Committee on Commerce, Science, and Transportation of 111th Congress, 2010; Sam Hall, 2013¹). In efforts to institutionalize pipeline awareness and training in the first responder community, PHMSA has sought to promote the Hazardous Materials management model of training and operational capabilities (U.S. Department of Transportation, 2012). In addition, employees within the pipeline industry and labor union professionals, who also consider themselves to be part of the first responder community, have advocated for institutionalizing pipeline safety and emergency response along the lines of the model and protocols used by the U.S. Department of Energy National Nuclear Security Administration's Office of Emergency Operations, which mandates that all employees and emergency personnel in areas where facilities are located be thoroughly trained and drilled on a continual basis to identify and respond to any incident however small or large (U.S. Department of Energy, 2005).

At the national, and even global, level, there is a push among scientists and federal government security and emergency planners to incorporate emergency awareness raising and training activities into community-wide forums where not only trained professionals and volunteers but also residents living near high consequence infrastructure, such as pipelines, can learn and participate in emergency drills and trainings in order to build local capacity to respond to disasters (McNutt and Leshner 2013; Pines, Pilkington, and Seabury, 2014). Alongside such inclusive awareness-raising activities, these scientists and government planners also advocate for comprehensive emergency planning regarding all critical infrastructure that takes into account everything from terrorism to earthquakes and hurricanes and floods to large-scale chemical spills or releases and more. These comprehensive emergency response plans should be designed with an eye to not only mitigating disasters, but to preventing or at least curbing the after-effects of such rare but severe events (Pines, Pilkington, and Seabury, 2014).

¹ Conversation between Sam Hall, Program Manager for PHMSA, and Dr. Simona Perry, c.a.s.e. Consulting Services, at the June 2013 International Hazardous Materials Response Teams Conference, Baltimore, Maryland.

II. Identifying and Addressing the Local First Responder Awareness and Training Needs for Pipeline Emergencies

One of the factors that appears to be hindering progress towards more comprehensive and inclusive first responder awareness and training regarding gas pipelines in the United States is the low probability but disastrous consequences of pipeline incidents and low enthusiasm among many local first responder communities regarding safety awareness and response training at the state, county, and city level. Another factor is that pipeline operators, and not local fire, police, dispatch, or other emergency departments, identify themselves as the most qualified emergency responders to a pipeline incident (U.S. DOT, 2011). Instead, local fire and other emergency organizations are the first responders who assess the event and attempt to secure life and property until the operator's emergency resources arrive. In the protocol hierarchy of emergency management to a pipeline incident the local emergency organizations see themselves as playing a support role and not a lead role. In order for such a hierarchy to be effective in a crisis, local emergency departments and dispatch must know where all the pipelines are located, who owns them, and the estimated response time for the operator's emergency resources to arrive at the scene.

Evidence of low enthusiasm on the part of local first responders to pipeline emergency preparedness and training was collected from interviews and observations conducted by c.a.s.e. Consulting Services during training sessions attended with local and regional first responders during a June 2013 IAFC HAZMAT - International Hazardous Materials Response Teams Conference in Baltimore, as well as subsequent interviews and meetings in the Fall of 2013. For example, Tom Glass, an emergency professional who had been working in local first response for 30 years said in an interview with c.a.s.e. Consulting Services that pipelines are not high on the first responder priority list in Chester County (Tom Glass, 2013²).

Why a Chester County, Pennsylvania Case Study?

In 2010, Chester County finalized and released a Multi-Jurisdictional Hazard Mitigation Plan with guidelines from the Federal Emergency Management Agency and the Disaster Mitigation Act of 2000 (CCDES 2010). As of 2011, 57 of the 73 municipalities had adopted this Hazard Mitigation Plan for their community (CCDES 2011). Notably missing from the Plan is any specific guidelines for the County's extensive pipeline infrastructure and this infrastructure's vulnerability to a range of natural hazards. What is recognized by the County Hazard Mitigation Plan is a need for a review of the critical facilities and infrastructure database and hazard categories (Objective 2.2, p. 88, 96), the upgrade and further development of the County-wide GIS database that incorporates County infrastructure, critical facilities, land use, and hazard zones (Objective 2.3, p. 88, 96), and the need to provide emergency personnel training (Objective 4.4, p. 87, 98). All of these objectives are in-line with the purposes of this TAG. While the County did not ask specifically about "pipeline" infrastructure or accidents, a public survey of 2,069 people conducted by Chester County Emergency Services during the late summer and early fall of

² Interview with Tom Glass, HazMat Coordinator for Chester County, Pennsylvania, by Dr. Simona Perry, c.a.s.e. Consulting Services, at the June 2013 International Hazardous Materials Response Teams Conference, Baltimore, Maryland.

2013 was distributed to gauge public concerns regarding Chester County's hazard mitigation plan. The results revealed that over 1,200 residents, or 58%, think that man-made hazards pose the highest risk to the County's transportation infrastructure. Results also showed that with regards to which man-made hazards residents thought put their communities at most risk, transportation accidents and hazardous materials releases were the second and third most frequent concern, with the first concern being extended utility, data, or telecommunications outages.

This project, while conducted by a third party consultant and funded by a grant from PHMSA, is intended to supplement and inform this County All-Hazard Mitigation Plan. It is also intended to encourage more explicit dialogue on how critical transportation infrastructure systems, such as gas pipelines, and emergency training specific to that transportation infrastructure should be characterized and handled in future mitigation planning activities.

Gas Pipeline Infrastructure in Chester County

Located in the Greater Philadelphia Region, the first Pennsylvania railroads traversed Chester County in 1828, as did the first coast to coast road in the early 1900s. Known then as the Lincoln Highway, this cross-country road is known today as U.S. Route 30. The first gas pipelines were constructed in Chester County in the 1950's and in general followed the original rail lines and roadways. At the time of construction many of these first pipelines were buried in rural and sparsely populated areas of the County. In 2014 many of those same areas have been converted from farmland to suburban housing and retail, and with that conversion the risk to public safety from this pipeline infrastructure has increased.

As reported by PHMSA 2012 data, Chester County represented 1% of Pennsylvania's total square miles and ranked 3rd highest of Pennsylvania's 67 counties for percent of pipeline miles (the two counties ranking above Chester County are Washington 6.2% and Greene 5.5%). In 2009, Chester County's 750.51 square miles contained 560 linear miles of pipeline infrastructure which included 336 gas miles and 224 liquid miles. In the two year period of 2010-2012, the density of Chester County pipeline infrastructure increased by 6.07% while population slowed from the 2009 US Census rate of 15.1% to 1.278%. County comprehensive planning (CCPC 2009) has arrested population growth; however, pipeline infrastructure was not originally factored into that planning and remains on the rise, resulting in increased High Consequence Areas where gas pipelines intersect or run parallel to densely developed suburban and urban areas. Using available data, the Chester County Planning Commission (CCPC) has identified 59 of 73 municipalities that have pipeline infrastructure within their boundaries.

III. Chester County's Emergency Management Operations and Services Related to Pipeline Incidents

Chester County has 58 fire stations and 43 fire companies. Three fire companies are 100% volunteer³. Within the County, emergency medical transport is provided by several companies, with a total of 60 - 911 response units, of which 45 are manned by full time people. There are 60 fleet vehicles available for

³ <http://firedepartment.net/directory/pennsylvania/chester-county>

dispatch. This includes licensed ambulances and universal transport vehicles, but no medical evacuation helicopters since there are trauma centers within 20 minutes by ground from anywhere in the County. In the event of a disaster involving mass casualties, up to 3,000 units can respond within an hour or two from surrounding counties⁴. Also, according to the PennSTAR flight program of the University of Pennsylvania Medical Center, they have seven medical aircraft locations throughout Metro Philadelphia⁵. There are 44 local police departments and two state police barracks located in the County.

With passage of the Hazardous Material Emergency Planning and Response Act, Pennsylvania Act 1990-165⁶, in December 1990 and amendments in February 2001, the Chester County Hazardous Materials Response Team (Haz-Mat Team) was created under the direction of Tom Glass. In 2011, this Team spent 1,007 personnel hours during monthly training sessions on topics that included chemistry reviews, operating near water hazards, chemical detection equipment and radiological response concepts (CCDES 2011). The teams carry specialized equipment that can detect standard combustible/flammable gasses, the percent of oxygen in the air, carbon monoxide, hydrogen sulfide, volatile organic compounds, mercury, chlorine, and ammonia. Prior to formation of this County-wide Team, hazardous material response was handled by individual municipal fire and emergency departments as incidents occurred. According to Tom Glass, these Haz-Mat Teams are prepared to be the local first responders in the event of an oil, hazardous liquids, or natural gas pipeline emergency. Chester County also operates a 9-1-1 Center and an Emergency Operations Center (EOC). The 9-1-1 Center and the EOC have listings of resources available from county assets as well as resources available from the municipalities via mutual aid agreements. The 2005 Chester County Emergency Operations Plan embraces an “all-hazards” principle that most emergency response functions are similar, regardless of the hazard. Elected officials of the County are responsible for mobilizing the Emergency Operations Plan in the event of a disaster. Chester County is also part of the 5-County Southeastern Pennsylvania Regional Task Force (SEPA RTF) for response to critical infrastructure emergencies involving regional airports, ports, rail and highway facilities, petroleum and chemical facilities, nuclear and conventional power plants, electricity systems, major financial institutions, and historic sites.

In 2006, Chester County deployed a free community alert system as part of the ReadyNotifyPA.org 73-county system using the patented Roam Secure Alert Network (RSAN) from Cooper Notification. This system provides real-time alerts via e-mail, smart phones, cell phones, and pagers regarding severe weather, road closures, crime, and multi-hazard scenarios. More recently, in February 2013, the County purchased a new emergency radio system, a P25 Phase II design that includes remote transmitter/receiver sites configured in two fully-linked cells, modifications to the microwave transport system that connects the remote sites to the 9-1-1 Operations Center in the Chester County Government Services Center in West Goshen Township, replacement of existing 9-1-1

⁴ Phone and email correspondence between Steve Webb, Deputy Director of Field Services, Chester County EMS Council, Inc., Lynda Farrell, Executive Director of Pipeline Safety Coalition, and Dr. Simona L. Perry, c.a.s.e. Consulting Services, on 27 Feb 2014.

⁵ <http://www.pennmedicine.org/pennstar/locations.html>

⁶ <http://www.palrb.us/pamphletlaws/19001999/1990/0/act/0165.pdf>

consoles, and field equipment for the emergency responders, including 1,221 mobile (vehicle-mounted) radios, 2,750 hand-held radios, and 132 control stations for emergency responder station applications (The County of Chester, 2013).

On June 7, 2013, Tom Glass was interviewed to get a better understanding of the history and current status of the County's current emergency management operations and services as well as the Haz-Mat Team, and in order to document his insights and experiences from working in the County over so many years. According to Mr. Glass, the top priority of the Haz-Mat Team, as well as most first responders in the County is chemical spills and accidents involving hazardous materials along transportation corridors such as roads and rail lines. Within Chester County's boundaries there is an extensive network of major highways, including the Pennsylvania Turnpike/Interstate 76, so this is a logical priority. Other important priorities for first response in the County are fixed facilities and pipelines. To Mr. Glass, the biggest vulnerability Chester County faces with regards to pipelines is their age. And, he feels the fire services and other emergency departments in the County are prepared to respond if and when a pipeline incident should occur.

While Mr. Glass is a paid employee, he said that the majority of first responders, and related staffs, working in Emergency Services in the County are either part-time staff or volunteers who also live, work, and have families in the County. In Chester County, service in the first responder community sometimes involves not only individuals but entire families. Alongside himself, Mr. Glass said that his wife and son also work with the County's emergency services department. The Haz-Mat Team is composed of 30 volunteers who "do it for passion" according to Mr. Glass. However, there are signs that capacity for first response is waning. Mr. Glass noted a lack of volunteers despite the fact that funding had actually increased since September 11, 2001 as a result of Homeland Security grants. Mr. Glass noted that times have changed from when he began in emergency services in the County 30 years ago. He said there is less involvement overall and it is much less of a family affair. Over the past decade state-wide records verify Mr. Glass's concerns, indicating that the number of volunteer firefighters has declined from 210,000 to under 60,000 (CCDES 2012a).

IV. A Knowledge and Needs Survey of Chester County's Professional and Volunteer Emergency First Responders

According to a [Chester County Department of Emergency Services 2012 presentation](#) first responders in the County are currently required or offered a full range of trainings on everything from emergency communications to law enforcement. Some of these specific trainings currently include:

- Association of Public Safety Communications Officials (APCO) Courses for 9-1-1 Communications/Dispatchers
- Over 80 courses in fire suppression, vehicle rescue, and hazardous materials training (about 1,200 graduates each year)
- Voluntary Quick Response Squad/Service Certification (VQRSC) and Voluntary Rescue Service Certification (VRSC) for all field services personnel

- Emergency Management Division initial and quarterly training for Municipal Emergency Management Coordinators
- Pennsylvania Emergency Management Agency (PEMA) and Federal Emergency Management Agency (FEMA) Courses
- National Incident Management System (NIMS) Trainings
- Community Emergency Response Team (CERT) Trainings (for non-responder community members)
- Once a year nuclear plant emergency exercises
- State and Regional emergency exercises

In 2012, the Chester County Department of Emergency Services opened the first phase of a new multi-million dollar Public Safety Training Campus, with the final phase expected to be operational in the Summer of 2014 (CCDES 2012a). When complete, the campus will be home to an academic building with classrooms, a gymnasium, equipment bays, a tactical training village, and an indoor firing range.

On July 15 and October 14, 2013 the Chester County Department of Emergency Services and Pipeline Safety Coalition distributed a 33-Question survey to 1,206 emergency management contacts in the County to gauge their current awareness of pipeline safety and emergency preparedness, including hazardous materials safety. Forty-six (46) first responders and emergency professionals working with 56 different Chester County emergency services and municipal organizations responded to the survey (4% response rate). Table 1 includes the names of all the Chester County emergency organizations these respondents indicated working with. Of those responding directly to the survey, the majority were over 36 years of age (79% ages 36-64, 12% above age 65, and 9% ages 19-35), male (97% male, 3% female), and college educated (53% attended college and 21% attended graduate school). This section outlines the type of questions asked and the results of this County-wide survey of first responders.

Table 1. Organizations in Chester County that Participated in the First Responder Survey

Name of County Emergency Organization	Number of Respondents Who Indicated Affiliation
Avon Grove Regional Emergency Management (AGREM)	3
Avondale Fire Company	1
Birmingham Township Emergency Management	1
Birmingham Township Police	1
Borough of Modena Emergency Management	1
Borough of South Coatesville Emergency Management	1
Charlestown Township	1

Chester County ARES-RACES (Amateur Radio Emergency Services/ Radio Amateur Civil Emergency Service)	1
Chester County Department of Emergency Services	3
Chester County Emergency Management Coordinators	1
Chester County Fire Training Division	2
Chester County Haz-Mat Team	2
Coatesville Fire Department	1
Cochranville Fire Company	1
Cochranville Station 27	1
East Brandywine Township Emergency Management	1
East Brandywine Township Police	1
East Fallowfield Township Fire Marshal / Emergency Management	1
East Goshen Township	1
East Whiteland Fire Company	1
East Whiteland Township	1
East Whiteland Township Fire Department	1
Easttown Township Police Department	1
Elk Township, Oxford Regional Emergency Management (OxREM)	1
Elverson Borough EMA	1
Elverson EMS	1
Franklin Township EMC	1
Goshen Fire Company	1
Highland Township Emergency Management	1
Kennett Fire Company	1
Keystone Valley Fire Company	1
Keystone Valley Fire Department	1

Keystone Valley Station 8	1
Liberty Steam Fire Engine Co. No. 1	1
Longwood Fire Company EMS	1
Malvern Fire Company	1
Malvern Fire Company EMS	1
Martins Corner Fire Department	1
Parkesburg Borough Police	1
Pennsbury Township Emergency Management	1
Phoenixville Borough Office of Emergency Management	1
Phoenixville Fire Department	1
Ridge Fire Company	1
Schuylkill Township Police Department	1
Southern Chester County Emergency Medical Services (SCCEMS)	1
Uwchlan Township EMA	1
Valley Township Emergency Management	1
Wagontown Fire Company	1
Wagontown Fire Department	1
West Brandywine Township Emergency Management	1
West Nantmeal Township EMA	1
West Pikeland Township Emergency Management	1
West Vincent Township Emergency Management	1
West Whiteland Fire Company	1
Westtown-East Goshen Regional Police Department	1
Westwood Ambulance	1

Emergency Organization Types and Geographic Distribution

The survey asked all respondents to identify the type of emergency or municipal organization that they are associated with (Question 2). The names and types of organizations that responded are listed in Table 1. Half of the respondents (50%) indicated working with an emergency management organization, 30% with a fire unit, and 17% with either an emergency medical services organization or law enforcement. The remaining respondents were with hazardous materials units (9%), emergency training organizations (7%), and other (4%, municipal government and public works). They were also asked to name the municipalities, townships, boroughs, or cities that their organization served, or to indicate whether they served the entire county (Question 3). Three respondents indicated that their organization operated County-wide.

Overall Experience and Training in Emergency Services Inside and Outside of County

In order to understand the overall emergency response experience and training levels of those responding to the survey who have worked both inside and outside of Chester County, three questions were asked about length of service (both in Chester County and elsewhere) and adequacy of training in emergency services outside of Chester County (Questions 4-6).

In length of service within Chester County, the majority of respondents indicated serving more than 30 years (32%), followed by those serving between 21 and 30 years (21%), and 11 and 20 years (12%). Only 9% and 2% reported being involved in emergency services in Chester County between 1 and 10 years and less than 1 year, respectively. According to these results, the emergency personnel who responded to this survey tend to have served for longer than 20 years, and this seems to verify what Tom Glass referred to when he said that it is getting more difficult to find people who are willing to get involved as volunteers (7 Jun 2013 Interview).

Thirty-two (32%), or 19, of the respondents reported having worked in emergency services outside of Chester County. Of those working outside the county, two commented that they had worked at the federal level. And, of those who worked outside of the county, 42% ranked the training they received as average to adequate compared to training received while in Chester County, 26% ranked their previous training as above average to exceptional compared to Chester County, and 11% ranked the training as below average or inadequate compared to Chester County. Sixteen percent (16%) of those with out-of-County experience indicated that they received no training compared to that in Chester County and a little more than 5% indicated “other” with no explanation. It appears from these responses that these first responders find training *outside* of the County comparable or slightly better than the training they have received inside of the County.

Incident Command System (ICS) Training

In 2004, FEMA under direction of the U.S. Department of Homeland Security instituted an [Incident Command System](#) (ICS) as “a standardized, on-scene, all-hazards incident management approach” used by all levels of government (federal, state, tribal, local), by the private sector, and many nongovernmental organizations that allows for integration of facilities, equipment, personnel,

procedures, and communications, enables coordinated response among different jurisdictions and agencies that are both public and private, and establishes common processes for planning and managing resources during single or multiple incidents

In general, the system identifies five major functional areas that are necessary to facilitate incident response for complex and/or multi-jurisdictional emergencies: Command, Operations, Planning, Logistics, and Finance/Administration.

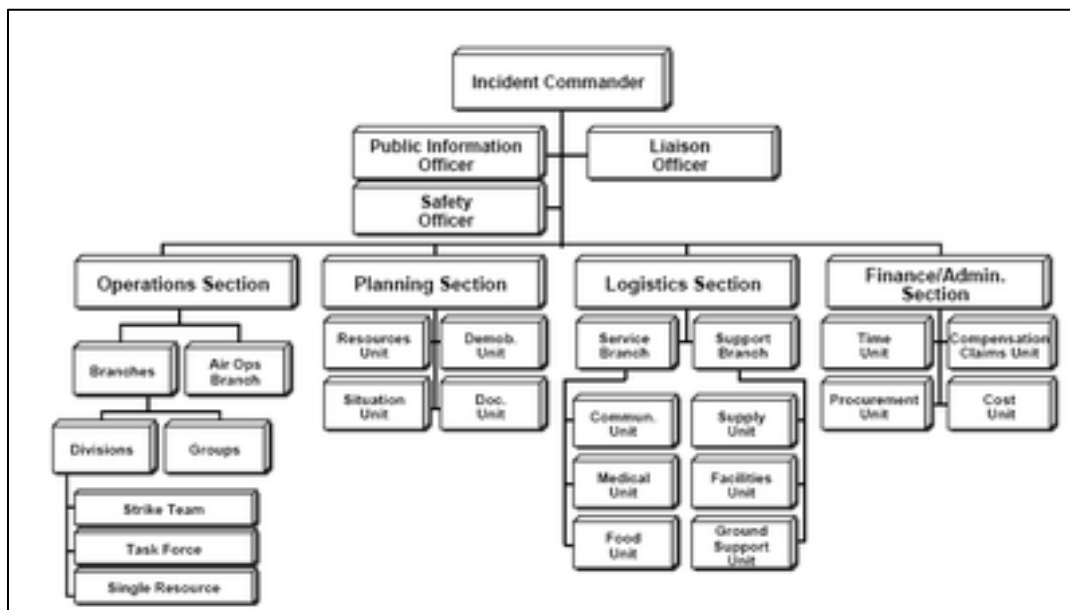


Figure 1. ICS basic organization chart (ICS-100 level) (From [FEMA Incident Command System Training Manual](#), May 2008, p. 7)

Under the leadership of the U.S. Fire Administration and the National Wildfire Coordinating Group, core competencies in the overall system and specific needs of the functional areas are identified and modified as necessary, serving as the basis for ICS-specific trainings. The National Incident Command System, or NIMS, simply refers to the federal capacities to assist state and local authorities when and where necessary (U.S. Department of Homeland Security 2014). The philosophy of NIMS is that “all incidents begin and end locally,” therefore increasing ICS training and capacity at the local level is the ultimate goal. For Chester County first responders, ICS training is available from [national \(FEMA Emergency Management Institute, EMI\)](#), [state \(Pennsylvania Emergency Management Agency, PEMA\)](#), and various private training companies.

Questions 7 and 8 asked respondents to identify the type of ICS training they have received and to reflect on whether or not they needed more such training in ICS or NIMS. With regard to the type of training first responders have received in ICS, the largest number (78%) reported taking specific classes (See Table 2 for course names) and participating in exercises and drills. Just as significant to ICS training for Chester County first responders who participated in this survey was on-the-job training (66%) and manuals or training books (61%). With the exception of one respondent, all indicated receiving some type of ICS training while in Chester County. Almost half of respondents (46%) indicated that they do

need more training and exercises in ICS and NIMS, 39% indicated that they did not need more training, 15% did not know, and five surveys provided no response to the question about the need for more training.

Table 2. ICS and Other Training Courses Respondents Identified in Survey

Specific Names of Courses	Number of Respondents
ICS-300, in-class training	18
ICS-400, in-class training	17
IS-100.b - (ICS 100) Introduction to Incident Command System	15
IS-200.b (ICS 200) ICS for Single Resources and Initial Action Incidents	17
IS-700 A NIMS	14
IS-701 NIMS Multiagency Coordination System	1
IS-702 NIMS Public Information Systems	1
IS-703 NIMS Resource Management	1
IS-704 NIMS Communications and Information Management	1
IS-800.b National Response Framework, An Introduction	12
NIMS and ICS classes, no specific type identified	14
County's Incident Support Team Training	1
Trainings provided by CCDES	1
NIMS National Fire Academy Train the Trainer Course	1
Company, chief officer training and certification	2
Managing Company Tactical Operations (MCTO) Program	1
All Hazards Type 3 Incident Management Team (IMT) Training	1
Advanced Professional, G Series Classes	1
Radiological Emergency Management	1
Multiple Incident Command Classes	1

International Association of Arson Investigator's (IAAI) Certified Fire Investigator (CFI) Courses	1
UL Fire Safety On-Line Courses	1
NFA Classes	1
Basic EMA Certification	1
Basic PEMA Emergency Management Certification	1
Introduction to Organizational Roles and Resources	1
Management and Unified Command	1

Awareness of and Involvement in County EMS Mass Casualty Response Plan and Incident Support Team

As part of efforts to locally implement the ICS, Chester County developed a [Mass Casualty Response Plan](#) to assist Chester County emergency medical service providers in organizing and controlling resources at the scene of a disaster where mass casualties are involved. The plan is intended to serve as a County-wide guide for identifying the basic working relationships between different types of emergency responders and jurisdictions and to be used by local emergency service agencies, municipal officials, and emergency management officials to develop more site-specific emergency response plans for the communities they serve. The Plan describes in detail event timelines, levels of disaster and appropriate response protocols, medical triage best practices, on and off-site personnel, roles and responsibilities, patient distribution and transportation, hazardous materials, weapons of mass destruction, decontamination guidelines, and critical incident stress management for responders, all within the framework of NIMS education, training, and best practices.

Since 2008, Chester County has had an Incident Support Team. This Team has two fully staffed teams that assist the Incident Commander/Unified Command in disaster response operations through the use of local incident management protocols and technical specialists. As of 2011, Chester County's Incident Support Team had 33 members from all emergency services organizations and municipal officials (CCDES 2011). In addition, the County team is a liaison with the SEPA RTF and participates in regional disaster response.

Survey Questions 9, 10, and 11 asked respondents about their awareness and level of involvement in the County's Mass Casualty Response Plan and Incident Support Teams. Responses indicated that most first responders know that these programs exist, with 68% familiar with the Chester County Mass Casualty Response Plan and 79% with the County's Incident Support Team. Furthermore, 25 respondents are either aware of the Incident Support Team's role in responding to County emergencies (22 respondents) or are active members of the Team (3 respondents). Two respondents indicated wanting to learn more about what the Team does. Most notably, three respondents were critical of how team members were selected and their level of training. One respondent expressed

concern about the IST's qualifications and training saying, "Current IST team members were hand-picked and are below par to what an incident support team should be. When/if the team is called they should be trained to a higher level or experience than responders, which they currently are not."

Awareness and Knowledge of Pipelines in the County

Questions 12 through 15 of the survey asked first responders about their knowledge and level of awareness regarding the type, number, location, and operators of the pipelines in the areas of Chester County that they serve. Because the survey was distributed directly to the County's first responder and emergency services community by the Department of Emergency Services, the respondents to the survey remained anonymous, making it impossible to analyze individual surveys and to verify the accuracy of answers given based on the respondent's area of responsibility in the County. Therefore, these questions were not intended to "test" for the correct answers but rather to gauge the relative knowledge and overall awareness first responders have regarding the characteristics of pipelines found within the County.

Seventy-two percent (72%) of responders who answered Question 12 indicated that there were between 1 and 5 different pipelines within their area of responsibility, followed by 14% who indicated between 6 and 10 different pipelines. Six percent (6%) of respondents indicated that there were no pipelines in their area and 3% indicated that there were more than 10 pipelines in their service area. Six percent (6%) of responders did not know how many pipelines there were in the area that they served.

Seventy-four percent (74%) noted that natural gas pipelines were in their service area, followed by liquid petroleum pipelines (44%), liquefied natural gas pipelines (35%), other liquids (21%), and other gases (12%). Close to 15% of responders indicated not knowing what type of material(s) was transported in the pipeline(s) found within the areas they serve.

With regard to the location of pipelines, responders were asked about the types of places that are found near or underneath pipelines in their operation area. Eighty-one percent (81%) of responders indicated that pipelines are located underneath or near residential areas as well as open space, park, or farmland, while 56% indicated pipelines underneath or near an environmentally sensitive area or major roadway. Other respondents identified schools (28%) or hospitals (6%) as above or near pipelines.

Only seventeen responders indicated knowing which pipeline companies or operators manage the pipeline(s) located in their area of responsibility. Ten pipeline companies were identified by survey respondents, including companies in the oil, natural gas, water, and steel/mining operations. The names of all companies identified by survey respondents can be found in Table 3.

Table 3. Names of All Pipeline Companies/Operators Identified by First Responders in Survey

Name of Pipeline Company/Operator Identified in First Responder Survey
National Transit (formerly Standard Oil)- Northern Pipeline (Vineyard Oil and Gas & Royal Dutch Shell joint venture)
Williams Transco or Williams
Eastern Shore
Sunoco
Buckeye
Columbia or Columbia/NiSource
Texas Eastern
Colonial
Pennsylvania-American Water
ArcelorMittal

Pipeline-Specific Emergency Response Preparedness & Trainings

To determine the types of pipeline-specific or relevant trainings first responders in Chester County had participated in and their overall level of preparedness we asked them a series of questions related to training in general pipeline incident response (Question 24), medical response (Question 25), hazardous materials response (Questions 22 and 23), attendance at operator-sponsored trainings (Questions 16 and 17), and the availability of pipeline emergency standard operating procedures and plans (Question 27).

With regards to general pipeline-specific trainings, 61% of respondents indicated that their organizations had participated in safety meetings with local pipeline companies (53% identified this as safety meetings with local pipelines and 8% identified this as RP1162 Public Awareness), followed by table-top drills for first responders (31%), and other types of trainings, including PA One Call, pipeline awareness, on-line training through a pipeline company, and annual training by pipeline operators (14%). Twenty-eight percent (28%) responded that their organization had participated in no pipeline-specific incident training. Overall, these results suggest that the majority of pipeline-safety “trainings” attended by emergency first responder organizations in Chester County are currently being conducted by pipeline companies and operators through the American Petroleum Institute (API) Recommended Practice (RP) 1162, “Public Awareness Programs for Pipeline Operators”, and incorporated into Federal pipeline safety regulations, 49 CFR 192.616 and 49 CFR 195.44. In specific questions (16 and 17) about these “trainings,” 86% said they were aware of the operator meetings and 78% said they had attended these meetings in the past. This is a key finding, since these company meetings are not necessarily trainings at all and are not necessarily designed to adequately prepare emergency responders for a

pipeline emergency since they are part of company-wide public awareness programs to ensure timely communications and information dissemination to residents living along right-of-ways, emergency officials and elected officials in their areas of operation⁷. However, there is the potential for the meetings between companies and emergency responders to incorporate greater emphasis on pipeline-incident response and emergency preparedness efforts, and even for real training to take place, such as emergency table-top and deployment exercises which are in fact recommended as supplemental activities in RP1162.

With regards to medical first responder training, 72% indicated that they or personnel in their organization did have training, 19% indicated they did not have such training, and 8% did not know. For hazardous materials training, 67% indicated that personnel in their organization were trained to the Hazmat Awareness Level, 36% to the Hazmat Operations Level, and 28% to the Hazmat Technician or Specialist Level. Five percent (5%) of respondents did not know the level to which their organizations were trained. This indicates that the level of medical training is slightly above the level of hazardous material training among those first responders who participated in the survey, but that the level of hazardous material training is probably higher than average across the board.

Finally, with regards to the availability of pipeline emergency standard operating procedures and plans, survey respondents were asked to affirm (True) or deny (False) the following statement: "There are specific standard operating procedures and plans for responding to pipeline emergencies in the areas where my organization works." Slightly more than half of respondents, 54%, affirmed that the statement was correct for their organization, while slightly more than a quarter, 26%, denied the statement for their organization. Two percent (2%) did not know.

Operational Experience in Responding to Pipeline Emergencies

It is important to understand the direct experience Chester County emergency responders and professionals have had to date with pipeline-related incidents in order to identify what areas first responders may have the least experience with. Questions 18 and 19 asked them if they had any experience with pipeline-related incidents, and to specifically identify those incidents. Of those who responded, 81% said that their organization had never responded to a pipeline incident in Chester County. Only 17% said that their organization had responded to a pipeline incident, and of those, four responded with details and all described incidents involving liquid petroleum products that needed to be contained in order to avoid environmental damage. None of the respondents indicated direct experience related to high pressure natural gas explosions or leakage of other gaseous substances. This lack of direct experience may be at least partially responsible for the seemingly lackadaisical attitude towards pipeline emergency training and preparedness in the County. Speaking with other emergency responders who have had direct experience in the United States and internationally with high pressure, large diameter natural gas pipeline accidents in particular, they admit that they could not have imagined before-hand what level of coordination and resources would be required in order to respond to the accident. The key to better preparedness they also agree is to have standard operating procedures in

⁷ <http://mycommittees.api.org/standards/pipeline/1162%20Links/1162nonprintable.pdf>

place across all emergency organizations that are specific to what first responders may encounter at the site of a large-scale pipeline leak and/or explosion. Some of these specific ideas for better operational preparation during pipeline incidents are found in **Section VI** of this report.

Operational Preparedness Specific to Pipeline Emergencies

To gauge the actual operational preparedness of Chester County emergency organizations to natural gas and other pipeline incidents, a series of questions regarding Department of Transportation hazardous materials placards (Questions 20 and 21), availability of Combustible Gas Indicators (Question 26), and communication protocols in the event of an emergency were asked (Questions 28 and 29).

As far as pipeline emergency knowledge and response resources at the disposal of first responders, all respondents (100%) said that they and their organization had reviewed the 2012 Department of Transportation Emergency Response Guidebook (ERG) Orange Book which contains a guide to all hazardous materials placards used on containers. In addition, 81% of organizations require emergency responders to carry a copy of the ERG Orange Book with them while on duty or on call in the County. Over half (56%) of all responding units of emergency organizations that participated in the survey indicated that they do have access to Combustible Gas Indicators, or CGIs, for the detection of natural gas. Thirty-six percent indicated that they did not have CGIs, while 6% did not know.

With regards to communication with pipeline operators in the event of an emergency, 54% of responding units of those responding indicated that they do carry an emergency contact list of all operators and companies that manage pipelines in the area where they operate. Thirty-four percent (34%) indicated that their responding units did not have such an emergency contact list, and 11% did not know. When asked who would be the first person or organization they would contact in the event of a pipeline emergency in their area of emergency service, there was a great diversity of answers. Twenty-nine percent (29%) indicated that they would first contact the local fire company or fire chief. This was followed by operator of the pipeline or the pipeline company hot-line (21%), either 911/Dispatch or Chester County Emergency Services (both at 15%), the Haz-Mat Team, Chester County or Local Emergency Management Coordinator, or the Police/Chief of Police (all at 9%). One respondent indicated that they would contact CHEMTrec, a company specializing in “immediate critical response information for incidents involving hazardous materials and dangerous goods”⁸, and two respondents (6%) said that they do not know who they would contact. Five (15%) responded that they would contact more than one type of emergency organization, such as local police and fire, fire and the Haz-Mat Team, 911 dispatch and the Haz-Mat Team, or the emergency management coordinator, fire company, and operator hot-line. This lack of consistency in the response from emergency responders in the County about who to contact first in the event of a pipeline emergency could indicate two things, one a procedural issue and the other an artifact of the survey itself. The first may point to a lack of standard operating procedures for pipeline incidents, and the second could be the result of the diversity of types of emergency organizations responding to the survey and varying levels of experience among survey respondents. Regardless, this lack of consistency among first responders regarding the first point of

⁸ <http://www.chemtrec.com/>

contact in the event of a pipeline emergency warrants further investigation by Chester County Department of Emergency Services.

V. County Resident Stakeholder Awareness, Knowledge, and Perceptions of Pipeline Risks, Safety, and Emergency Preparedness

One of the intentions in conducting this case study of Chester County's first responders was to make recommendations for the creation of a first responder-resident cooperative support campaign specific to pipeline emergencies and to prepare a blueprint for a pipeline first responder curriculum that can be used County-wide by emergency professionals and volunteers, as well as community residents. To be able to appropriately recommend such a campaign and develop this curriculum blueprint, more information about community residents' level of awareness, particular knowledge, and perceptions about pipeline risks, safety, and emergency preparedness of County first responders was collected. This data collection was done through an on-line survey sent out to 108 County "resident stakeholders," defined as those people living in the County who have attended Pipeline Safety Coalition meetings in the past or otherwise shown interest in pipeline issues as landowners or residents who live and work along pipeline right-of-ways. At the same time, this survey was also used as an outreach and educational tool to get residents thinking about gas pipeline safety, emergency preparedness, and response. Eighteen (17%) resident stakeholders completed the survey. Those who completed the survey indicated that they all own the place in which they reside and that those residences are found in 10 different Chester County municipalities: West Vincent (2), Honey Brook (1), East Brandywine (3), West Pikeland (1), Devon (1), Warwick (4), Chester Springs (1), North Coventry (2), East Nantmeal (3), Downingtown (1). The questions asked in the survey are attached as an Appendix, "County Resident Stakeholder Awareness Survey." Resident responses to the survey questions with applicability to this case study project and design of the campaign and curriculum are discussed below.

Awareness and Knowledge of Current Pipeline Locations and Characteristics

Of the 18 residents completing the survey, a majority are aware of the location of gas pipelines and related infrastructure, such as compressor stations, near their homes (Question 3). Forty-four percent (44%) reported that their residences were within approximately a half mile of a gas pipeline or compressor station and 44% reported that there was not a gas pipeline or compressor station within a half-mile from their residences. Eleven percent (11%) did not know. However, resident survey respondents indicated that they were less sure of the diameter and pressure of these pipelines (Question 4); 47% responded "No" when asked if they knew this information, and another 37% did not answer the question at all.

In terms of distribution lines and gas service directly to structures (Questions 7 and 8), 94% of respondents know whether or not there is natural gas service to their place of residence or place of work. Only one respondent indicated not knowing this information. This is a good indicator that residents, at least those who are already engaged as stakeholders, are aware of the location of gas pipelines in their immediate surroundings. However, these responses also indicate that there is a need

for greater awareness-raising and education regarding the diameter and operating pressures of those gas pipelines.

Awareness and Knowledge of Pipeline Safety and Emergency Preparedness

In terms of County resident stakeholder's awareness and knowledge of what to do in the event of smelling a "rotten egg" odor (from the use of mercaptan to odorize natural gas distribution lines) in their home, neighborhood or at work, everyone responded that they would do something to report the odor (Question 9). Most residents, 78% appropriately indicated that they would leave the area of "rotten egg" smell and then call 911. They also indicated they would call 911 (50%), call the gas company (39%), walk away from the smell (33%), and tell a friend (11%).

When asked what they would do if they saw bubbles coming out of a creek or stream (Question 10), most residents (83%) indicated they would Call 911 and half of residents (50%) would call the Chester County Conservation District. Others indicated that they would tell a friend (11%), leave the area, alert a township clean water action group, and notify the township supervisors and Pipeline Safety Coalition. One resident said, "I wouldn't know what to do, or if that was a normal occurrence or not." And, one resident indicated that they would do nothing.

Question 11 asked the residents if they were aware of the Chester County Community Emergency Response Team (CERT), and if they were, if they had ever participated. According to Chester County Department of Emergency Services' 2011 Annual Report, this free disaster preparedness curriculum is designed to train community members to be prepared and provide their neighbors with assistance during times of emergency, consisting of CPR, first aid, basic fire extinguisher training, and general training on how to stay safe during an emergency. As of 2011, the County reports that they have trained over 500 community members. The majority of residents responding to the survey (61%) had not heard of CERT at all. Of those that had heard of CERT (39%), only one resident said they had attended a meeting about a response to a pipeline incursion and requested that Chester County be given authority to inspect pipelines for safe placement. None said they were trained in the CERT program.

In an effort to determine if resident stakeholder's might also be involved in the County's emergency response organizations in a professional or volunteer capacity, Questions 12 and 13 asked if they or anyone their immediate family was currently or ever had been a fire fighter, EMT, emergency dispatch worker or other first responder in the County. Their responses indicated that no one who completed the survey has this type of background or family affiliation with the County's emergency services. This lack of personal involvement by residents in the County's emergency first responder community is an important consideration in the creation of a first responder-resident cooperative support campaign specific to pipeline emergencies, and must also be considered when designing a blueprint curriculum that could be just as useful to first responders and emergency workers as it is to community resident stakeholders.

Resident Perceptions of Gas Pipeline Safety and Emergency Preparedness

The final questions (Questions 14, 15, and 16) in the survey asked resident stakeholders about their perceptions of safety and emergency preparedness, in terms of levels of concern for property and lives and levels of confidence in the capabilities of local first responders and pipeline operators.

When asked how concerned they were that a gas pipeline accident could destroy property and lives in Chester County, over half of respondents (61%) indicated they were “Very Concerned,” followed by “Moderately Concerned” (22%), “Concerned” (11%), and “Not very Concerned” (6%). This high level of concern by most resident stakeholders should be taken seriously into development of campaigns and educational efforts.

In order to apply a “real-world” scenario to the final question regarding residents’ level of confidence in local first responders and pipeline operators to respond to pipeline disasters, Question 15 had respondents read about the investigation into the causes of the 2010 San Bruno pipeline rupture that destroyed 38 homes, damaged 70, and killed eight people. In this way, survey respondents were educated about this type of disaster event and asked to think about the causes and consequences in detail. Question 16 then asked them how confident they were that Chester County’s first responders and pipeline operators would be capable of appropriately responding to a pipeline accident on the scale of the San Bruno disaster. Over half (56%) of resident stakeholders responded that they were “Not at all confident” that they would be capable, while 17% responded that they were either “A little confident” or “Fairly confident,” and 11% responded that they were “Very confident.” The reality of whether or not Chester County’s first responder community or pipeline operators are capable of responding must be reconciled with what appears to be a lack of confidence in their capabilities on the part of local residents. This is one of the roles that the first responder-resident cooperative support campaign could play, in building confidence among residents of the County’s emergency response capabilities and in identifying areas where the County’s emergency services should be more proactive in reaching out to local residents and involving them directly in disaster preparedness activities specific to pipeline incidents. In addition, including pipeline-specific curriculums into CERT or other already existing education programs directed at non-emergency audiences, would raise the awareness among residents about the safety and preparedness training that the County’s first responders should have.

VI. Recommendations for Filling the Gaps in Chester County’s Pipeline Emergency Preparedness and Training

Operational Preparedness for Pipeline Incidents

While there has been no pipeline incident in Chester County that has led to serious public safety and environmental consequences to date, with the County’s population density, aging pipeline infrastructure, and increasing pipeline miles the probability of such an incident increases with each year. Lessons learned from pipeline disasters in Allentown, Pennsylvania and San Bruno, California, as well as international incidents provide some idea about what can go wrong when local first responders are not properly prepared to handle the early stages of a pipeline incident. In some cases, better emergency operational preparedness that quickly assessed the situation as pipeline-related may have actually saved

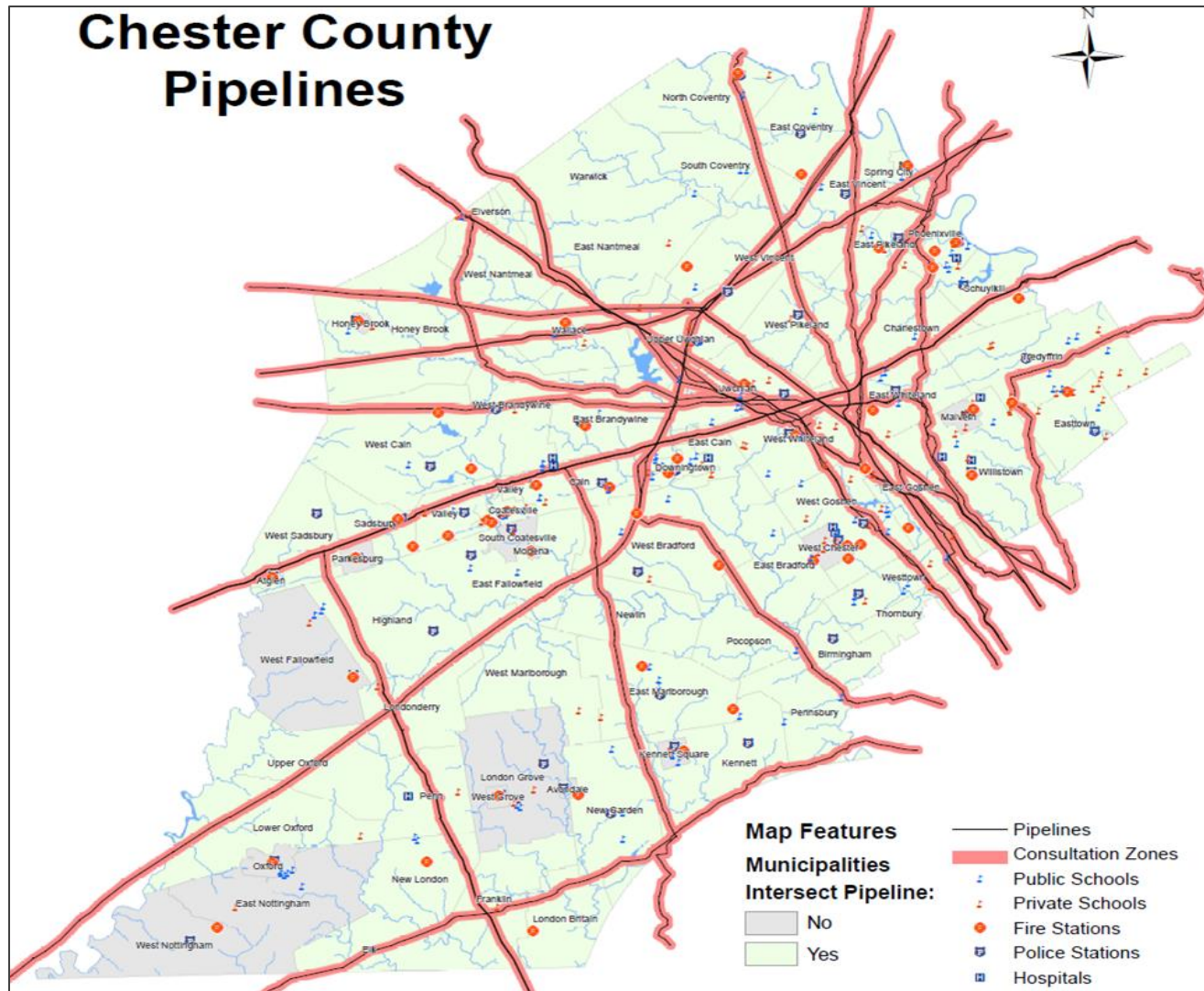
lives. The survey responses from Chester County emergency organizations and community stakeholders, along with interviews from pipeline safety officials and local first responders, that are highlighted in this report help to identify some of the operational gaps in the preparedness of Chester County's first responders to pipeline incidents.

In Belgium, two Fire Chiefs, Eddy Goossens and Jan Jorissen were involved in a 2004 pipeline accident involving a 40 inch natural gas line that killed a total of 29 people, including firefighters and policemen. This deadly and dramatic pipeline accident was a wake-up call that motivated them to develop a Standard Operation Procedure (SOP) specific to pipeline emergencies that they have since initiated in all fire departments across Belgium. The SOP provides communication and knowledge tools to departments whenever they respond to a pipeline emergency involving different types of hazardous liquids and gases, including propylene, ethylene, natural gas, hydrogen, oxygen, and nitrogen. One of the central features of the Protocol is a set of Action Cards that include easy-to-read icons, graphs, and tables that can be used to quickly determine the minimum safe distances for the public and first responders in both ignition and no ignition situations. It primarily assists the first responder to a pipeline emergency in making decisions regarding evacuation, shelter-in-place, and/or active fire-fighting, as well as the type of communication alarms or protocols that should be used based on the type of material in the pipeline, pipeline diameter and pressure, and wind directions. The Natural Gas Booklet designed by Goossens and Jorissen can be found in the Appendix. To address the immediate need of greater operational readiness in the event of a gas (or hazardous liquids) pipeline emergency, a recommendation is made that Chester County DES consider adopting the Action Card concept to fit within existing County DES and Incident Command System and County Emergency Management protocols, and ensure that all emergency professionals and volunteers know how to use the Action Cards and that they are kept in all emergency vehicles (fire, police, EMT, Haz-Mat, communications) across the County.

Local First Responder Pipeline-Specific Training

It is clear from the results of the survey and annual reports from DES that the County's first responders are well-trained in basic fire-fighting, hazardous materials response, dispatch communications, emergency medical response, law enforcement, tactical response, radiological response, and other specialized emergency and disaster response skills. What is missing across the board is any specific training related to gas pipeline incidents. With the opening of the DES Emergency Training Website as well as the new state-of-the-art Public Safety Training Campus, it is recommended that Chester County DES immediately incorporate into their curriculum offerings the "Pipeline Emergencies" Course developed by the National Association of State Fire Marshals, DOT and PHMSA and offered through FEMA's National Training and Education Division (DOT-006-RESP). Section VI provides a blueprint for the addition of this and other pipeline-specific trainings from PHMSA, the National Association of Fire Marshals, as well as the pipeline industry, into the core training curriculum of Chester County emergency personnel. In particular such a core curriculum should be required for fire chiefs, as well as new volunteer and professional fire fighters, police chiefs, and elected officials who are involved in the County's Emergency Management Plan and whose area of operation includes high

pipeline and population density areas of the County, as determined by GIS mapping done by the Chester County Planning Department (see Map 2).



As was suggested in Section II of this report, one of the reasons for this lack of specific training may be the tacit understanding that pipeline operators are traditionally the lead emergency responders once a pipeline incident has been identified, with local emergency organizations playing solely a first responder and assistance role. Despite this supposed operational hierarchy, there is mounting evidence from pipeline accidents in recent years that this hierarchy is not working properly. It should also be acknowledged that local first responders may have a better understanding of the location of above-ground County facilities, residences, and high-occupancy buildings that may be in the most danger should there be a pipeline incident. Federal investigations have revealed various reasons for this breakdown including lack of knowledge by local first responders or dispatch about the location of pipelines, pipeline operators not notifying local emergency officials regarding known pipeline incidents, local emergency responders attempting to shut down valves without contacting the operator, the long distances and travel times of the operator's emergency responders from the scene, and pipeline

operator errors in shutting down valves. Many of these failures point to the need for greater on-going communication and cooperation between pipeline operators and local emergency staff and volunteers both prior to pipeline emergencies and, importantly, during and after emergencies (Armstrong, Butters, and Hall, 2012). To ensure proper communications along the operational hierarchy and preparedness in the event of a pipeline emergency, it is recommended that both local emergency officials and pipeline operators in Chester County develop a more comprehensive emergency planning and training-oriented (as opposed to only awareness/informational) approach to RP 1162, Public Awareness Meetings. RP 1162 Meetings should include emphasis on pipeline-incident response protocols, emergency preparedness efforts on behalf of the operators and local responders, and emergency table-top and deployment exercises. In addition, all fire chiefs, emergency officials, including elected officials involved in County Emergency Management Planning, should be required to participate in these meetings on an annual basis. Guidelines for how these Public Awareness Meetings should be developed and evaluated are found on the PHMSA website⁹.

Community Stakeholder Pipeline Emergency Awareness and Training

In addition to the reality of the gaps that exist in preparedness of the local first responder community in the event of a pipeline incident, the perceptions local community stakeholders have regarding local first responder preparedness must also be addressed. As the results from the community resident stakeholder survey suggest there is a lack of confidence among community residents that Chester County's emergency organizations are fully prepared for a pipeline disaster. Initially, the Pipeline Safety Coalition did approach DES with developing a "Save a Face You Know" Campaign to encourage first responder-resident awareness and cooperative support. It was envisioned that "Save a Face You Know" would be modeled after the [Safe at Home/Safe at School Pipeline Safety Program](#) created as part of an RP 1162 initiative by pipeline operators in the Greater Houston, Texas area. However, in October 2013 Chester County DES told Pipeline Safety Coalition that they had a school-based outreach program that involved fire departments already and that they were not interested in expanding that program to specifically cover pipeline safety and emergencies. Without the necessary cooperation of DES such a community awareness campaign was not achievable as part of this project. However, it is strongly recommended that Chester County DES develop as soon as feasible some type of first responder-resident awareness campaign around gas pipelines, either in collaboration with pipeline operators as done in the Greater Houston Area's Safe at Home/Safe at School Pipeline Safety Program or independently, in order to answer immediate community stakeholder concerns.

There is also a clear need for community stakeholders to be educated in the proper response to pipeline incidents as well. Despite people's concerns, and the DES having documented the training of over 500 community members in their CERT program, there was no one who completed the survey of resident pipeline stakeholders for this project who had received CERT certification. It is recommended that Chester County DES do more to actively promote the CERT program to community pipeline stakeholders who live, work, play, or attend school within at least a half-mile of a pipeline right-of-way or in high consequence areas. In terms of specific pipeline information that should be considered for

⁹ http://phmsa.dot.gov/staticfiles/PHMSA/Pipeline/Public_Awareness_WBT/PA_0_0.htm

incorporation into the CERT trainings it is recommended that at a minimum Chester County's CERT trainings include a pipeline safety awareness module that provides information on how to interpret pipeline markers, what to do if you smell a "rotten egg" odor, what to do if you see bubbles coming from a stream, creek, or pond, and what to do before you dig. Ideally, it is also recommended that Chester County's CERT trainings include information about the County's emergency response procedures and capabilities with regards to pipeline incidents as it relates to community residents, including shelter-in-place procedures, evacuation procedures, the responsibilities and communication protocols of pipeline operators and local first responders, and public telecommunications networks that residents can use to get up-to-date information in the event of a pipeline emergency. Overall, better promotion of the CERT program and pipeline-specific additions to the CERT training would go a long way towards improving the awareness and preparedness of residents County-wide, as well as their confidence in the County's first responder capabilities to handle pipeline emergencies.

VII. Curriculum Blueprint for Improving Chester County Pipeline Incident Awareness and Preparedness Training

This curriculum blueprint is intended to be used by the Chester County Department of Emergency Services to define a strategic plan for training that is specific to pipeline emergencies and that is aligned with the critical mission of each emergency organization in the County and recognizes the need for on-going communication and cooperation between local first responders and pipeline operators. It identifies pipeline-specific training courses offered by the training centers and organizations that County first responders are already using and identifies new training centers and organizations that provide trainings specific to pipeline emergency response that DES might consider adding to the Chester County DES Training Site. These courses should be considered supplemental to the basic emergency training County first responders already receive. The blueprint defines learning objectives, identifies courses, recommends course delivery methods, and discusses ways to create an organizational framework along with incentives for promoting continuing education among both volunteer and professional emergency first responder personnel.

Learning Objectives

All Chester County emergency managers, dispatch operators, fire fighters, law enforcement officers, EMTs, whether volunteer or paid staff:

1. Know the location of the transmission pipelines that cross their area of jurisdiction;
2. Know how to get detailed information about the materials, diameter, and operating pressures of transmission pipelines in their area of jurisdiction;
3. Know the name(s) of the pipeline operator(s) and the emergency contact information for each pipeline in their area of jurisdiction;
4. Know the products carried by the pipeline(s) in their area of jurisdiction and their hazards;
5. Know how to safely respond to a pipeline emergency.

Chester County emergency management directors, fire chiefs, police chiefs, field service directors:

- 1a. Know the location of emergency response plans with respect to each pipeline in their jurisdiction;
- 2a. Know how to contact the pipeline operator regarding questions, concerns or an emergency;
- 3a. Have a working knowledge of what the pipeline operators need to do to prevent accidents and mitigate the consequences of accidents when they occur;
- 4a. Know who to contact with questions or comments about the pipeline company's public safety, additional overview information on Integrity Management Programs to protect High Consequence Areas under their jurisdiction, land use practices, emergency preparedness or other matters.

Course Matrix

Name of Course	Learning Objective(s)	Target Audience	Training Center/Organization	Appropriate for County Public Safety Training Website
			Link to Training Materials	
Introduction to Pipelines	Basic Introduction to Pipeline Systems Terminology	All	DOT PHMSA	Yes
			http://www.phmsa.dot.gov/staticfiles/PHMSA/Pipeline/Intro_to_Pipeline/frame.htm	
Pipeline Emergencies, Second Edition (DOT-006-RESP)	All	All	FEMA NTED/National Association of State Fire Marshals	Yes
			http://www.pipelineemergencies.com/ http://www.pipelineemergencies.com/peprogram.html	
Enbridge and Vector Pipeline Emergency Responder Education Program (Two Programs, one for pipeline emergency response training and one for 9-1-1 dispatch operators)	All	Dispatch operators; Chester County emergency management directors, fire chiefs, police chiefs, field service directors	Enbridge Inc., Vector Pipeline	Yes
			http://www.mypipelinetraining.com/	

RP 1162 Public Awareness Meetings and Table-Top Drills with Pipeline Operators in the County	3, 5, 1a, 2a, 3a, 4a	Chester County emergency management directors, fire chiefs, police chiefs, field service directors	Williams Transco Eastern Shore Sunoco Buckeye Columbia/NiSource Texas Eastern Colonial	Maybe
PHMSA On-Line Workshops on Pipeline Safety, Emergency Response, Planning	All, depends on workshop topic	Chester County emergency management directors, fire chiefs, police chiefs, field service directors	DOT PHMSA	Yes
			http://primis.phmsa.dot.gov/meetings/	

Course Delivery Methods

With the launch of the Chester County DES Emergency Training website and the opening of the Public Safety Training Campus, courses identified in the course matrix should be offered through the County DES on-line Emergency Training website and the Public Safety Training Campus whenever possible. At this time, these in-County resources should be sufficient to deliver these and other pipeline-specific courses.

Organizational Framework for Training and Promoting County First Responder- Pipeline Operator Cooperation

In order to promote sustained learning and long-term behavioral change related to pipeline emergency response and preparedness throughout the County's emergency services, it is necessary to ensure an organizational framework and culture that promotes and continues to provide logistical support for easy access to continuing education courses for both volunteer and professional emergency personnel. With the launch of the Chester County DES Emergency Training Website and opening of the Public Safety Training Campus, the County now has the facilities to provide for the logistics of training registration, delivery, and record-keeping.

In terms of promoting continuing education on pipeline emergency response training, it is paramount that the County DES leadership continues to develop and foster strong communications and working and training relationships with pipeline operators in Chester County. As was discussed at the beginning of this report, in order to be effective in a crisis, local emergency departments and dispatch must know where all the pipelines are located, who owns them, and the estimated response time for the operator's emergency resources to arrive at the scene. To have this information ready during an actual emergency, communication and cooperation between local first responders and pipeline

operators must have been established long before an incident. This culture of sharing, above all else, is the key to how well local emergency organizations and personnel are prepared to appropriately respond in the event of a gas pipeline emergency.

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APPENDICES

Emergency Training and Preparedness Survey

1. What is the name of the emergency services organization(s) you work with?

2. Which of the following best describes this organization(s)?

Fire Unit
Emergency Medical Services (EMS)
Hazardous Materials Unit
Law Enforcement
Emergency Dispatch
Emergency Management
Emergency Training
Other

3. Please list the name(s) of the municipality, township, borough, or city that your organization serves; or does your organization serve the entire county?

4. How long have you been involved in emergency services in Chester County?

less than 1 year
1 - 10 years
11 - 20 years
21 - 30 years
more than 30 years

5. Have you worked in emergency services outside of Chester County?

Yes, Please provide the location and length of time in the Comment box.
No

6. If you worked in emergency services before Chester County, rate the training received in comparison to that in Chester County.

No Training
Below Average, Inadequate Training
Average, Adequate Training
Above Average, Exceptional Training
Other

7. What type of training have you received on the roles, functions, and purposes of the Incident Command System (ICS) used in Chester County?

Specific classes (describe in comment box)
On-the-job training
Manual or training book
Exercises and drills
None
None in Chester County - Training received in former location
Other

8. Do you need more training/exercises in Incident Command (ICS) and the National Incident Management System (NIMS)?

Yes
No
I don't know

9. Are you familiar with the Chester County EMS Mass Casualty Response Plan?

Yes
No
I don't know

10. Are you aware of the Chester County Incident Support Team?

Yes

No

11. If you answered yes, please describe what you know about the Team and/or your level of involvement in the County's Incident Support Team.

12. In your area of responsibility, approximately how many different natural gas and/or hazardous materials pipelines exist.

No pipelines

1 - 5 pipelines

6 - 10 pipelines

More than 10 pipelines

I don't know

13. If there are pipelines in the area you operate, what type of materials do these pipelines transport? (Check all that apply)

Liquid petroleum

Natural gas

Liquified natural gas

Other liquids

Other gases

I don't know

Other

14. Are the pipelines located in your operational area located near or underneath the following type(s) of places? (Check all that apply)

Residential area

Open space area, park, farmland

Schools

Hospitals

Environmentally sensitive area (creek, woodland, etc.)

Major roadway

Other

15. What pipeline companies or operators manage the pipelines located in your area? List all of them in the Comment box. If not known, leave blank.

16. Are you aware of training offered by pipeline operators?

Yes

No

17. Have you attended a training offered by pipeline operators in the past?

Yes

No

18. Has your organization ever responded to a pipeline incident in Chester County?

Yes

No

I don't know

19. If yes, briefly describe the nature, extent, and response to the pipeline incident(s).

20. Have you and your organization reviewed the 2012 DOT Emergency Response Guidebook-Orange Book (ERG-Orange)?

Yes

No

I don't know

21. Does your organization require emergency responders to carry a copy of the 2012 DOT ERG Orange Book while on duty or on call?

Yes

No

I don't know

22. Are personnel in your organization trained to:

Hazmat Awareness Level

Hazmat Operations Level

I don't know

23. Is anyone in your organization trained to the Hazmat Technician or Hazmat Specialist Level?

Yes

No

24. What type of pipeline-specific incident training(s) has your organization participated in?

None

National Association of State Fire Marshall's Pipeline Emergencies on-line training

Safety meetings with local pipeline operators

Table-top drills for first responders who may be called to pipeline incident scenes

RP1162 Public Awareness Meetings

I don't know

25. Have you or anyone else in your organization completed Medical First Responder Training?

Yes

No

I don't know

26. Do responding units that your organization manages or is a part of have access to Combustible Gas Indicators (CGIs) for natural gas detection?

Yes

No

I don't know

27. "There are specific standard operating procedures and plans for responding to pipeline emergencies in the areas where my organization works."

True

False

I Don't Know

28. Do responding units that are managed by or a part of your organization carry an emergency contact list for all operators and companies that manage pipelines in the area where they operate?

Yes

No

I don't know

29. If there was a pipeline emergency in the area in which your organization operates, the first person or organization to be contacted would be

30. What is your age?

Under 18
19-35
36-64
65+

31. What is your gender?

Male
Female
Other

32. What is the highest level of academic education you have received?

Grade School
High School
Technical School
College
Graduate School
Other

33. THANK YOU FOR YOUR TIME AND INPUT! If you wish to be kept informed of the results of this survey and would like to participate in future pipeline emergency response trainings and other activities please provide your contact information below.

First Name
Last Name
Job Title
Work Phone
Email Address
Address 1
Address 2
City
State/Province (US/Canada)
Postal Code

County Resident Stakeholder Awareness Survey

1. In what Chester County municipality(s) do you reside?

2. Which applies to your Chester County residence(s)?

I own
I rent
Other

3. Is there a gas pipeline(s) or a compressor station(s) within approximately a half-mile distance from your residence?

Yes
No
I do not know

4. If yes, do you know the diameter and/or pressure of these pipelines?

Yes
No

5. Are there gas pipelines planned or proposed to be constructed within a half-mile or less of your residence?

Yes
No
I do not know

6. If yes, do you know what the diameter and/or pressure of these pipelines will be?

Yes
No

7. Do you have natural gas service at your place of residence?

Yes
No
I do not know

8. Do you have natural gas service at your place of work?

Yes
No
I do not know

9. What do you do if you smell a "natural gas" or "rotten egg" odor in your home, neighborhood, or at work? Check all that apply.

Call 911
Leave the area until I don't smell "rotten eggs" and then call 911
Walk away from the smell
Nothing
Call a gas company
Tell a friend
Other

10. What do you do if you see bubbles coming out of a creek or stream? Check all that apply.

Call the Chester County Conservation District

Nothing

Call 911

Tell a friend

Other

11. Have you ever heard of the Chester County Community Emergency Response Team, or CERT? If yes, please let us know if you have participated in CERT, if you are certified, and when you were certified in the Comment Box.

Yes, please describe involvement in the Comment Box

No

12. Are you currently, or have you ever been, a volunteer fire fighter, EMT, or other first responder in Chester County? If yes, please let us know your level and type of involvement in the Comment Box.

Yes, please describe your involvement in the Comment Box

No

13. Is anyone in your immediate family (mother, father, sister, brother, son, daughter, and in-laws) currently a volunteer fire fighter, EMT, emergency dispatch worker, or other first responder in Chester County?

Yes, please describe in Comment Box

No

14. Please rank your level of concern that a gas pipeline accident in Chester County could destroy property and lives?

No concern at all

Not very concerned

Moderately concerned

Concerned

Very Concerned

15. In September 2010, a 30-inch-diameter segment of an intrastate natural gas transmission pipeline owned and operated by the Pacific Gas and Electric Company (PG&E), ruptured in a residential area in San Bruno, California. The released natural gas ignited, resulting in a fire that destroyed 38 homes and damaged 70. Eight people were killed, many were injured, and many more were evacuated from the area. Here is a link to the National Transportation Safety Board's final report of the incident: [NTSB Final Report- San Bruno Pipeline Incident](#). According to this report, what was the probable cause of the incident?

1. Substandard and poorly welded pipe sections.

2. The California Public Utilities Commission's (CPUC) and the U.S. Department of Transportation's exemptions of existing pipelines from the regulatory requirement for pressure testing.

3. Inadequacies of PG&E's pipeline integrity management program.

4. PG&E's flawed emergency response procedures.

Answers 1 and 4.

Answers 1,2,3, and 4.

Answers 1 and 3.

None of the above.

16. How confident are you that Chester County's local first responders and pipeline operators would be capable of appropriately responding to a pipeline accident on the scale of the San Bruno gas pipeline rupture?

Very confident
Confident
Fairly confident
A little confident
Not at all confident

17. THANK YOU FOR YOUR TIME AND INPUT! If you wish to be kept informed of the results of this survey and would like to participate in future pipeline emergency response events and trainings please provide your contact information below.

First Name
Last Name
Home Phone
Email Address
Address 1
Address 2
City
State/Province (US/Canada)
Postal Code

Natural Gas Action Cards for Use in Emergency Vehicles throughout Chester County

Developed by Eddy Goossens and Jan Jorissen, Belgium Fire Chiefs



Natural Gas

Natural Gas to HP & MP

Alarms:

- ✓ Alert the crews and the officer according to local procedures.
- ✓ If any doubt regarding resources, increase the response.
- ✓ Specify the correct location by: address, bollards,
- ✓ Large leak in a HP or MP pipeline: Announce the contingency plan - local phase
- ✓ Notify neighboring companies or affiliated companies.

✓ **Prohibition of all air traffic if effects in height of more than 165 yards.**

Notify aviation authorities .



Notify administrator

.....

911

HazMat officer

Police

Actions

- ✓ Stay upwind
- ✓ Perform explosion-range and oxygen measurements, carried out wearing SCBA and full intervention gear and activate the measurement plan if possible.
- ✓ Remove ignition sources if possible.
- ✓ On arrival, leave all electric devices in the vehicle.
- ✓ If the gas is burning: do not extinguish.
- ✓ Extinguish secondary fires outside zone 1 (taking care of your personal safety).
- ✓ Use a water spray to provide protection to structures exposed to radiation.

Ignition of gas (torch fire)!

✓ **Never enter Zone 1!!**

- ✓ **Only go into Zone 2 if strictly necessary and if you are wearing intervention gear, SCBA and heat-resistant clothing. Only enter Zone 2 for specific actions such as:**
 - rescues: pay attention to your personal safety and use as few staff as possible;
 - actions to control the escaped product (eg. help with closing valves - the fire department never does this itself!).

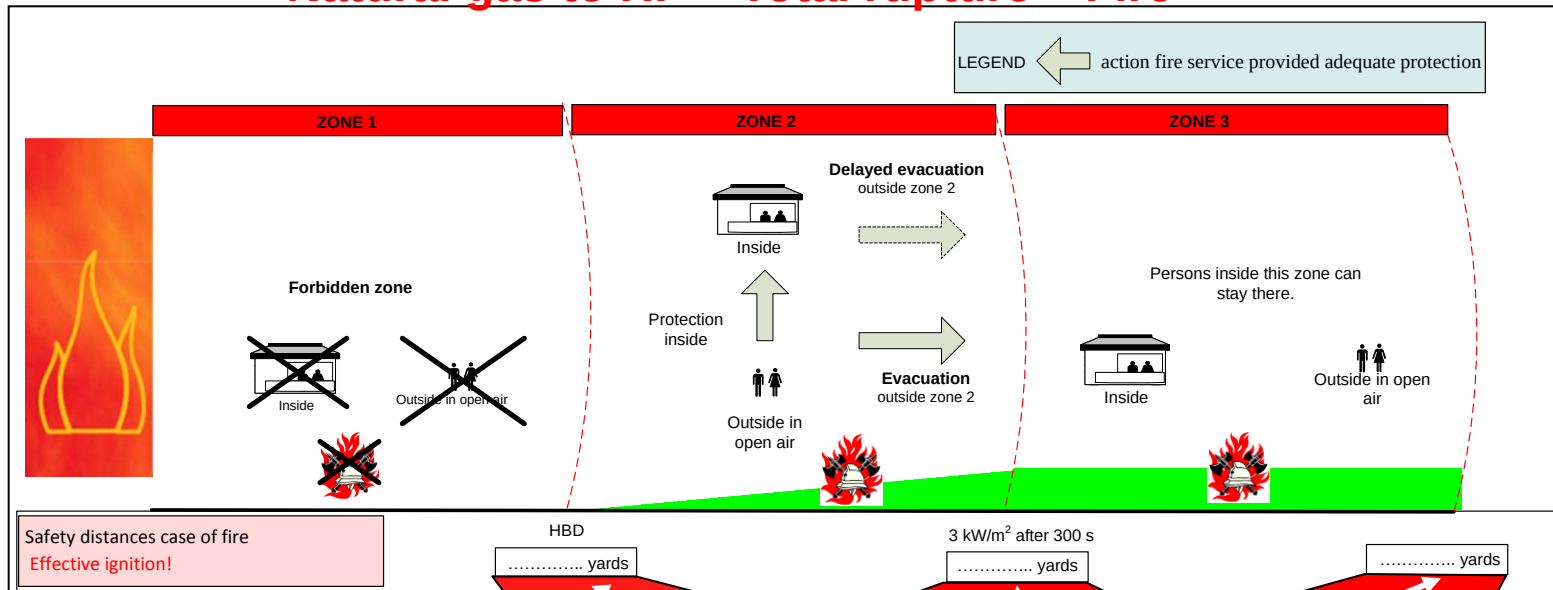
✓ **Delayed evacuation = individuals who are inside Zone 2 and are protected by a building are kept inside** (evacuation is delayed until the radiation intensity is significantly lower).

No Ignition of gas yet!

- ✓ **Never go into Zone 1 unless you are wearing intervention gear, SCBA and heat-resistant clothing. Only enter zone 1 for:**
 - preventive evacuations; and
 - actions to control the escaped product (e.g. help with closing valves – the fire department never does this itself!).

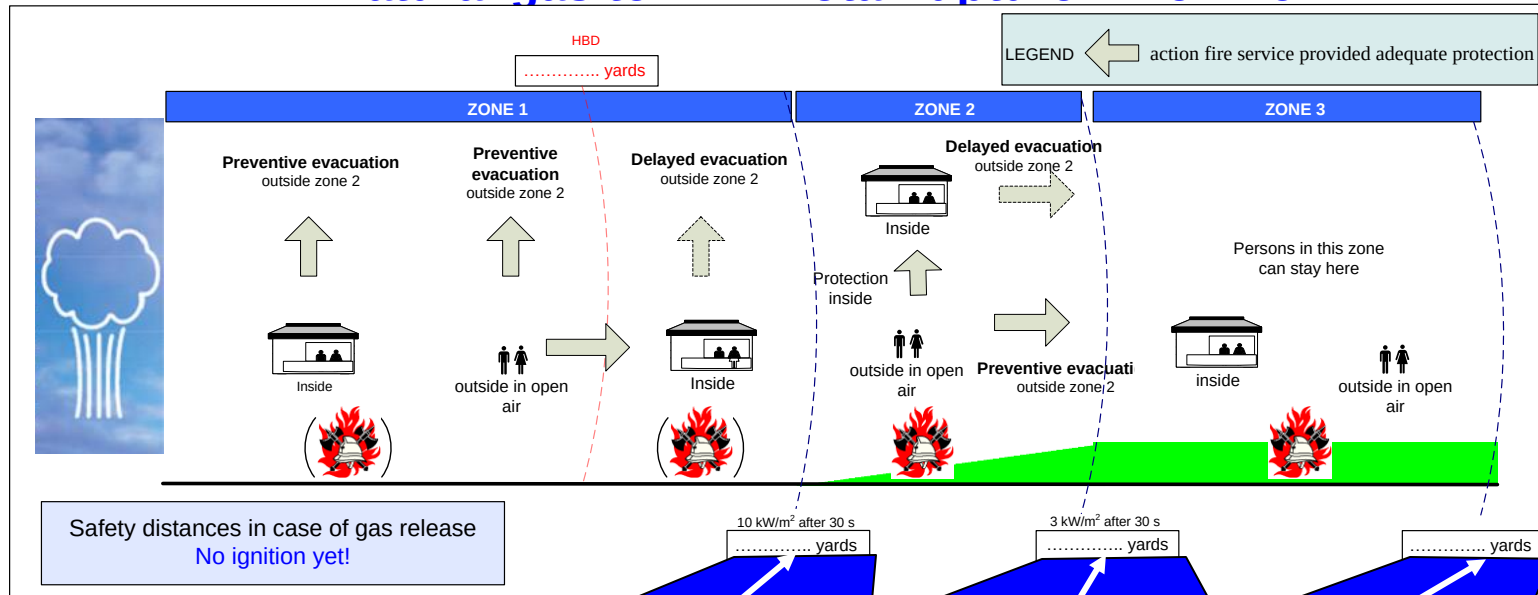
- i. **preventive evacuation:** evacuation of all individuals within **HBD and of individuals in Zone 2 who are not protected by buildings or structures**, while taking care of your personal safety and ensuring that as few staff as possible are used for evacuation;
- ii. **delayed evacuation:** individuals who are **protected by a building** and are **inside Zone 1 but are outside HBD** and individuals who are **inside Zone 2** and are protected by a building are kept inside (evacuation is delayed until the radiation intensity has significantly decreased).

Natural gas to HP – Total rupture – Fire



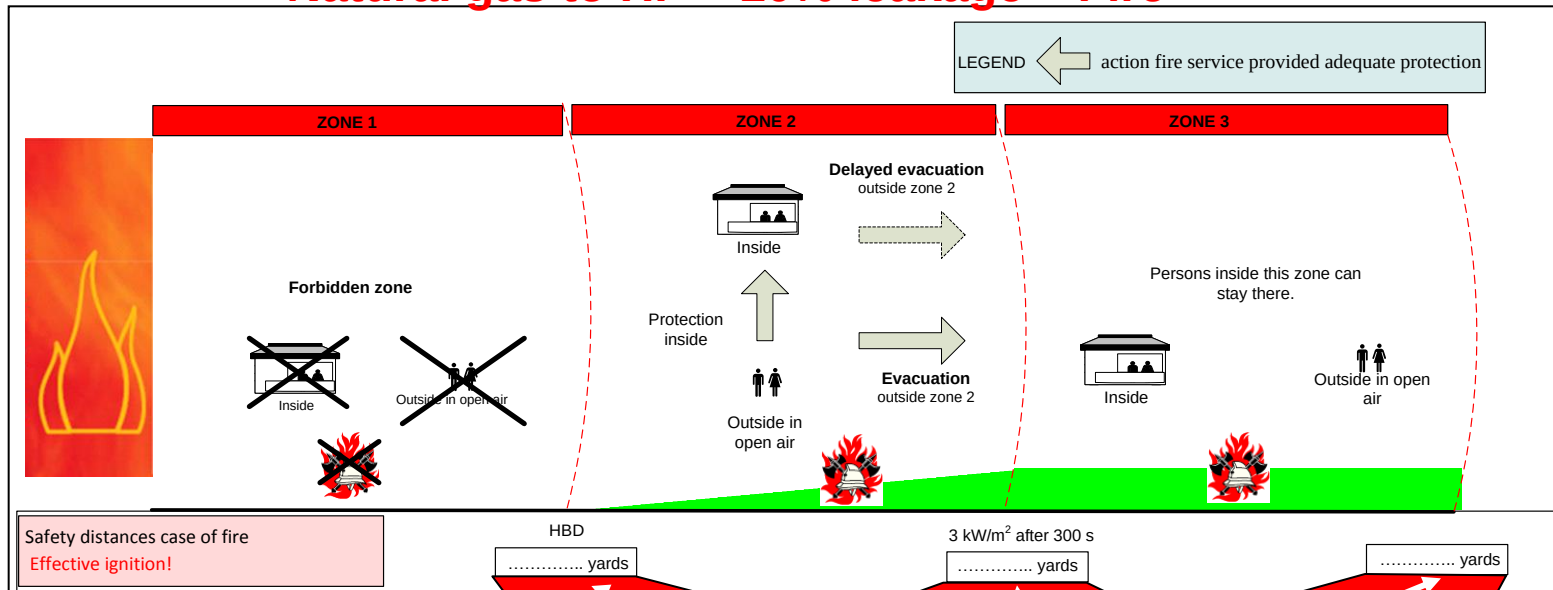
Radius in yards	Diam.	Noise 90 dBA	Zone 1	Zone 2	Zone 3	
	4 in	80	35	65	110	
	8 in	80	65	155	220	
	12 in	80	90	240	330	
	16 in	160	120	320	440	
	20 in	160	140	395	550	
	24 in	160	150	470	660	
	28 in	160	175	550	770	
	32 in	275	200	625	880	
	36 in	275	210	700	990	
	40 in	275	230	780	1100	
	48 in	275	250	845	1300	

Natural gas to HP – Total rupture – No Fire

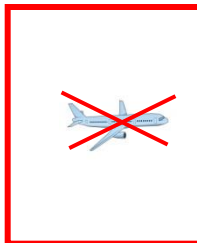


	Diam.	Noise 90 dBA	Zone 1	Zone 2	Zone 3	
Radius in yards						
	4 in	80	55	100	110	
	8 in	80	110	220	220	
	12 in	80	165	330	330	
	16 in	160	220	440	440	
	20 in	160	265	550	550	
	24 in	160	315	660	660	
	28 in	160	370	770	770	
	32 in	275	420	860	880	
	36 in	275	470	960	990	
	40 in	275	520	1055	1100	
	48 in	275	615	1245	1300	

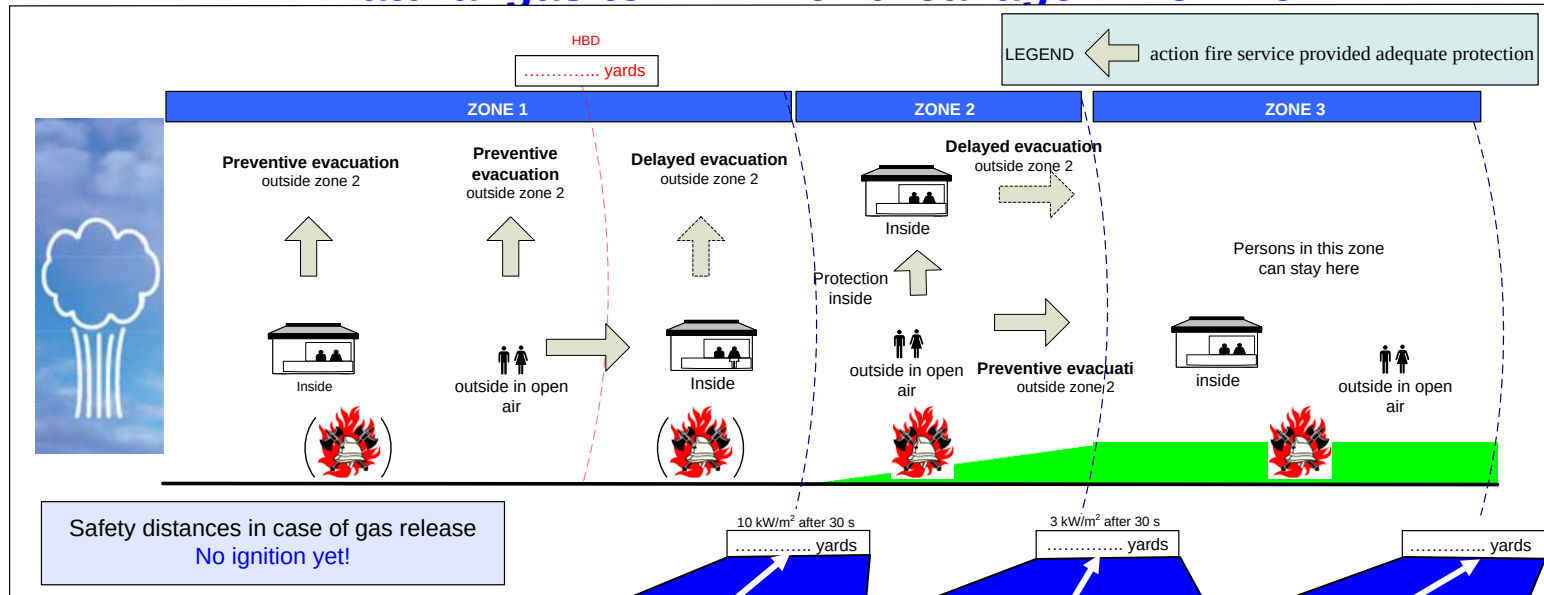
Natural gas to HP – 10% leakage – Fire



Radius in yards	Diam.	Zone 1	Zone 2	Zone 3	
	4 in	5	15	55	
	8 in	10	30	55	
	12 in	10	40	55	
	16 in	15	55	110	
	20 in	15	70	110	
	24 in	20	85	110	
	28 in	20	100	170	
	32 in	20	115	170	
	36 in	25	130	170	
	40 in	30	150	170	
	48 in	35	175	220	

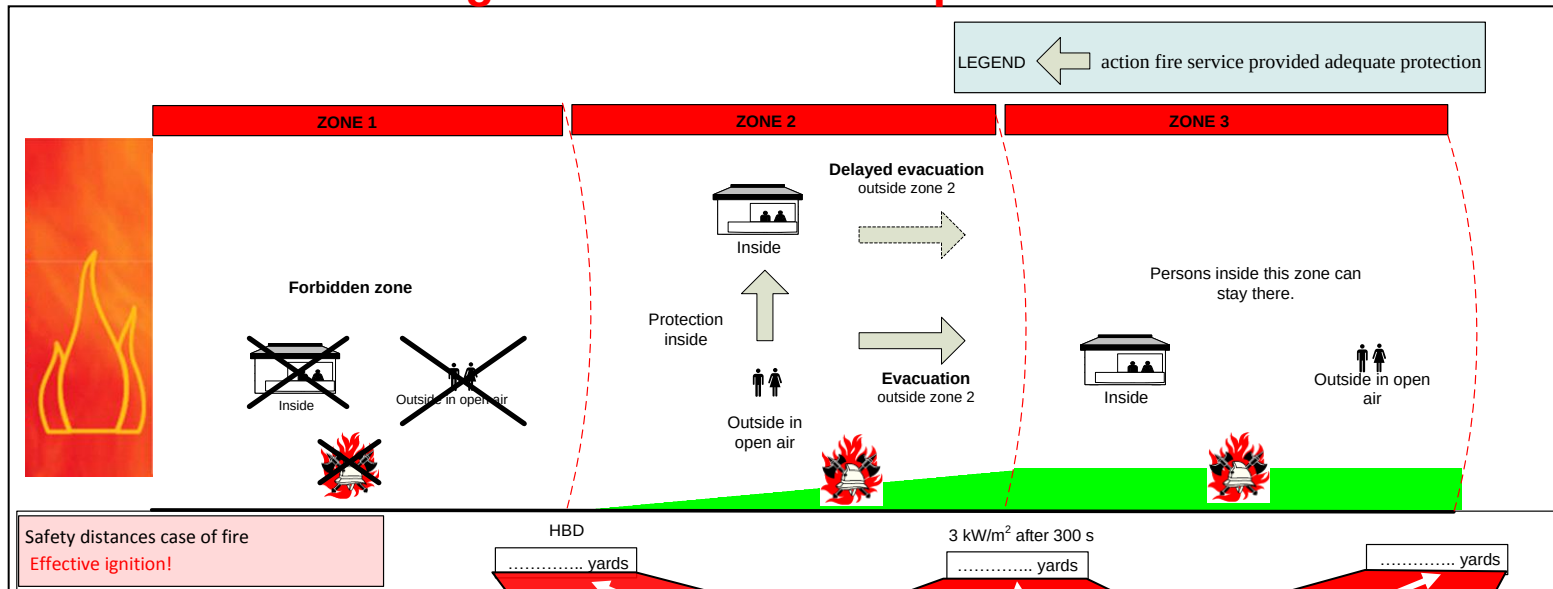


Natural gas to HP – 10 % leakage – No Fire



Radius in yards	Diam.	Zone 1	Zone 2	Zone 3	
	4 in	5	10	55	
	8 in	10	25	55	
	12 in	15	40	55	
	16 in	25	55	110	
	20 in	30	70	110	
	24 in	35	85	110	
	28 in	45	100	170	
	32 in	50	115	170	
	36 in	55	130	170	
	40 in	65	150	170	
	48 in	75	175	220	

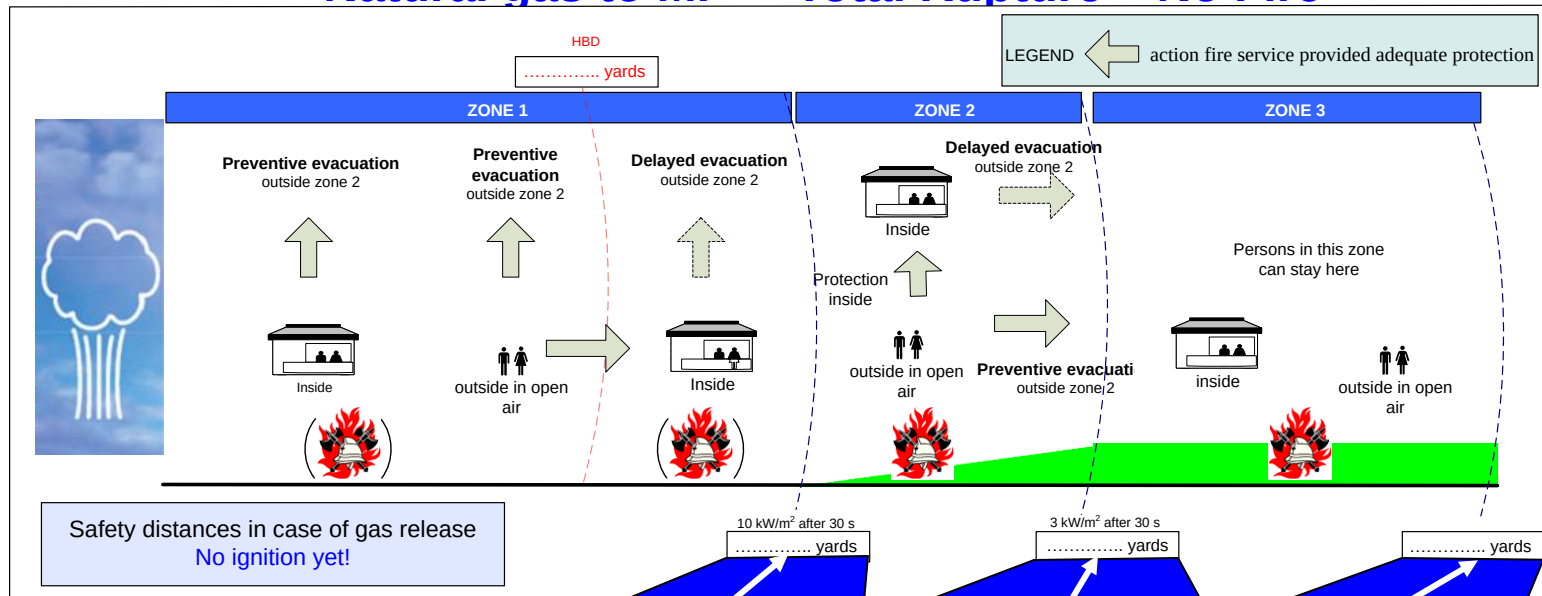
Natural gas to MP – Total Rupture – Fire



Radius in yards	Diam.	Zone 1	Zone 2	Zone 3	
	4 in	20	35	60	
	8 in	35	80	120	
	12 in	55	120	180	
	16 in	75	165	250	
	20 in	90	200	300	
	22 in	100	240	350	

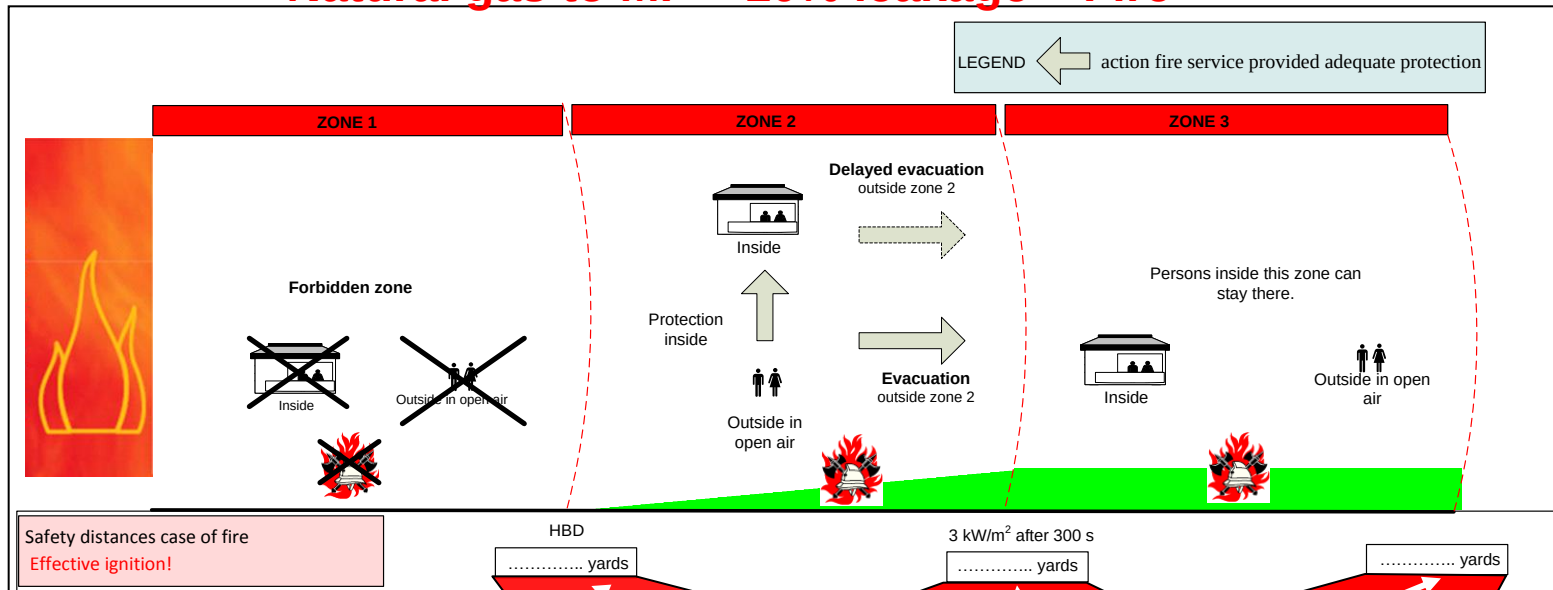


Natural gas to MP – Total Rupture – No Fire



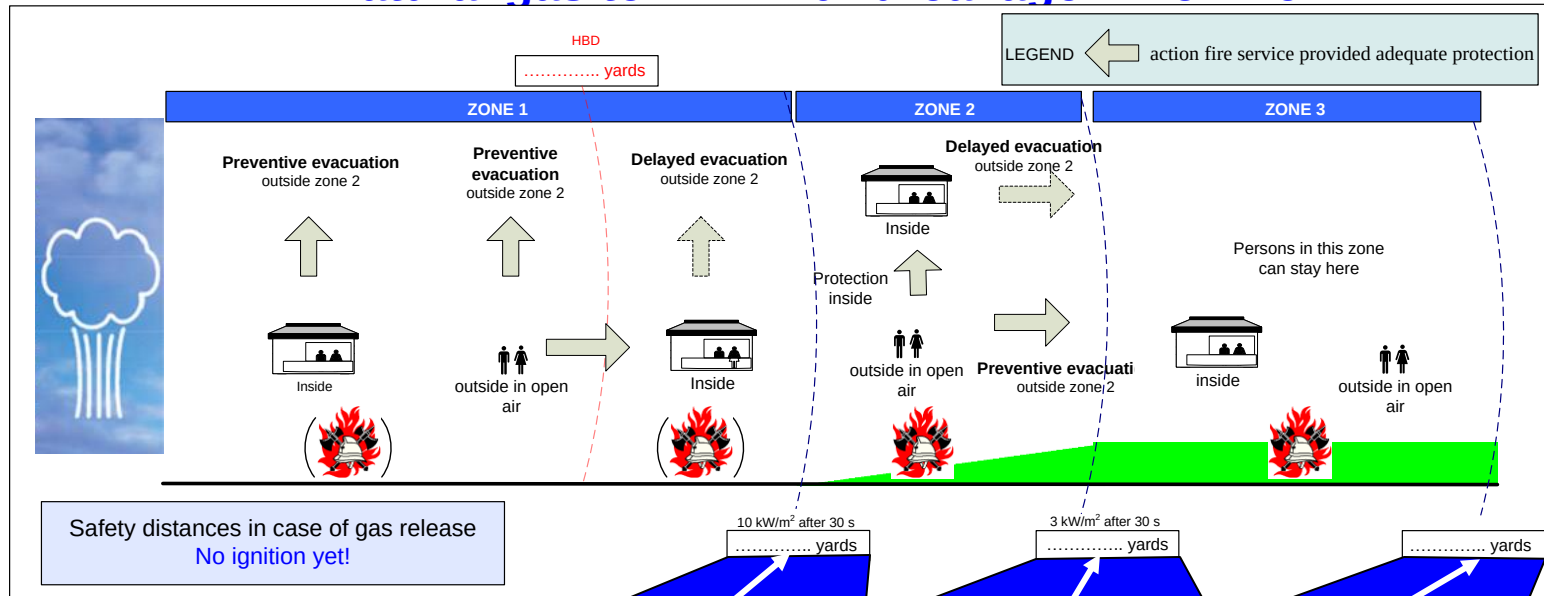
Radius in yards	Diam.	Zone 1	Zone 2	Zone 3	
	4 in	35	55	60	
	8 in	65	110	120	
	12 in	90	175	180	
	16 in	120	230	250	
	20 in	145	285	300	
	22 in	165	340	350	

Natural gas to MP – 10% leakage – Fire



Radius in yards	Diam.	Zone 1	Zone 2	Zone 3	
4 in		5	10	30	
8 in		5	10	30	
12 in		5	15	30	
16 in		10	20	55	
20 in		10	30	55	
24 in		10	35	55	

Natural gas to MP – 10 % leakage – No Fire



Radius in yards	Diam.	Zone 1	Zone 2	Zone 3	
4 in		5	10	30	
8 in		5	10	30	
12 in		10	15	30	
16 in		10	25	55	
20 in		15	30	55	
24 in		15	35	55	

Natural Gas

Product information: Natural gas

- ✓ Gaseous in the pipeline and gaseous when escaping from the pipeline.
- ✓ UN no. **1971** CAS no. **74-82-8** Hazard ID no. **23**.
- ✓ Explosion limits **5-15% by volume** – min. ignition energy **0.28 mJ**.
- ✓ Produces a **torch fire: yellow-red** flame with **soot formation**.
- ✓ Cooling on pressure relief: accumulation in lower parts may occur exceptionally in misty, cold and calm weather.

Potential risks

- ✓ Heat
- ✓ Pressure effects (only significant in enclosed spaces or over short distances)
- ✓ Fragmentation
- ✓ Noise
- ✓ Choking
- ✓ Freezing

Observations

- ✓ Colorless in the case of a small leak - white rising cloud in the case of a big leak.
- ✓ Odorless - in the case of MP and HP pipelines, no odorisers are added to - impurities can be smelled in high concentrations.

ZONE 1: There is a high risk of death in this prohibited zone; access is only authorised under very exceptional circumstances, after an appropriate risk assessment, and the required protective clothing must be worn.

ZONE 2: Only members of the fire department are authorised to access this zone - they must wear the required protective clothing and take care of their personal safety.

ZONE 3: Isolation zone: only the emergency services are authorised to enter this zone from outside in an emergency situation. Anyone already in this zone can stay there. Individuals who have to be evacuated from zones inside must be at least brought outside this zone.