DOCKET NO. C-2018-3006116, et al.

Hearing Date: October 7, 2020

EXHIBITS

Sunoco Pipeline, L.P.

St. 4 Rebuttal Testimony of Gregory G. Noll

Ex. GN-1 Curriculum Vitae of Gregory G. Noll

Ex. GN-2 2017 MERO Training PowerPoint

Ex. GN-3 5/18/18 After Action Report for Chester County Tabletop Exercise

St. 4-RJ Rejoinder Testimony Outline of Gregory G. Noll

Ex. GN-1-RJ Additional MERO PowerPoint Pages

St. 9 Rebuttal Testimony of Richard King

Ex. RK-1 Curriculum Vitae of Richard King

Ex. RK-2 Site Location Map - Fuller Address

Ex. RK-3 Site Map Plan

Ex. RK-4 Geologic Map

Ex. RK-5 Summary of Lab Sample Results

Ex. RK-6 Summary of X-ray Diffraction Results

Ex. RK-7 Piper and Stiff Diagrams

RK-8 Confidential Document

RK-9 Fracture Trace Review Map

RK-10 Lidar Map

St. 9-RJ Rejoinder Testimony Outline of Richard King



St. 15-RJ Rejoinder Testimony of Brian Magee

Ex. BM-1-RJ Curriculum Vitae of Brian Magee

Chester County

Cr-Ex. 5 12/13/18 After Action Report

Kerslake

Cr-Ex. 1 3/23/16 FDA Warns Consumers Not to Use "Best Bentonite Clay"

Cr-Ex. 2 Data Safety Sheet for Super Gel-X

**BEFORE THE**
**PENNSYLVANIA PUBLIC UTILITY COMMISSION**

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|---|---|---|---|
| MEGHAN FLYNN et al. | : | Docket Nos. | C-2018-3006116 (consolidated) |
| | : | | P-2018-3006117 |
| MELISSA DIBERNARDINO | : | Docket No. | C-2018-3005025 (consolidated) |
| REBECCA BRITTON | : | Docket No. | C-2019-3006898 (consolidated) |
| LAURA OBENSKI | : | Docket No. | C-2019-3006905 (consolidated) |
| ANDOVER HOMEOWNER'S ASSOCIATION, INC. | : | Docket No. | C-2018-3003605 (consolidated) |

v.

SUNOCO PIPELINE L.P.

# REBUTTAL TESTIMONY

# OF GREGORY G. NOLL

# ON BEHALF OF SUNOCO PIPELINE, L.P.

Date: June 15, 2020

SPLP
N4

**Q: What is your full name and current occupation?**

A: My name is Gregory G. Noll and I am the Principal of GGN Technical Resources, LLC in Lancaster, Pennsylvania. GGN provides emergency planning, response and incident management consulting services to public safety, government and private organizations with a current focus on hazardous materials emergency response and incident management.

**Q: Can you describe for me your educational background?**

A: I have an associate degree in fire science from Prince George College in 1976, bachelor's degree in business administration from Kutztown State College in 1978, and a master's degree in public administration with a minor in occupational safety and health in 1981 from Iowa State University.

**Q: Do you have any professional certifications?**

A: Yes. Since 1992 I have been a Certified Safety Professional by the Comprehensive Practice Board of Certified Safety Professionals and a Certified Emergency Manager by examination since 2012 by the International Association of Emergency Managers. As a member of the National Incident Management Team System, I'm a Type 3 incident commander and a Type 3 operations section chief. I also have numerous firefighter professional qualification certifications as a fire officer, a hazardous materials technician, a hazmat incident commander and as a hazmat officer.

**Q: Can you describe your military experience?**

A: I served in the United States Air Force for 29 years. I was on active duty in the 1970's. The remainder of my time was primarily in the Reserves and Air National Guard. I served as a fire officer, fire and emergency services. Among my duties, I was involved in virtually every hazardous materials and weapons of mass destruction training program that was developed for emergency responders during the period 1997 to 2012. I retired as an E-8, or a senior master sergeant and possessed a TS/SCI security clearance.

**Q: Can you highlight your work experience as it relates to emergency planning, emergency response and incident management?**

A: I've been in the emergency services community for 50 years. I've served in a variety of different positions, encompassing volunteer, career, military and the industry side. Since approximately 1989, I have provided emergency planning and response consulting to both public safety personnel, government and industry. Also, from 2003 to 2018, I've served as the program manager for the South Central Regional Task Force through the Pennsylvania Emergency Management Agency. In this role, I served as the program manager for the Homeland Security Grant Program. In that position, I managed the Task Force's day to day activities and dealt with virtually all elements of the emergency response community, ranging from agriculture to business and industry to fire to law enforcement to EMS. I supervised 15 Planning Specialists and a network of 10 subcommittees and related working groups.

**Q: Part of that is for Homeland Security as well, correct?**

A: Yes.

**Q: To be clear you don't just consult for industry? You do substantial work for public entities, government, public agencies and fire departments?**

A: That is correct.

**Q: Do you have specific experience with respect to emergency response, emergency management and incident management with respect to pipelines?**

A: Yes, in several areas. In 2004, I was contracted by the National Association of State Fire Marshals who received a grant from PHMSA to develop a pipeline emergencies curriculum. That led to the development of the Pipeline Emergencies textbook, which is now in its third edition. In addition, I have done a lot of work over the years in the oil and chemical industry, not just in pipelines but also upstream and downstream facilities. The common theme is always going back to emergency planning and emergency response issues. In addition, I've served as an adjunct instructor for the National Fire Academy as well as for the FBI Technical Hazards Response Unit.

**Q: Are you familiar with pipeline and hazardous materials safety regulations that deal with emergency response and public awareness requirements for pipelines?**

A: Yes, I am.

**Q: Are you a member of any codes or standards committee relating to emergency response?**

A: Yes. I am a current member and Past Chairperson of the National Fire Protection Association Technical Committee on Hazardous Materials and WMD Emergency Response. For

the period of roughly 2007 to 2017, I served as the chair. That committee is responsible for the development of the training standards that directly pertain to hazardous materials emergency response. In addition, I have worked on several projects relative to pipeline audits and specific emergency response issues, such as high hazard flammable liquid trains and liquefied natural gas (LNG) transportation by rail.

**Q: Have you served on any other standard or code setting committees?**

A: Yes. I am a Member and Past Co-Chair of the Interagency Board for Emergency Preparedness and Response - Training and Exercise Group and a Member of the Pennsylvania Pipeline Emergency Response Initiative.

**Q: Have you published any texts or articles on the subject of emergency response?**

A: Yes. I've either authored or co-authored a total of ten textbooks or handbooks. Eight of those are stand-alone textbooks. The one that would be most pertinent to my testimony would be Hazardous Materials: Managing the Incident, which is now in its fourth edition. It was originally published in 1986. It has also been adopted by a number of states and agencies as the basis for their hazardous materials technician and incident commander training curriculum, directly leading to certification. In addition, I am involved with the pipeline emergencies curriculum, as I previously noted, which is the framework for what many of the pipeline companies use for their emergency response training.

**Q: Is it fair to say that you literally wrote the book on these issues?**

A: Yes, along with my other co-authors.

**Q: Have you also written any articles on these topics?**

A: Yes. I have authored approximately 50 articles on topics pertaining to hazardous materials.

**Q: Have you received any awards in this area?**

A: In 2019 I was inducted into the National Fire Heritage Center – Hall of Legends, Legacies and Leaders. I previously received two lifetime achievement awards, one from the International Association of Fire Chiefs through their Hazardous Materials Committee, the second from the State of California through their hazardous materials response community. All of these pertain to leadership and activities in the hazardous materials emergency response community. In addition, I have an award for valor as a member of Pennsylvania Task Force 1 responding to the World Trade Center attack.

**Q: Have you ever received awards specific to your teaching and training?**

A: Yes. At the Texas Hot Zone Conference in 2017 I received the Dieter J. Heinz Instructor of the Year Award and the Keystone Chapter of the International Society of Fire Service Instructors named me Educator of the Year in 1994.

**Q: Have you ever testified before?**

A: Only twice, once at the earlier session of this case and in the *Baker* case before the PUC in July 2019.

**Q: What percentage of your work is based upon your expert testimony?**

A: It's somewhere around .001.

**Q: Have you yourself served an emergency responder?**

A: Yes. This has included experience as both a volunteer and career firefighter in Reading, PA, as a Senior Fire Instructor for Iowa State University – Fire Service Extension, as a volunteer firefighter and then career Hazardous Materials Coordinator for the Prince George's County (MD) Fire and Rescue Dept., as a military firefighter and senior fire officer at both the installation and command levels, and as a member of PA Task Force 1 Federal Urban Search and Rescue Teams.

**Q: Is your resume attached as Exhibit SPLP GN-1?**

A: Yes.

**Q: Sunoco offers Mr. Noll as an expert in emergency planning, emergency response, emergency response and planning training, including as it relates to pipelines, hazardous materials and natural gas liquids.**

**Q: Mr. Noll, is the work that you have done with respect to the Mariner East project related to the training of emergency planning and emergency response officials?**

A: That is correct. The MERO program, the Mariner Emergency Responder Outreach program, was directly targeted towards emergency responders and planners along the pipeline right-of-way.

**Q: Can you tell me what your role was when you first got started with respect to the MERO program?**

A: My role was to reach out to the county emergency management agencies along the pipeline right-of-way and to work with them on the scheduling, coordination and the logistics of the delivery of the classes. The classes were approximately two to two and a quarter hours in length, and I believe it was a total of 23 programs that were delivered along the right-of-way in all the counties along that right-of-way.

**Q: Were there already some materials that had been drafted as the training as part of the MERO?**

A: There was a basic MERO program that was already in existence and had previously been used for the training of responders along the right-of-way in the 2015-2016 time frame.

**Q: And what was your role with respect to reviewing that existing MERO paperwork?**

A: I reviewed the previous program and then made some modifications to reflect several areas. One was just personal teaching preferences, how the material is presented. Second was the inclusion of what we refer to as risk based response. And third was to ensure that the materials were consistent with the latest edition of the pipeline emergencies textbook and curriculum.

**Q: I want to focus on the training in Delaware and Chester Counties that are at issue here. First, with all the MERO training, were you the lead instructor?**

A: Yes. I served as the lead instructor and then was supplemented by Sunoco personnel on the operation side who served as what I would refer to as the technical specialists

for the pipeline operations questions.

**Q: Let's first talk about the training that was done in Delaware County. You conducted the MERO training in Delaware County?**

A: Yes.

**Q: How many times?**

A: Twice. One was on September 25, 2017 and the other was on October 14, 2017. I have currently been engaged by Energy Transfer Partners to deliver the MERO training later this year as the Commonwealth returns to a "green" status under the Governor's COVID-19 guidance.

**Q: Approximately how many people attended those sessions?**

A: Approximately 40 in each session.

**Q: Now, the second session, was that part of a larger emergency planning operation that was going on in Delaware County that day?**

A: Yes. Delaware County conducts an annual hazardous materials training day through their local emergency planning committee, so the MERO session was one of several workshops on a variety of different emergency response topics that day.

**Q: Can you describe the role of the local emergency planning committee for Delaware County?**

A: The local emergency planning committee is a requirement that was originally enacted in 1986 as part of the Superfund Amendments and Reauthorization Act. Within the Commonwealth of Pennsylvania, there is an LEPC within each of the counties, and those counties are charged with essentially coordinating emergency planning and training as it relates to hazardous materials. There is funding that comes to each of the LEPCs through the state, specifically through the Pennsylvania Emergency Management Agency, to support those activities.

**Q: Who attended the MERO training that you did in Delaware County?**

A: The training was primarily attended by firefighters, emergency managers, law enforcement, EMS, emergency medical services, and hospitals, township officials and representatives from the Department of Homeland Security.

**Q: Were you also the lead instructor the MERO sessions in Chester County?**

A: Yes.

**Q: How many times?**

A: Twice. The first one on October 23, 2017, and the second was on October 26, 2017. As previously noted, I have currently been engaged by Energy Transfer Partners to deliver the MERO training later this year as the Commonwealth returns to a "green" status.

**Q: Approximately how many people attended those sessions?**

A: Approximately 50 in each.

**Q: Can you tell me generally who attended those sessions?**

A: The makeup paralleled what we saw in Delaware County: fire, emergency management, more elected officials than in Delaware County, representatives from the Pennsylvania Department of Environmental Protection and representatives from the Chester County Department of Emergency Services.

**Q: Is Exhibit SPLP GN-2 a hard copy of the PowerPoint slides that were used as part of the MERO training programs in Delaware and Chester County?**

A: Yes. And this is specific for Delaware and Chester Counties. There were modifications that were made to each program so that we could insert the pertinent local maps for that jurisdiction.

**Q: Does p. 4 of the MERO materials in Exhibit SPLP GN-2 describe the overarching goals of the MERO Training?**

A: Yes.

**Q: What are those goals?**

A: Ensure safety, develop and sustain relationships with the emergency community and produce product and pipeline information to facilitate the delivery of risk-based emergency response.

**Q: Can you describe what a risk management approach is to allow for a response by the local emergency responders to each specific incident?**

A: Yes. Within MERO, we integrated the concept of risk-based response, and in simple terms, risk-based response is based upon analysis of a problem, assessing the hazards, estimating potential consequences, and then determining courses of action, with those courses of action based upon facts, science and circumstances.

**Q: Do you discuss this risk-based approach in the MERO training?**

A: Absolutely. It is specifically identified on slides 16-17 and is discussed throughout the presentation.

**Q: Explain a little bit about what you mean by basing emergency response decisions for each unique incident based upon facts, circumstances and science?**

A: So for example, when we talk about facts -- and this is not unique to pipelines, this is a system that is used in hazardous materials training in general -- by facts, we would look at the container, the product, the location of the incident, and the environment where it is taking place. By science, we would focus on the physical and chemical properties of the material with an emphasis on how those products will behave when released. And on circumstances, we would focus on what resources and capabilities and experience do emergency responders bring to the incident. To me the basic information you need in responding to an incident is where is it, what is it, who operates the source and how do I shut the source down.

**Q: Can you have an emergency response plan that details every kind of incident and a unique response for each individual neighborhood?**

A: No. That is not only impractical it is contrary to the fundamentals of emergency response planning. As I stated, this is a risk-based approach that establishes a process in place that can be applied regardless of the incident or neighborhood. It is a process that allows for the reliance on and application of facts, science and circumstances no matter what the situation or location.

**Q: Does the MERO training incorporate that approach?**

A: Yes. For example, slides 82 and 83 identify critical "size-up questions" that an incident commander asks to understand the facts, circumstances and science of a particular incident. Can a responder safely approach the incident? How do you secure the area around the release? What is a safe distance? What product are we dealing with?

**Q: And when an incident occurs, do the emergency response plans identify a point person, an incident commander?**

A: Yes. All of the documents typically go back to and reference the local on-scene or incident commander.

**Q: And who is that, typically?**

A: In most jurisdictions, for a pipeline incident, that would be the local fire chief of the authority having jurisdiction over where the incident is located.

**Q: Is the incident commander supposed to apply this risk-based approach to make specific decisions based upon that unique event?**

A: That is correct.

**Q: Do the MERO training materials provide a description of the nature of the materials in the pipeline?**

A: Yes. On slides 56 and 57, I describe natural gas liquids or Hazardous Volatile Liquids ("HVLs") and then specifically the products carried in the Mariner East pipelines, namely ethane, propane and butane.

**Q: Do the MERO training materials describe the general properties and hazards associated with these HVLs?**

A: Yes. On slides 59, 62-69, it provides general hazards, vapor behavior, pressure, health hazards, boiling point, specific gravity, vapor density and flammability of ethane, propane and butane in detail.

**Q: Do the MERO training materials provide information on medical response to exposure to these HVLs?**

A: Yes On pages 60 and 61. It describes how to provide medical care for exposure to these NGLs.

**Q: Do the MERO training materials provide information on the direction of flow of product in ME2?**

A: Yes. On slides 12-14, the MERO materials describe that the flow is west to east.

**Q: Do the MERO training materials provide information and mapping resources regarding the location of the pipeline?**

A: Yes. It is complemented by the maps that are also provided for in each training session that showed specifically where the pipeline right-of-way was going through that respective county jurisdiction. Slides 22-31 shows maps of the pipeline route through each municipality in Chester County and slides 32-39 does the same for each municipality in Delaware County.

**Q: Does your MERO training provide information about how to detect a release?**

A: Yes. Slides 76-80 provide detail on that. It starts by providing information on how to detect a release.

**Q: Can you hear a release?**

A: Yes. Depending on the volume of a release, the sound could range from a hissing sound to a loud roar.

**Q: How do you detect a release by sight?**

A: There are many ways. From discolored vegetation, bubbling, an oil sheen on water, a visible vapor cloud, frozen ground in warm weather and in cold weather even a puddle. The MERO training materials provide photographs as examples of some of these potential visual observations.

**Q: Is a vapor cloud visible?**

A: Yes. When visible it is a white color.

**Q: How about smell?**

A: These NGLs have a slight petroleum odor.

**Q: Does the MERO training also provide information on procedures to follow for different types of incidents, for example depending on whether the release is non-ignition release versus an ignition release?**

A: Yes.

**Q: Can you tell me generally the procedures in a non-ignition release?**

A: As slides 88-90 provide, you are to control ignition sources, do not start motor vehicles or electrical equipment. And then I also note that there are special considerations associated with butane in cold temperatures. It also directs not to operate pipeline valves, do not ring doorbells, do not drive into a vapor cloud, and has suggestions for air monitoring. It is very common for fire-based emergency responders, both the engine companies and for the hazmat teams, to have access to monitoring and detection equipment. I am emphasizing again that you should bring science to the process in terms of determining where the vapors are not visible, where the vapors are at and at what concentrations.

**Q: Does the MERO training provide training to the emergency responders specifically on what happens in the case of ignition and fire?**

A: Yes. For example, on slides 91 to 93, it describes that you would attempt to control the spread of the fire, protect exposures, and attempt to extinguish a product fire.

**Q: Does the MERO training provide information on the danger areas of the release?**

A: Yes. As slide 70 depicts, and building on some of my previous testimony, it points out that in the areas where you have the release area, you'll have the condensation of moisture and air which will give you a visible vapor cloud. However, flammable vapors can actually go beyond the visible vapor cloud. And then we have the flash fire area, which typically in open vapor cloud scenarios, the ignition source is further away from the release point.

**Q: So the MERO training is identifying different types of incidents and what they look like?**

A: That is correct. And, we actually use a videotape to illustrate that point. That was based on a training propane fire at Delaware State Fire School.

**Q: Is it important as part of this whole MERO training process and in emergency response to develop relationships among the pipeline operator and the local emergency response community.**

A: Yes.

**Q: Did Sunoco do that as part of the MERO training, establishing these relationships not only between Sunoco and the emergency responders but among the emergency response professionals?**

A: At each of the MERO sessions that I conducted, there were Sunoco pipeline personnel, operators and supervisors who were present. There were a number of instances where contact information was exchanged between emergency responders and their peers. And in some cases,

there was already person-to-person relationships that were already in existence from previous activities.

**Q: So do you believe, in your opinion, that you were able through this process to establish those important relationships between the emergency response and Sunoco?**

A: Yes.

**Q: Did Sunoco put any limitations on you in terms of establishing those relationships with the emergency responders?**

A: No.

**Q: Now, in your professional opinion to a reasonable degree of certainty, does the MERO training provide all of the specific information to the emergency responders to allow them to develop a pre-incident emergency response and evacuation plan?**

A: Yes.

**Q: Who actually develops the emergency response and evacuation plans? Is it Sunoco or is it the local emergency responders?**

A: Within the Commonwealth of Pennsylvania, each county is responsible for the development of an emergency operations plan. That is typically developed through the county emergency management agency. There are also planning requirements that exist at the local jurisdiction level, i.e. the townships, the towns and the boroughs.

**Q: So just to be clear on this, the obligation on the pipeline operator is to provide information sufficient for the local or county planning and emergency responders to develop their emergency response plan?**

A: Yes.

**Q: There has been a suggestion that emergency responders need a separate plan just for responding to HVLs? Do you agree?**

A: No. State law dictates that you have an all hazards plan and that is proper because as I explained the general principles of a risk-based approach apply across the board regardless of the hazard. It may be prudent to adopt an annex to the plan to address discrete issues. For example, a hazardous materials annex or a railroad annex. But sometimes too much information can be unhelpful noise.

**Q: Can you give me an example of too much information being unhelpful noise?**

A: Yes. I have heard the suggestion that emergency responders need real time data on the volume, rate and types of materials being transported via ME2 at a specific community or location. Clearly knowing what material is involved in an incident is critical and that information will be provided to emergency responders as soon as possible. But experience in other modes of hazmat transportation has shown that "real time" transport notification requirements offer limited value to emergency responders. As an example, a number of communities have attempted to initiate notification requirements for specific types of trains or products as they transit through a community. Experience has shown that after a relatively short period of time they lose their intended value due to the large number or frequency of shipments. That is why hazardous

materials commodity flow studies which summarize the critical information – regardless of the mode - have value as planning tools.

**Q: There has been a lot of discussion about what is the safe distance in the event of a release. How is that determined?**

A: It is typically a two-step process. Initial actions are based upon sight, sound, smell and the initial guidance provided by references such as the Emergency Response Guidebook. Generally, the farther away from the problem, the less the potential harm. As the incident timeline progresses, responders will move to a risk-based response process based upon facts, science and circumstances. These are incident-specific decisions on safe distances made by emergency responders on the scene, and also influenced by the air monitoring results. That process is not unique to just pipelines. This is the process that we use for hazardous materials training and response holistically.

**Q: Can you explain the process between an individual's walking away from the incident and then the emergency responders setting up a safe zone?**

A: My experience and a review of case studies shows that in most cases civilians are already taking actions to protect themselves prior to the arrival of emergency responders. If not, emergency responders quickly initiate that process. But the initial goal, in very simple terms, is to separate people from the problem. What that distance is will be dependent upon the scenario and the incident location. And the incident commander, in concert with information provided by the pipeline operator and/or the HazMat Response Team, is the key player in this process.

**Q: And once the people are moving, essentially, then what is the role of the emergency responders in terms of establishing a safe distance?**

A: Emergency responders would look to establish an initial isolation perimeter and hazard control zones. Most people would refer to these zones as hot, warm and cold zones. And then the emergency responder would initiate public protective options, i.e., evacuate or shelter-in-place, again based upon incident specific considerations. While I'm separating these tasks along a timeline, the reality is that these often occur simultaneously in a time-compressed environment.

**Q: Have you provided any information that there may be circumstances in the case of a pipeline incident that you could shelter in place?**

A: I discuss that in the MERO materials at slides 83 and 93. I would point out that emergency responders have preexisting hazardous materials training requirements before we ever get to the pipeline question. That training, for example with the use of the Emergency Response Guide, specifically gets into assessing what factors would be viable with respect to making that decision of either sheltering in place or evacuating, or some combination of both of them simultaneously.

**Q: Can you describe the factors you evaluate in deciding to shelter in place or evacuate?**

A: Yes. Historically you would try to do evacuation first. But there are situations where it's impossible to do a complete evacuation, so while evacuation is preferable to sheltering-in-place, there are scenarios where sheltering would be applicable if to buy time, to wait for additional responders to arrive on the scene, or to simply move the impacted group from one part of a

structure into another part of the structure that's farther away from the problem. That temporary sheltering-in-place also allows you to obtain more information and assess available resources. The incident commander makes those decisions.

**Q: What happens in an evacuation setting when there is a conflict between walking away from the pipeline and moving in an upwind direction?**

A: The default is to move away from the pipeline.

**Q: Some have expressed concerns about the ability to evacuate people with physical or mental challenges. Can you address that.**

A: Yes. The challenges posed by special occupancies and immobile groups during an emergency are extremely difficult regardless of the cause or nature of the incident. For example, the 2017 Barclay Friends fire in West Chester clearly illustrated these challenges. However, these critical issues and anticipated challenges are not unique to one specific hazard such as a pipeline, but are more reflective of the type of immobility or facility.

**Q: Is there any way for you to know in a particular event who has had surgery and who is immobile in the short term?**

A: No unless someone has registered with the County database.

**Q: Or who may have been drunk and not mobile?**

A: No.

**Q: Or on drugs and not be mobile?**

A: No.

**Q: Is that unique to pipelines?**

A: It is not unique to pipelines and is so for any kind of emergency response. I should note that people with more permanent limitations, physical or mental, can register with the counties in advance and in great detail advise emergency responders about their individual limitations so that emergency responders will be better prepared when an emergency occurs. This includes the physical layout of the individual premises.

**Q: Is it difficult to determine wind direction?**

A: My experience is, it is pretty straightforward to determine wind direction. If you look at the range of reference sources that are available to both emergency responders and the public, they consistently note that wind direction should be considered in approaching any hazmat release.

**Q: Are you aware of public places, in Delaware and Chester County having signs that detail evacuation procedures for pipeline emergencies?**

A: No.

**Q: Would that be effective?**

A: Other than directing the public to move away from a visible hazard, it would be difficult to provide concise and actionable information that encompasses both the range of transmission pipeline products and release scenarios.

**Q: Are you aware of any pipelines that have an early warning system for a release?**

A: No. While fence line detection and monitoring systems can be found at some fixed facilities, such as nuclear power plants and chemical manufacturing facilities, I have not seen these used along a pipeline right-of-way. They may be found at pipeline valve and pumping stations. They are not required by law and there continue to be technology issues that often result in a number of false positive alarms.

**Q: But does ME2 have a release detection system?**

A: Yes. As depicted on slide 49 of the MERO training, Sunoco has a command and control center for pipeline operations. This includes the Supervisory Control and Data Acquisition ("SCADA") System that can remotely detect leaks and allow remote shutdown of the system. The command center also notifies 911 and Sunoco pipeliners to go into the field to confirm the leak, its location and other pertinent information.

**Q: There has been a suggestion that the control center should give direct notice to schools and municipalities of a potential release instead of 911 making those calls. Do you agree with that suggestion?**

A: No. This can actually delay the emergency response as the precise location of the incident may not be known and it provides more opportunity for delayed or conflicting

information. The key benchmark is to get the critical information to emergency responders who can assess the problem and then initiate response actions based upon the type and nature of the scenario. Coordination of information to sensitive occupancies or municipalities should be made through the emergency communications center or emergency responders, and not the pipeline operator.

**Q: In addition to the MERO training, have you done any other emergency training relating to the Mariner East project?**

A: I was contracted by the Chester County Department of Emergency Services to facilitate a table top session which was conducted on May 18, 2018, and I am facilitating a second table top exercise for them as well.

**Q: Just so we are clear about this, you were contracted by Chester County, not Sunoco?**

A: That is correct.

**Q: Okay. Who was present at that?**

A: It was a very diversified audience of about 50 people. Again, in many respects, it mirrored what we saw in the MERO classes: fire service, emergency management, a lot of local elected officials, representatives from some schools.

**Q: Was there an evaluation of that table top exercise done?**

A: Yes.

**Q: Is it the Chester County Department of Emergency Services Pipeline Emergency Preparedness and Training Table Top Exercise After Action Report, marked as Exhibit SPLP GN-3.**

A: Yes.

**Q: Did you prepare that document?**

A: Yes. I did.

**Q: Can you describe what it is?**

A: I develop after action reports which capture a synopsis of what the exercise objectives were, what were the planning assumptions were, and then lay out the scenario. The purpose of a table top exercise is to present problems. Essentially, the incident serves as a platform for discussion, focusing on questions and issues related to emergency response to the scenario.

**Q: As part of that, did you ask for feedback and ratings from the audience participants about the value of this training?**

A: Yes. That is a key part of the After Action Report process.

**Q: Can you describe the rating system that you developed, and then would you please detail the ratings that you were given for each of the categories?**

A: The question was, "What is your assessment of how the table top exercise was designed and conducted?" The ratings scale went from one, strongly disagree, to five, strongly agree, and there were five points. The exercise was well structured and organized: rating was 4.9. The

exercise scenario was plausible and realistic: rating was 4.9. The time allowed to run the exercise was sufficient: rating was 4.6. Participation in the exercise was appropriate for someone in my position: rating was 4.7. And the exercise included the right mix of people and disciplines to accomplish the stated objectives: rating was 4.7.

**Q: There have been questions about the use of cell phones in the event of an incident. Can you describe whether cell phones can be used?**

A: While there is data on the use of cell phones while fueling a gasoline-powered vehicle at a service station, I am not aware of any definitive scientific study about whether normal cell phones (non-intrinsically safe) can be used in the vicinity of an HVL release. It should be noted that there are petroleum refineries that allow the use of cell phones in process areas (Class 1, Division 2 atmospheres), based upon the type of protective box that the phone is placed. To ignite the HVL, you would need a flammable mixture, with an ignition source of sufficient energy to ignite it. While it is not likely that a cell phone would create an ignition, the current direction (2017) from PHMSA is to err on the side of safety and not to use them until you are at a safe distance.

**Q: I want to go back to the PHMSA regulations on public awareness as it relates to emergency response, which is at 49 C.F.R. 195.440. You're aware of those requirements?**

A: Yes.

**Q: The MERO training and the other training that you have done, does it identify a One-Call notification system prior to excavation?**

A: Yes.

**Q: Does it identify possible hazards from pipeline release?**

A: Yes.

**Q: Does it identify physical indicators that a release may have occurred?**

A: Yes.

**Q: Does it identify steps that should be taken for public safety in the event of a release?**

A: Yes.

**Q: Does it identify procedures to report such an event?**

A: Yes.

**Q: Does it identify for the public the pipeline locations?**

A: Yes.

**Q: And does it address all counties where the pipeline runs through?**

A: Yes.

**Q: I have three final questions for you, and these are in your opinion to a reasonable degree of professional certainty. Is the emergency planning and emergency response,**

**public awareness activities you've conducted for the Mariner East project compliant with PHMSA regulations?**

A: Yes.

**Q: In your opinion, to a reasonable degree of professional certainty, is the emergency planning and emergency response, public awareness you've conducted for the Mariner East project consistent with what other pipeline operators in Delaware and Chester County provide?**

A: Yes.

**Q: And in your opinion to a reasonable degree of professional certainty, is the emergency planning, emergency response and public awareness you have conducted for the Mariner East project sufficient for emergency responders to respond safely to a pipeline incident, including potential impacts to schools or for those who have limited mobility?**

A: Yes.

**Q: Do you wish to offer anything else?**

A: I reserve the right to supplement my testimony based on the sur-rebuttal testimony by Complainants and Complainant Aligned Intervenors.

# Exhibit SPLP GN-1

SPLP
GN-1

# Gregory G. Noll
# GGN Technical Resources, LLC

## CURRICULUM VITA

1020 Stonemanor Drive
Lancaster, PA 17603

717-575-0514 (cell)
email: ggnoll@me.com

## EDUCATION AND CERTIFICATIONS

Master of Public Administration, Iowa State University, Ames, IA, 1981.
Bachelor of Arts, Business Administration, Kutztown University of PA, Kutztown, PA, 1978.
Associate of Arts, Fire Science, Prince George's College, Largo, MD, 1976.

Certified Safety Professional (CSP) - Comprehensive Practice, Board of Certified Safety Professionals, Savoy, IL. Certification Number 11053, 1992.

Certified Emergency Manager (CEM). International Association of Emergency Managers, Falls Church, VA, 2012.

Fire Officer IV, Fire Fighter III, Fire Inspector III, Fire Instructor III, Hazardous Materials Technician and Hazardous Materials Incident Commander Certifications, National Board on Fire Service Professional Qualifications, Quincy, MA, 1994. Certification Numbers are F/O IV - 33455, F/F III - 1465, F/I III – 65876, F/I III - 28057, HMT - 7 and HMIC-33456.

Hazardous Materials Branch Officer Certification, International Fire Service Accreditation Congress. Certification Number 657163.

## EMPLOYMENT HISTORY

Present – January, 2001

Program Manager and All-Hazards Incident Management Team (AAHIMT) Leader, South Central PA Regional Task Force through PA Emergency Management Agency (PEMA).

SCTF is one of nine regional task forces established by the Commonwealth of PA. SCTF is funded through the U.S. DHS Homeland Security Grant Program and focuses on region-based homeland security and emergency management issues that exceed local capabilities. As Program Manager, have responsibility for the management of SCTF day-to-day activities, including oversight of 15 Planning Specialists and a network of 10 Subcommittees and related Working Groups. See attached organizational chart.

Present – January 2016

Principal, GGN Technical Resources, LLC, Lancaster, PA

The LLC provides emergency planning, response and incident

| | |
|---|---|
| | management consulting services to public safety, government and private organizations. Current project focus is on hazardous materials emergency response, incident / crisis management and homeland security. |
| October 2016 - May 1990 | Senior Partner, Hildebrand and Noll Associates, Inc. Port Republic, MD<br><br>Founded Hildebrand and Noll Associates (HNA) in 1990 with Michael S. Hildebrand. The consulting firm specialized in emergency planning, response and incident management consultation in three primary markets: petroleum, chemical, and defense industries, and the public safety community. |
| May 1990 - July 1987 | Hazardous Materials Coordinator, Prince George's County Fire Department, Landover Hills, MD<br><br>Managed and coordinated the Department's Hazardous Materials Division, which included all planning, response and training activities. Served as the Community Emergency Coordinator for the Local Emergency Planning Committee (LEPC). |
| July 1987 - July 1981 | Fire and Safety Specialist, Safety and Fire Protection, American Petroleum Institute, Washington, DC<br><br>Provided support to the API Committee on Safety and Fire Protection and its related subcommittees. Coordinated a nationally recognized safety and fire protection engineering technical standards program that included more than 25 standards covering safe operating practices and fire protection design principles for petroleum and petrochemical facility operations. Areas of responsibility included providing regulatory analysis, providing technical support and information on fire, safety and hazardous materials issues, and serving as the API liaison to various fire safety and industry professional organizations (IAFC, ISFSI, NFPA, CMA, etc.). |
| June 1981 - February 1978 | Fire Instructor, Iowa State University, Fire Service Institute, Ames, IA<br><br>Developed and taught college-level fire science courses in the areas of Administration and Management, Hazardous Materials, and Strategic Planning for Fire Protection. Conducted firefighter training in various basic and advanced subject areas, including breathing apparatus, strategy and tactics, hazardous materials, and flammable liquid and gas firefighting. |
| February 1979 - Jan. 1977 | Firefighter, Reading Fire Department, Reading, PA<br><br>Career firefighter with responsibilities in fire suppression, fire prevention and emergency medical services. |

## VOLUNTEER AND PART TIME WORK EXPERIENCE

| | |
|---|---|
| Present – January, 2000 | Advisor, Lancaster County Hazardous Materials Response Team (Company 2-9), Lancaster, PA and Member, Lancaster County Local Emergency Planning Committee, Lancaster, PA |
| Present - February 1988 | Board Member, Yvorra Leadership Development Foundation, Port Republic, MD<br><br>A non-profit foundation promoting leadership development within the emergency services community. Since its inception in 1989, has awarded over $150,000 in scholarships. |
| Present – 1987 | Adjunct Member, Hazardous Materials Committee, International Association of Fire Chiefs (IAFC), Fairfax, VA |
| October 2013 – March, 1997 | Hazardous Materials / WMD Manager, Pennsylvania Task Force 1 - Urban Search and Rescue Team (USAR), PA Emergency Management Agency, Harrisburg, PA<br><br>Served as a Manager of the HazMat Specialist element of PA Task Force 1. Responsible for the management and direction of all Hazardous Materials Specialists. Responded to World Trade Center and Hurricane Katrina – Mississippi AOR as part of PATF-1. |
| November, 2003 – July, 2000 | Co-Chairperson, Lancaster County Emergency Management Agency (LEMA) – Counter-Terrorism Subcommittee, Lancaster, PA |
| 1995 - March, 1992 | Past-President, Pennsylvania Association of Hazardous Materials Technicians (PAHMT).<br><br>PAHMT is a professional organization representing the interests of the PA hazardous materials response community. |
| Present - April 1981 | Adjunct Faculty Member, National Fire Academy, Emmitsburg, MD<br><br>Serve as an adjunct instructor for various courses in the resident and field hazardous materials and terrorism curriculum. Currently instruct the Special Operations Program Management Course. |
| August 1990 - May 1989 | Short Term Appointee, Argonne National Laboratory, Energy and Environmental Systems Division, Argonne, IL<br><br>Worked on various projects directly with the U.S. Department of Transportation, Research and Special Programs Administration (RSPA), Washington, DC. |
| December 1988 - Sept. 1984 | Adjunct Faculty Member - Fire Science Curriculum, Montgomery College, Rockville, MD |

| | |
|---|---|
| December 1987 - June 1981 | Firefighter and Fire Officer, Berwyn Heights Volunteer Fire Department, Berwyn Heights, MD |
| July 1987 - June 1983 | Hazardous Materials Technician and Shift Officer, Prince George's County Fire Department, Hazardous Materials Response Team, Landover Hills, MD |
| January 1977 - Sept. 1970 | Volunteer Firefighter and Fire Officer, Reading Fire Department, Reading, PA |

## MILITARY EXPERIENCE

| | |
|---|---|
| August 2012 - February 1972 | Retired as SMSgt (IMA), assigned to the Air Force Civil Engineering Center – Headquarters, Fire & Emergency Services (AFCEC/CEXF), Tyndall Air Force Base, FL. Total active military service (Active Duty, U. S. Air Force Reserve, PA ANG and IA ANG) = 29 years. Possess a TS/SCI security clearance. |

## CODES AND STANDARDS COMMITTEES

| | |
|---|---|
| Present - 1986 | Member and Past Chairperson, Technical Committee on Hazardous Materials Response Personnel (NFPA 472, 473, 475 and 1072) - National Fire Protection Association (NFPA), Quincy, MA. |
| Present – October, 2005 | Member and Past Co-Chair – State and Local Government, The Interagency Board for Equipment Standardization and Interoperability (IAB) - Training and Exercise Subgroup.<br><br>The IAB is designed to establish and coordinate local, state and federal standardization, interoperability, and responder health and safety to prepare for, train and respond to, mitigate and recover from any incident by identifying the requirements for an all-hazards incident response, with an emphasis upon CBRNE issues. |
| Present – August, 2014<br>2003 - 1997 | Member, Pennsylvania Fire Service Certification Advisory Committee, Lewistown, PA |
| Present – July 2017 | Member, Pennsylvania Pipeline Emergency Response Initiative (PA PERI), Lewistown, PA |

## MAJOR TEXTS AND PUBLISHED ARTICLES

1. *Hazardous Materials: Managing the Incident* (4th edition), by Gregory G. Noll and Michael S. Hildebrand, Burlington, MA: Jones & Bartlett (2014).

2. *Pipeline Emergencies (3rd edition)*. Michael S. Hildebrand and Gregory G. Noll, Washington, DC: U.S. Department of Transportation and National Association of State Fire Marshals (2017).

3. *Storage Tank Emergencies - Guidelines and Procedures (2nd edition),* by Michael S. Hildebrand and Gregory G. Noll, Burlington, MA: Jones & Bartlett (2017).

4. *Handling Gasoline Tank Truck Emergencies (4th edition),* by Michael S. Hildebrand and Gregory G. Noll, Burlington, MA: Jones & Bartlett (2016).

5. *Hazardous Materials Emergencies Involving Intermodal Containers: Guidelines and Procedures (2nd edition)*, by Gregory G. Noll, Michael S. Hildebrand and Michael L. Donahue, Burlington, MA: Jones & Bartlett (2017).

6. *Propane Emergencies (3rd edition)*. Michael S. Hildebrand and Gregory G. Noll, Lisle, IL: National Propane Gas Association (2006).

7. *Special Operations for Terrorism and Hazmat Crimes*. Chris Hawley, Gregory G. Noll and Michael S. Hildebrand. Chester, MD: Red Hat Publishing, Inc. (2002).

8. *Hazardous Materials for Fire and Explosion Investigators*, Michael S. Hildebrand, Gregory G. Noll and William Hand, Stillwater, OK: Fire Protection Publications (1998).

9. *The Fire Chief's Handbook (6th edition)*, edited by Thomas Brennan and Joseph Bachelor, Saddle Brook, NJ: Fire Engineering (2003). Authored chapter on Hazardous Materials Operations.

10. *Fire Protection Handbook (20th Edition)*, edited by the National Fire Protection Association, Quincy, MA: NFPA (2008). Co-authored chapter on Hazardous Materials Emergencies.

11. Author of approximately fifty articles on various topics pertaining to hazardous materials response, personnel protective clothing, flammable liquids, and firefighting foams. Articles have been published in various fire service professional journals, including *Fire Engineering*, *The International Fire Chief*, *Industrial Fire Safety*, and *Fire Chief*. Currently serve as a member of the Editorial Advisory Board of *Fire Engineering* magazine and on the Conference Planning Committee for the Fire Department Instructor's Conference (FDIC).

## SPECIAL AWARDS, CITATIONS AND CERTIFICATES OF APPRECIATION

1. South Central (PA) Task Force received the following awards under the Program Management of Gregory Noll for its efforts in establishing a regional counter-terrorism planning and response capability:

    - International Association of Emergency Management (IAEM) 2006 Interagency Disaster Preparedness Award
    - U.S. Environmental Protection Agency Region 3 Partnership Award
    - Mid-Atlantic Regional All-Hazards Forum 2006 Regional Readiness Achievement Award.

2. Texas Hot Zone Conference 2017 – Dieter J. Heinz Instructor of the Year Award.

3. U.S. Air Force, Air Force Civil Engineer Center – 2012 Air Force Outstanding Civil Engineer Manager of the Year - Runner-Up (January 2013).

4. International Association of Fire Chiefs – Hazardous Materials Committee. John M. Eversole Lifetime Achievement Award for leadership and contributions to further and enhance the hazardous materials emergency response profession (May 2011).

5. Pennsylvania Catholic War Veterans - 2011 Catholic Veteran of the Year Award in recognition of outstanding service to country, state and community (June 2011)

6. California Continuing Challenge Hazardous Materials Conference – recipient of the William Patterson Lifetime Achievement Award for leadership and significant contributions to the hazardous materials emergency response and training community (September, 2010).

7. Texas Hot Zone Conference 2009 – "In the Zone Award" for contributions and commitment to responder health and safety through training and education (October, 2009).

8. International Association of Fire Chiefs – Hazardous Materials Committee. Level A award for lifetime contributions to the hazardous materials emergency response and education community (2006).

9. PA District 23 Little League Baseball, Hometown Hero Award for Operations at the World Trade Center – September 11$^{th}$ – 19$^{th}$, 2001 (September 15, 2002).

10. City of Harrisburg, PA. Mayor's Award for Valor for Operations at the World Trade Center – September 11th – 19th, 2001 (October10, 2001).

11. Pennsylvania Association of Hazardous Materials Technicians. Award of Appreciation for serving as the First PAHMT President (October, 1995).

12. Keystone Chapter of the International Society of Fire Service Instructors. Keystone Educator of the Year - 1994. Awarded for commitment, dedication and performance in training and education of Pennsylvania emergency response personnel.

13. Prince George's County Fire Department, Hazardous Material Response Team, Landover Hills, MD. Plaque of recognition and appreciation from Prince George's County for service as the PGFD Hazardous Materials Coordinator (May, 1990).

14. Prince George's County Fire Department, Hazardous Material Response Team, Landover Hills, MD. Recipient of PGFD Unit Citation for continued excellence in the field of hazardous materials training and response (April, 1990).

15. Prince George's County Fire Department, Hazardous Material Response Team, Landover Hills, MD. Recipient of National Association of Counties Award for Excellence for development of a PGFD HMRT program for the handling and treatment of chemically contaminated individuals (September, 1989).

16. Eastern Division of the International Association of Fire Chiefs. Scholarship Recipient (1978).

17. International Association of Fire Chiefs, Washington, DC. Scholarship Recipient (1977).

18. PA Air National Guard, Middletown, PA. Firefighter of the Year - 1976.

# Exhibit SPLP GN-2

SPLP
GN-2

# MERO

## Mariner Emergency Responder Outreach

MASTER COPY
October 4, 2017

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# Safety Pipeline LP Safety Minute


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# Purpose

- Changes in the energy sector are having impacts upon the emergency response community
  - Challenges are not new or unique, but responder frame of reference is often different
- Familiarize responders with tactical considerations for responding to pipeline incidents involving Natural Gas Liquids (NGL's)

# Why We Are Here….

- Ensure the safety of our communities
- Develop and sustain relationships between Sunoco Pipeline and local / county emergency response community
- Provide product, container / pipeline and tactical information to facilitate the delivery of a risk-based emergency response

# Introductions

- Instructor – Greg Noll
- Sunoco Pipeline personnel attending:
  - Local Pipeline Operations Supervisor
  - Local Health & Safety Specialist
  - Public Affairs/Right of Way/ME2 Project Team
  - Public Awareness
- Local Responders & Officials

# Workshop Objectives

- Participants will be able to:
  - Describe the general path of the Mariner East 2 pipeline through their community /region
  - Identify component parts of a pipeline operation
  - Describe the hazards associated with Natural Gas Liquids (NGL) products
  - Describe the types of NGL incident scenarios that may involve Mariner East 2 pipeline operations
  - Describe emergency response procedures pertinent to incidents involving the Mariner East 2 pipeline

Pipeline Incidents

# Emergency Response Procedures

The National Association of STATE FIRE MARSHALS

www.pipelineemergencies.com


OUR SERVICES

ONLINE TRAINING

PURCHASE PIPELINE EMERGENCY MATERIALS

IN-PERSON TRAINING

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# Sunoco Pipeline (SPLP)

- Part of Energy Transfer Partners (ETP)
- ETP founded in 1995 as small intrastate natural gas pipeline company
  - Today one of largest and most diversified master limited partnerships in US.
- ETP operates > 71,000 miles of natural gas, crude oil, NGL's and refined product pipelines and related facilities in 38 states.



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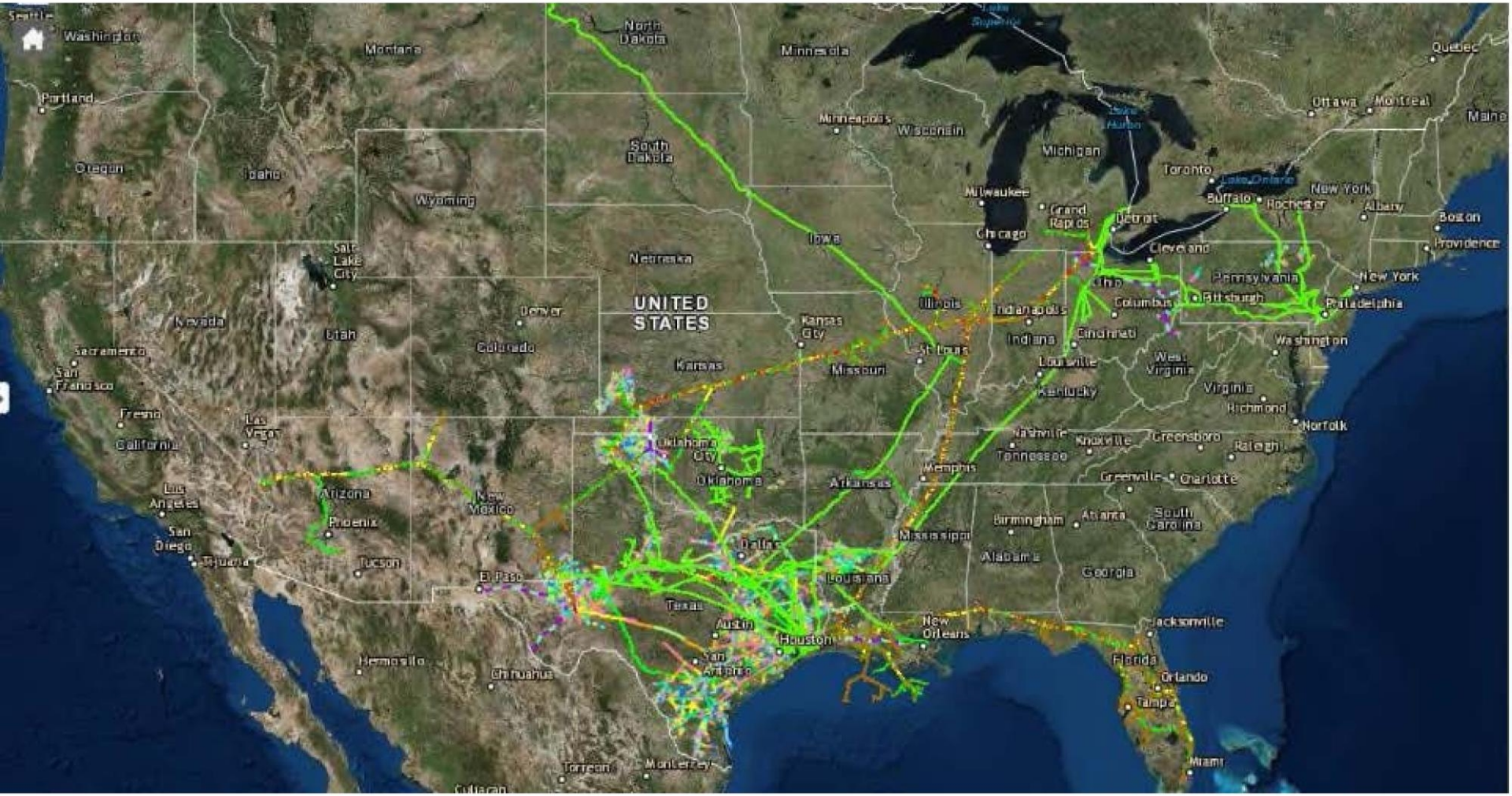
# ETP System Map



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# Sunoco Pipeline, LP (SPLP)

- SPLP operates almost 12,000 miles of pipelines in 21 states
- SPLP's Eastern Pipeline System consists of refined petroleum product, LPG, and crude oil pipelines
  - Operations in Mid-Atlantic states, including PA, DE, OH, MI, NJ and NY.

# Mariner East Pipeline Project

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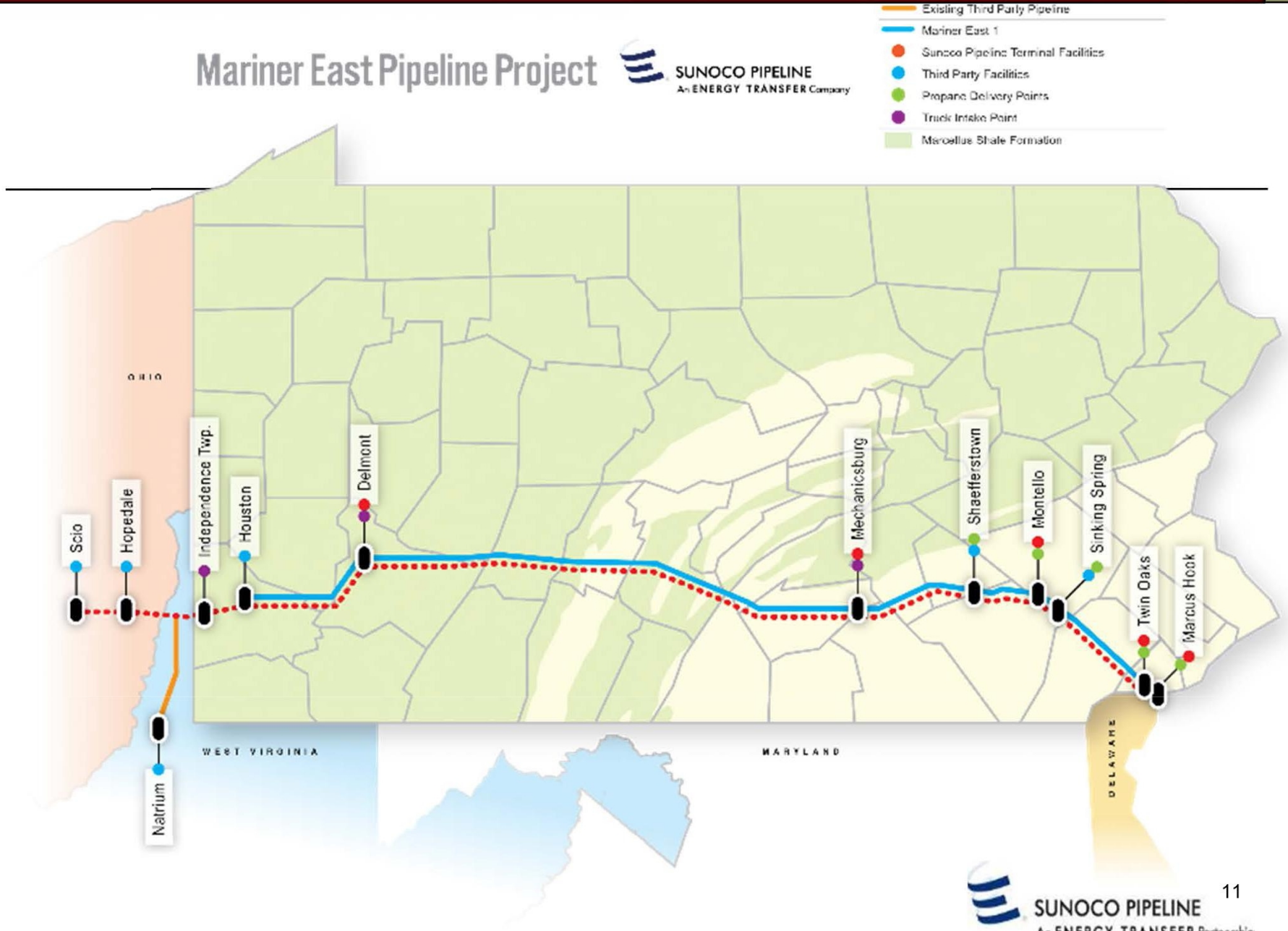


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# Summary Mariner Pipeline Projects

- *Mariner East Phase 1 Project* – originally transported refined petroleum products from Philadelphia area refineries
  - Incorporated an existing 8-inch pipeline with new 12-inch pipeline from Houston, PA to Delmont, PA
  - Pipeline has been upgraded, tested to 125% MOP and "reversed"
  - Operational since Dec 2014 in ethane / propane service;
  - Includes 16 pump stations

# Summary Mariner Pipeline Projects

- *Mariner East Phase 2 Project* – new west to east 20-inch NGL pipeline scheduled to be operational 1st quarter 2018
  - Transport propane and butane from Scio, OH to Marcus Hook Industrial Complex (NGL hub)
  - Capacity of 275,000 to 400,000 bbl/day
  - Primarily in the ME1 right-of-way, although there are split-offs with new right-of-ways in Blairsville and Altoona areas
  - Includes 3 pump stations (Delmont, Ebensburg Middletown)

# Summary Mariner Pipeline Projects

- *Mariner East Phase 2X Project* – new west to east 16-inch NGL pipeline to be operational 1st quarter 2019
  - Located in same right-of-way as ME2 Project
  - New pipeline from Scio, OH through WV to the Houston, PA connection.
  - Capacity of 250,000 bbl/day
  - Pipeline batch operations transporting ethane, propane and butane to Marcus Hook
  - Includes 3 pump stations (Delmont, Ebensburg, Middletown)

# Summary Mariner Pipeline Projects

- *Marcus Hook Industrial Complex*
  - Previously Sunoco Marcus Hook Refinery
  - Converted to an LPG, refined products & crude terminal
  - Has both aboveground and underground storage



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# What Responders Should Know

- Location of pipelines in response area
- Pipeline operator
- What is being transported
- Shut-off valve locations
- Apply risk-based response principles to likely incident scenarios
  - Release with no ignition / fire
  - Release with fire

# Risk-Based Response (RBR) Process

Systematic process by which responders:

- Analyze a HM problem
- Assess the hazards
- Evaluate the potential consequences
- Determine the appropriate response actions based upon facts, science and circumstances of the incident

# PA Transmission Pipeline Mileage by County

| County | Gas Miles | Liquid Miles | % | County | Gas Miles | Liquid Miles | % | County | Gas Miles | Liquid Miles | % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ADAMS | 125 | 0 | 0.90% | DAUPHIN | 92 | 91 | 1.40% | MERCER | 290 | 0 | 2.20% |
| ALLEGHENY | 365 | 131 | 3.80% | DELAWARE | 82 | 219 | 2.30% | MIFFLIN | 32 | 0 | 0.20% |
| ARMSTRONG | 259 | 0 | 1.90% | ELK | 234 | 3 | 1.80% | MONROE | 107 | 0 | 0.80% |
| BEAVER | 167 | 68 | 1.80% | ERIE | 150 | 0 | 1.10% | MONTGOMERY | 223 | 79 | 2.30% |
| BEDFORD | 112 | 0 | 0.80% | FAYETTE | 291 | 0 | 2.20% | MONTOUR | 8 | 3 | 0.00% |
| BERKS | 148 | 221 | 2.80% | FOREST | 71 | 0 | 0.50% | NORTHAMPTON | 146 | 18 | 1.20% |
| BLAIR | 73 | 95 | 1.20% | FRANKLIN | 185 | 0 | 1.40% | NORTHUMBERLAND | 0 | 34 | 0.20% |
| BRADFORD | 101 | 30 | 1.00% | FULTON | 58 | 0 | 0.40% | PERRY | 103 | 74 | 1.30% |
| BUCKS | 241 | 48 | 2.20% | GREENE | 726 | 0 | 5.50% | PHILADELPHIA | 9 | 77 | 0.60% |
| BUTLER | 105 | 0 | 0.80% | HUNTINGDON | 90 | 97 | 1.40% | PIKE | 52 | 0 | 0.40% |
| CAMBRIA | 150 | 84 | 1.70% | INDIANA | 151 | 104 | 1.90% | POTTER | 491 | 26 | 3.90% |
| CAMERON | 65 | 18 | 0.60% | JEFFERSON | 229 | 2 | 1.70% | SCHUYLKILL | 0 | 47 | 0.30% |
| CARBON | 9 | 81 | 0.60% | JUNIATA | 49 | 21 | 0.50% | SOMERSET | 147 | 0 | 1.10% |
| CENTRE | 142 | 0 | 1.00% | LACKAWANNA | 36 | 47 | 0.60% | SUSQUEHANNA | 63 | 82 | 1.10% |
| CHESTER | 342 | 252 | 4.50% | LANCASTER | 199 | 70 | 2.00% | TIOGA | 258 | 28 | 2.10% |
| CLARION | 172 | 0 | 1.30% | LAWRENCE | 157 | 4 | 1.20% | VENANGO | 125 | 0 | 0.90% |
| CLEARFIELD | 145 | 35 | 1.30% | LEBANON | 67 | 95 | 1.20% | WARREN | 143 | 14 | 1.20% |
| CLINTON | 248 | 4 | 1.90% | LEHIGH | 7 | 120 | 0.90% | WASHINGTON | 753 | 70 | 6.20% |
| COLUMBIA | 32 | 0 | 0.20% | LUZERNE | 164 | 91 | 1.90% | WAYNE | 23 | 0 | 0.10% |
| CRAWFORD | 74 | 0 | 0.50% | LYCOMING | 180 | 35 | 1.60% | WESTMORELAND | 450 | 132 | 4.40% |
| CUMBERLAND | 18 | 95 | 0.80% | MCKEAN | 287 | 0 | 2.20% | WYOMING | 5 | 27 | 0.20% |
| | > 200 Miles | > 100 Miles | Top 10 % | | | | | YORK | 132 | 29 | 1.20% |

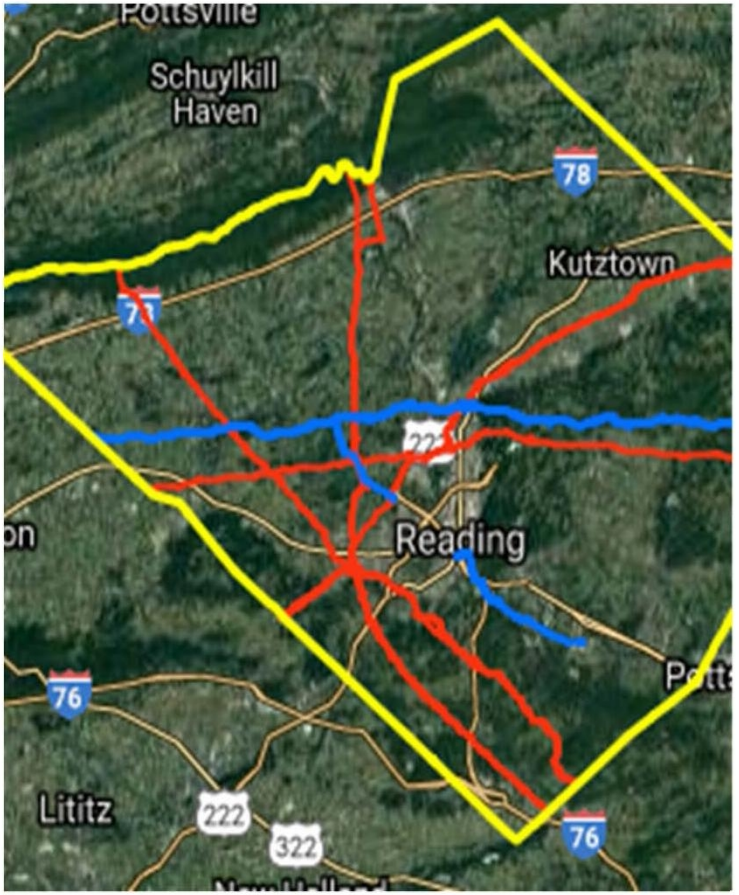
Table extracted from: http://primis.phmsa.dot.gov/comm/reports/safety/PA_detail1.html |

# National Pipeline Mapping System

- National Pipeline Mapping System (NPMS)
  - Web-based tool created by US DOT / PHMSA
  - Enables First Responders and community members to identify general locations and contents of pipelines in their region
- NPMS Public Map Viewer allows the general public to view maps of:
  - Transmission pipelines, LNG plants, and breakout tanks in one selected county
  - Distribution and Gathering systems are not included in NPMS
- First Responder Map Viewer is more refined than what is available to the general public

# National Pipeline Mapping System

- Attributes in NPMS pipeline data layer include:
  - Operator name
  - System and subsystem name
  - Diameter (voluntary data element)
  - General commodities transported
  - Interstate/intrastate designation
  - Operating status
    (in service, abandoned, retired)
- www.npms.phmsa.dot.gov



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# Comparative Safety Risks

- ME2 initial capacity to ship 275,000 BPD (barrels per day)
- Equivalent to 1,050 tank trucks per day
- Equivalent to 350 tank cars per day



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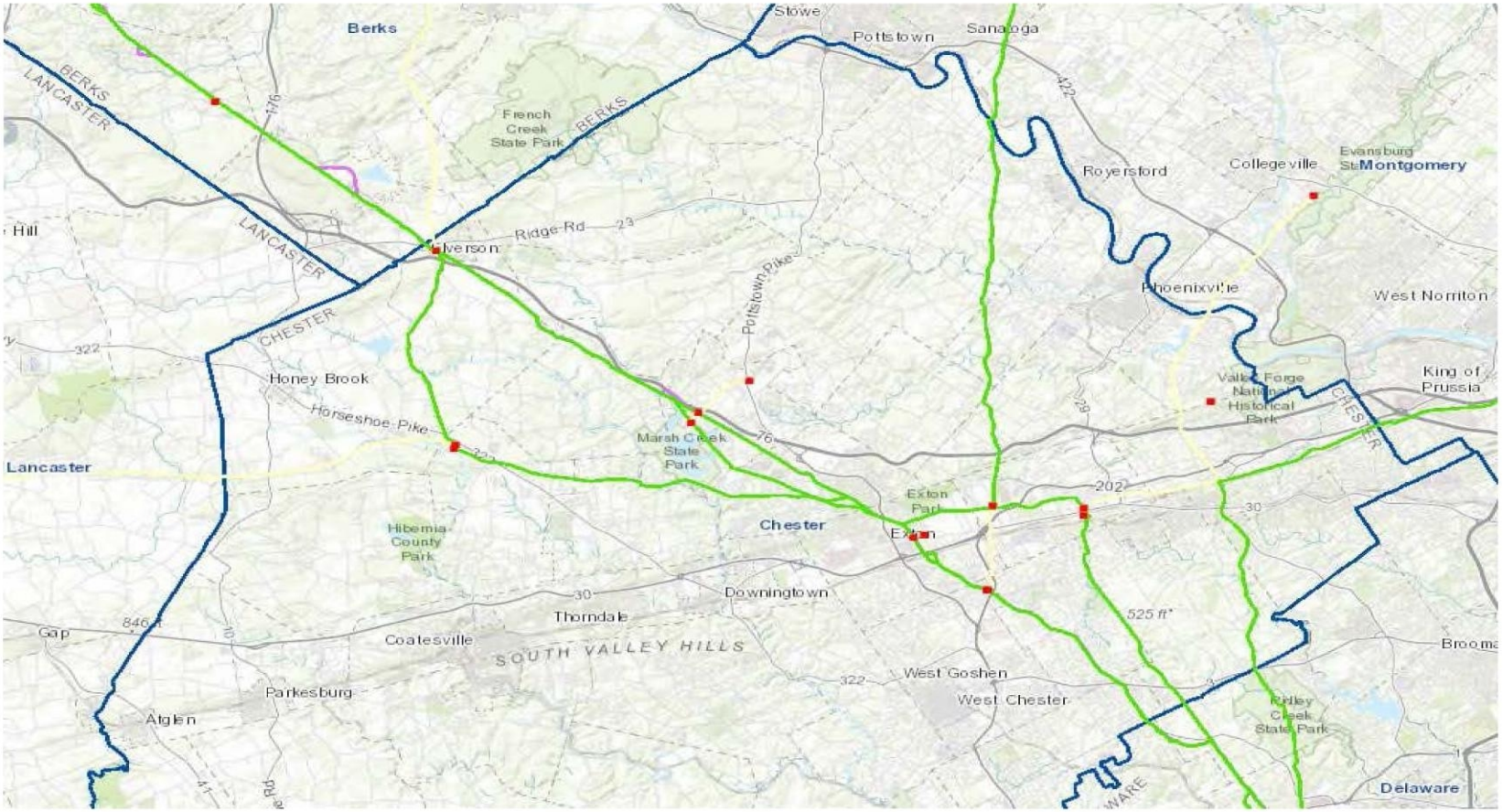
# Chester County Overview



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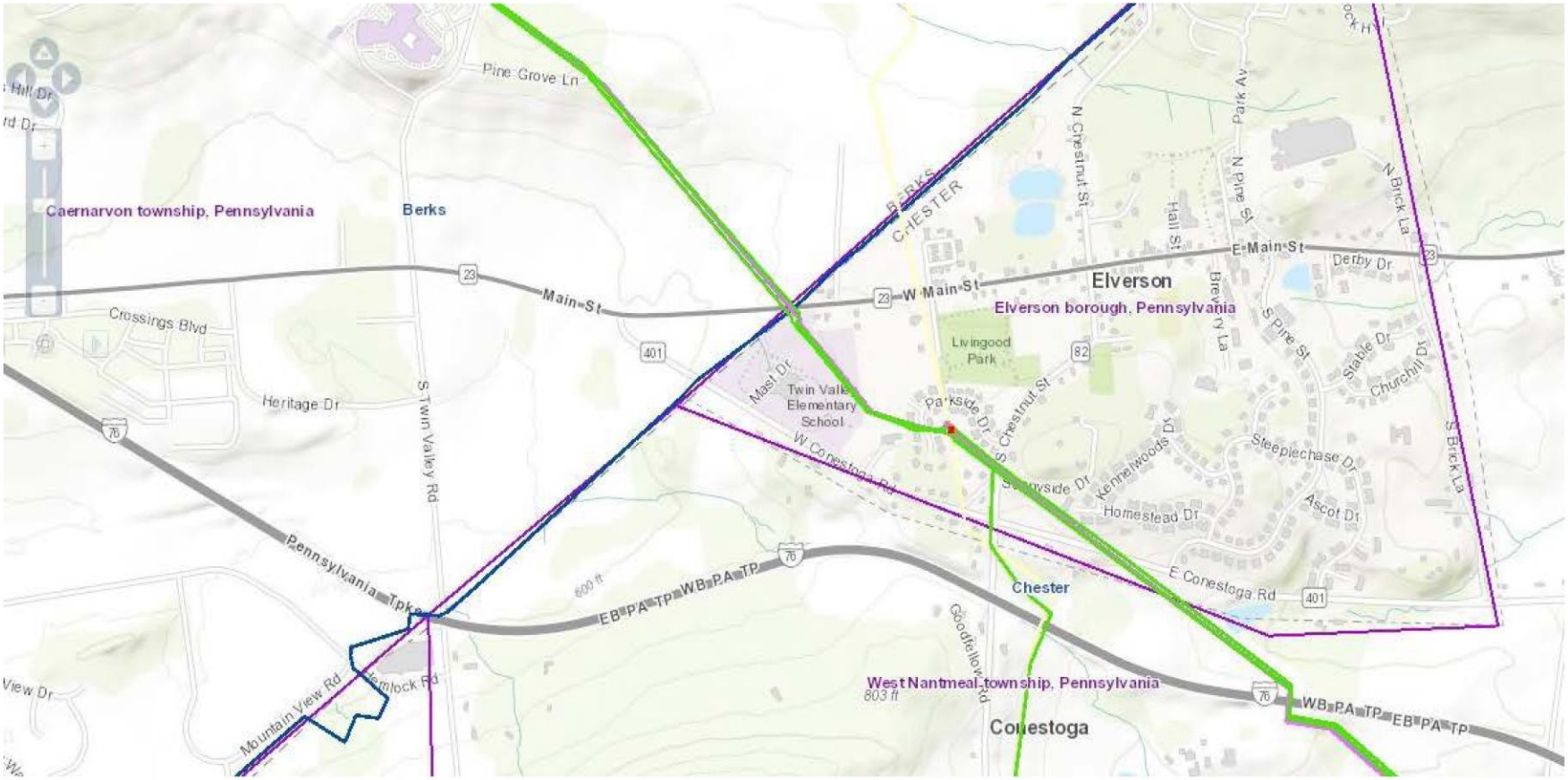
# Chester County–Elverson Borough



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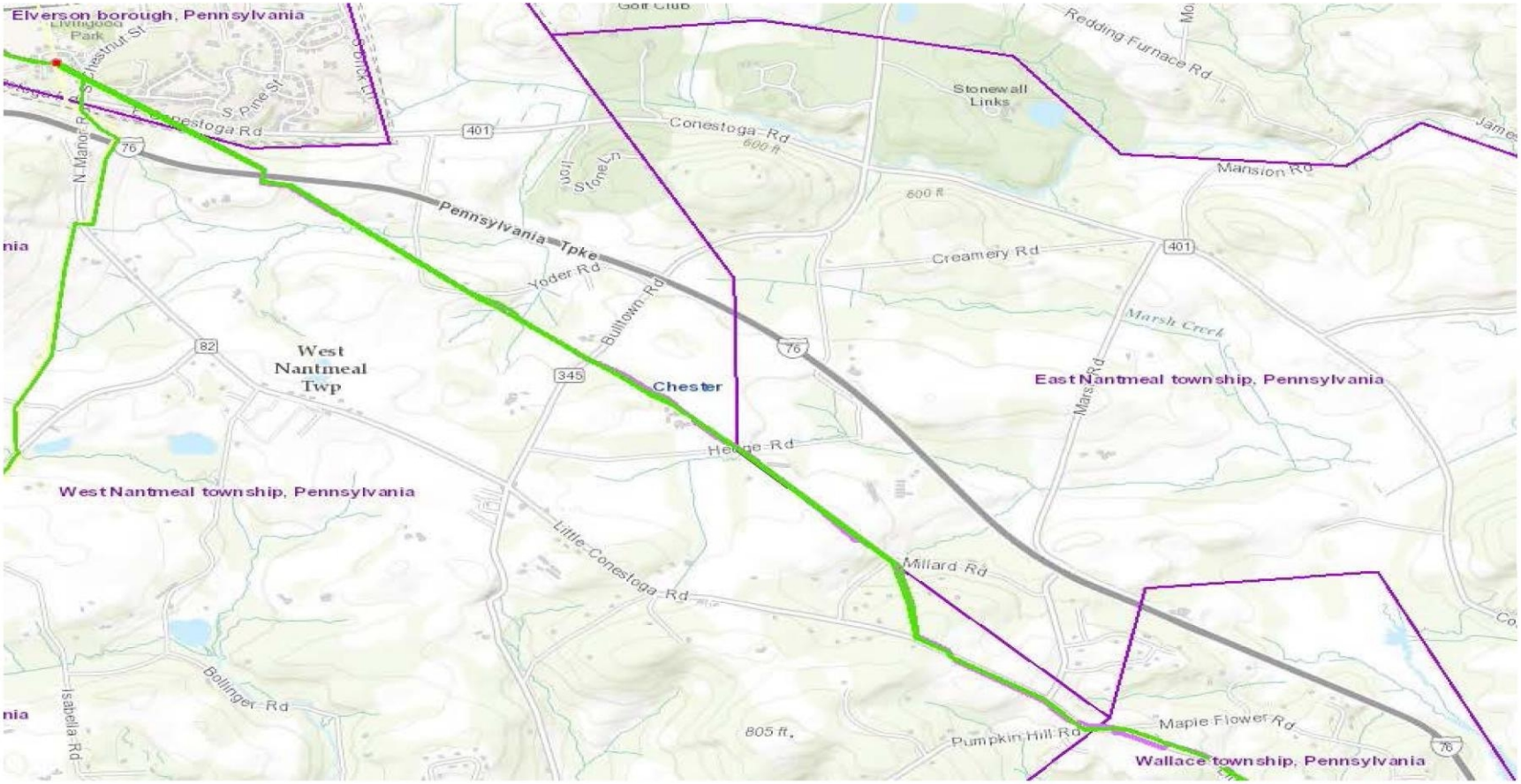
# Chester County- West/East Nantmeal Townships



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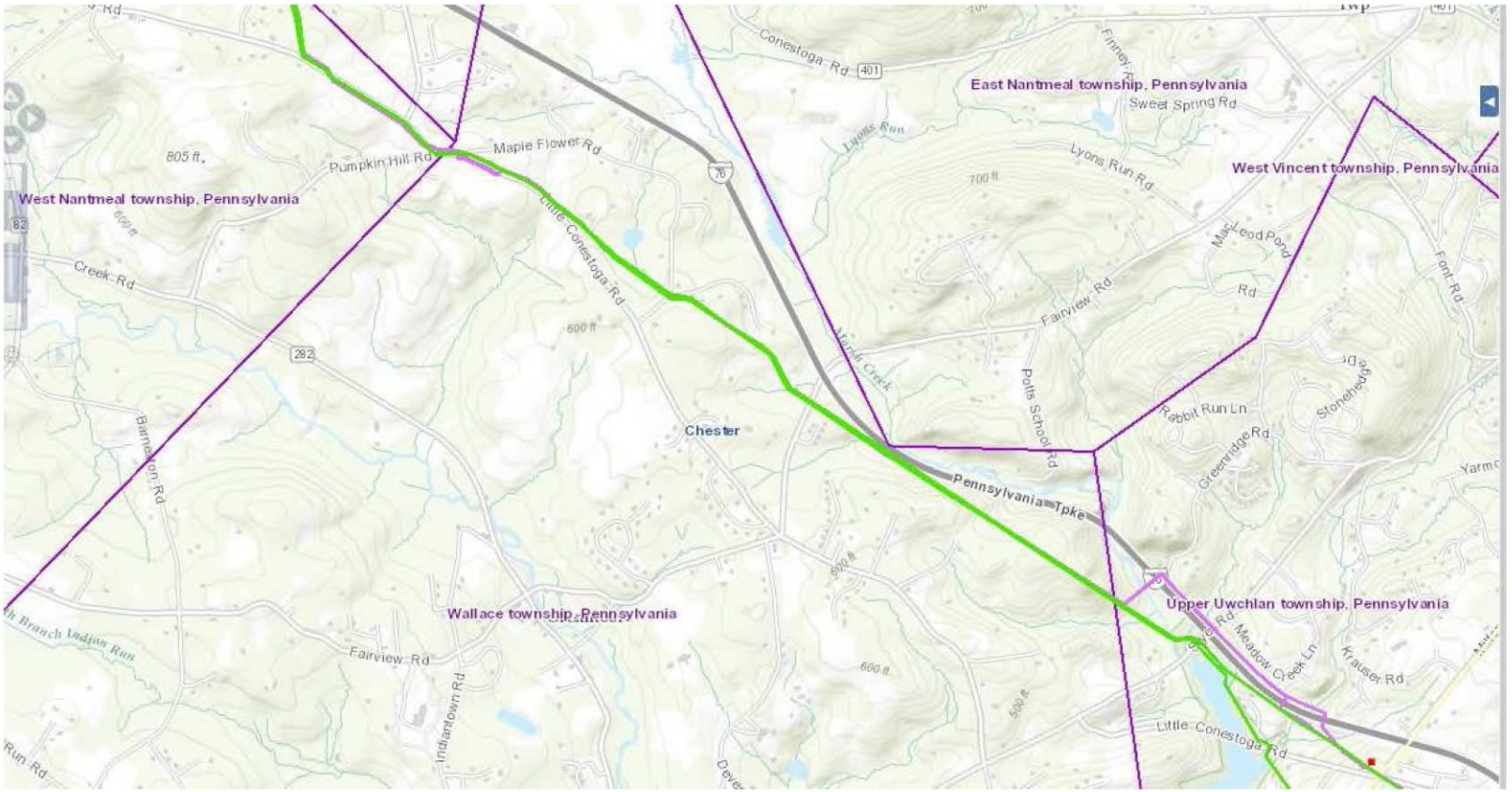
# Chester County-Wallace Township



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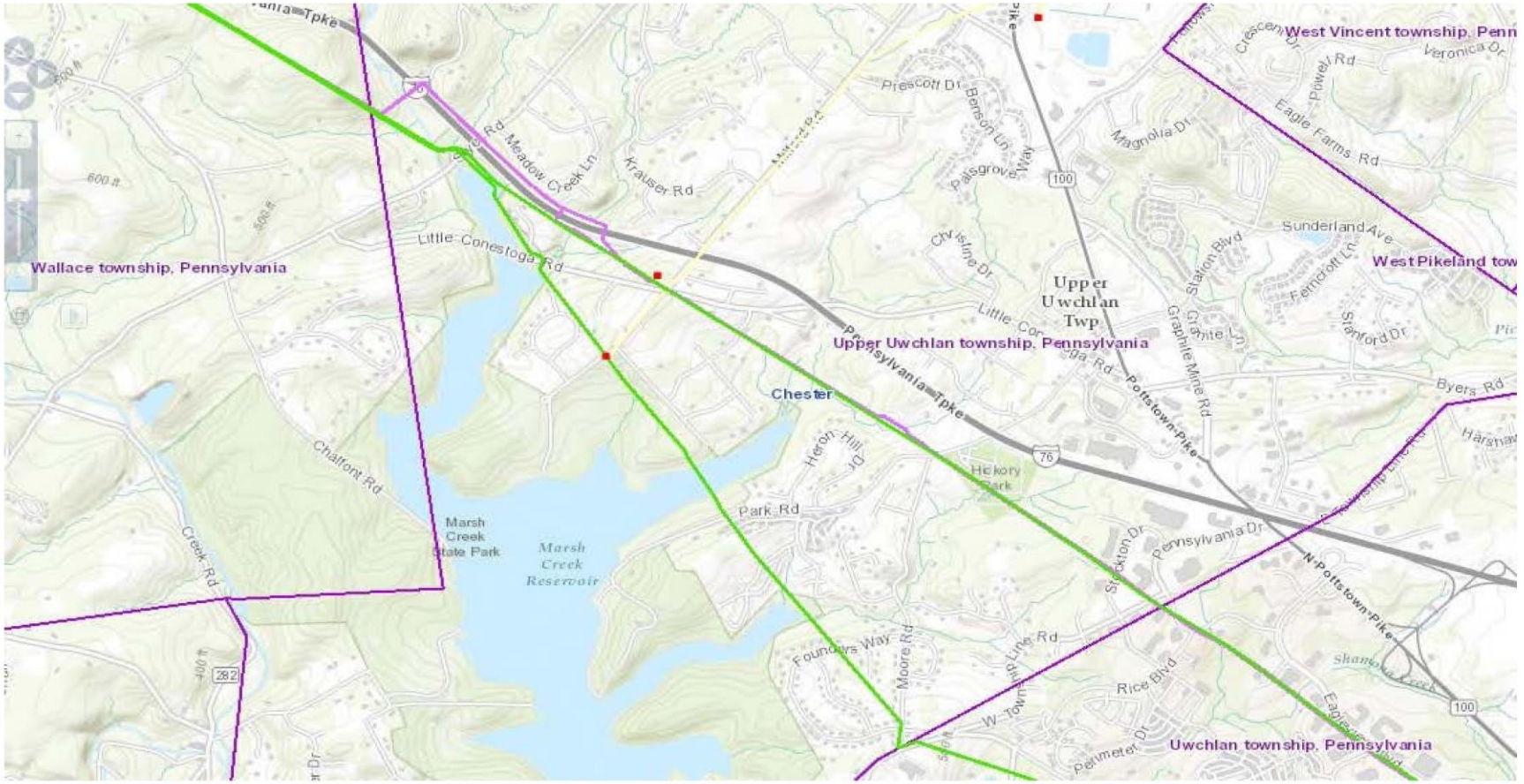
# Chester County-Upper Uwchlan Township



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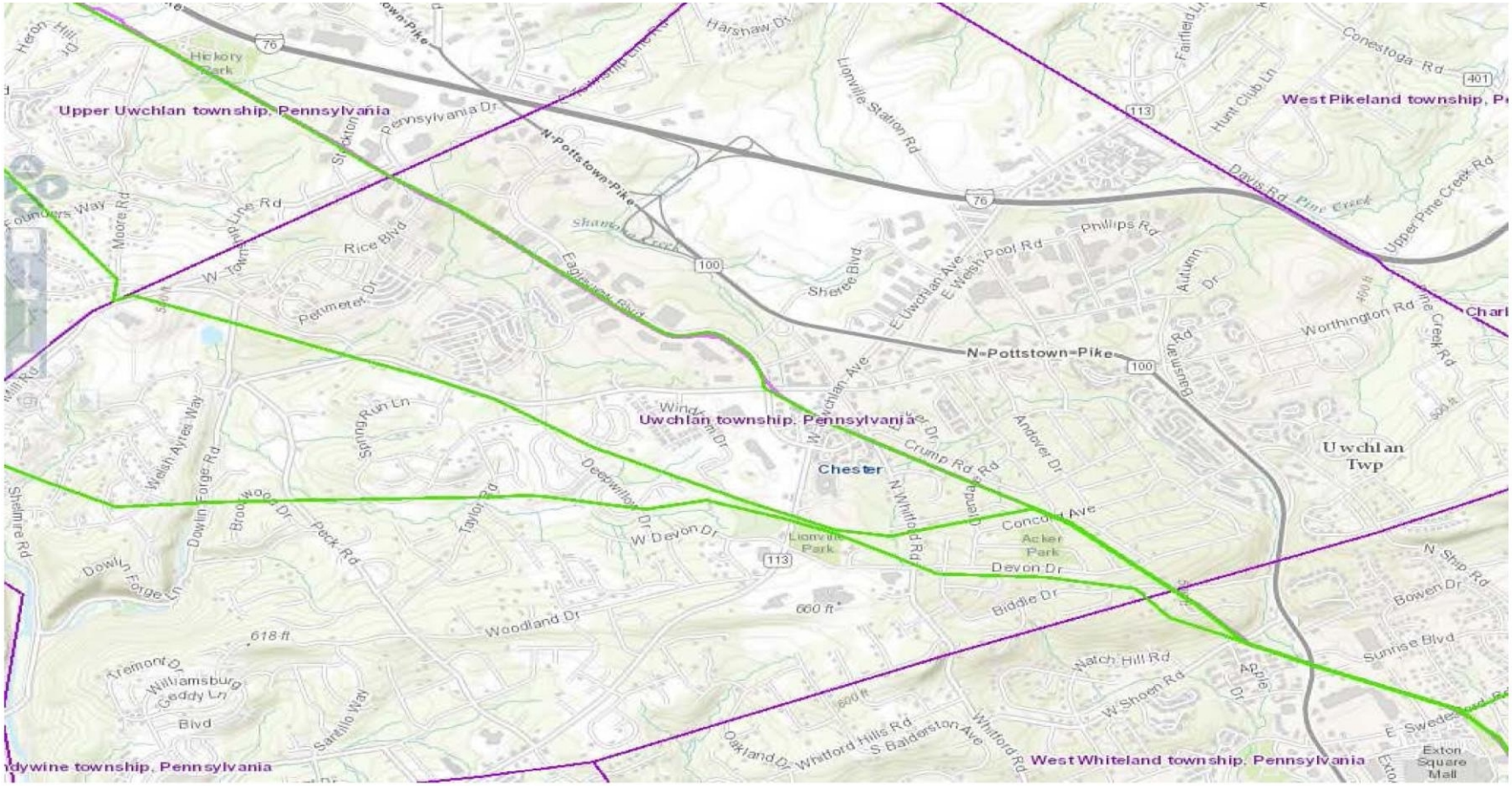
# Chester County-Uwchlan Township



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# Chester County-West Whiteland Township




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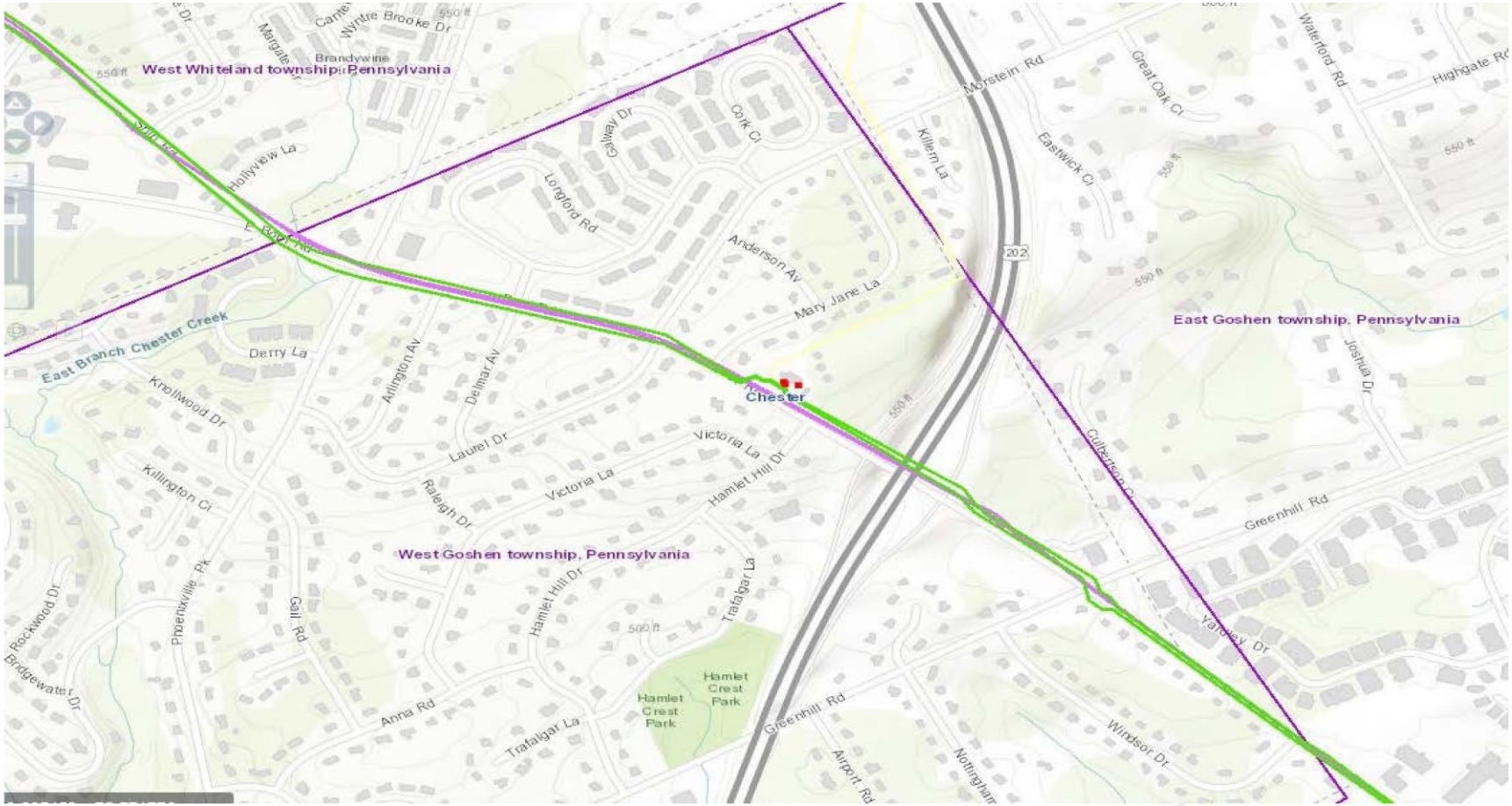
# Chester County-West Goshen Township



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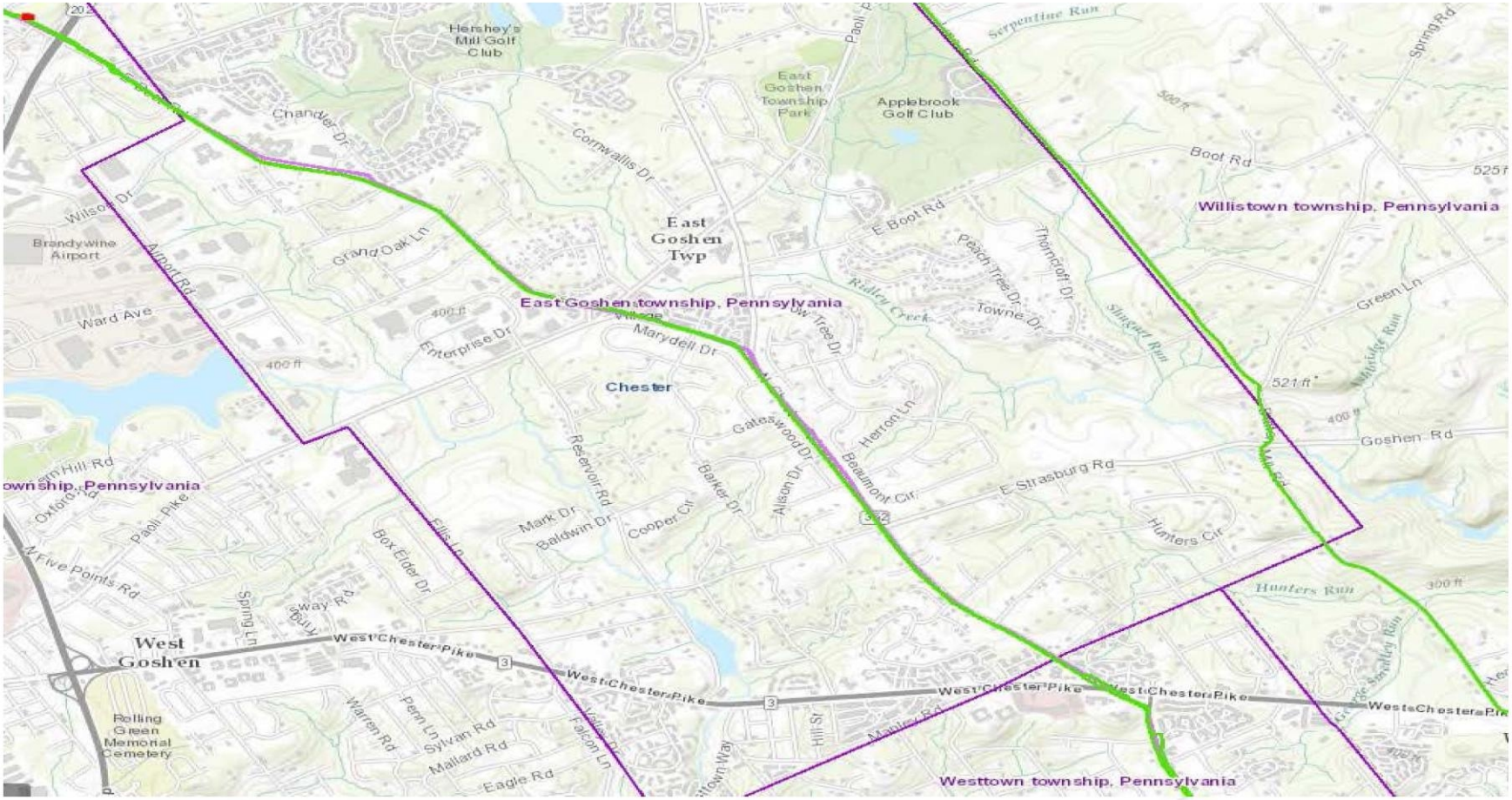
# Chester County – East Goshen



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# Chester County- Westtown Township




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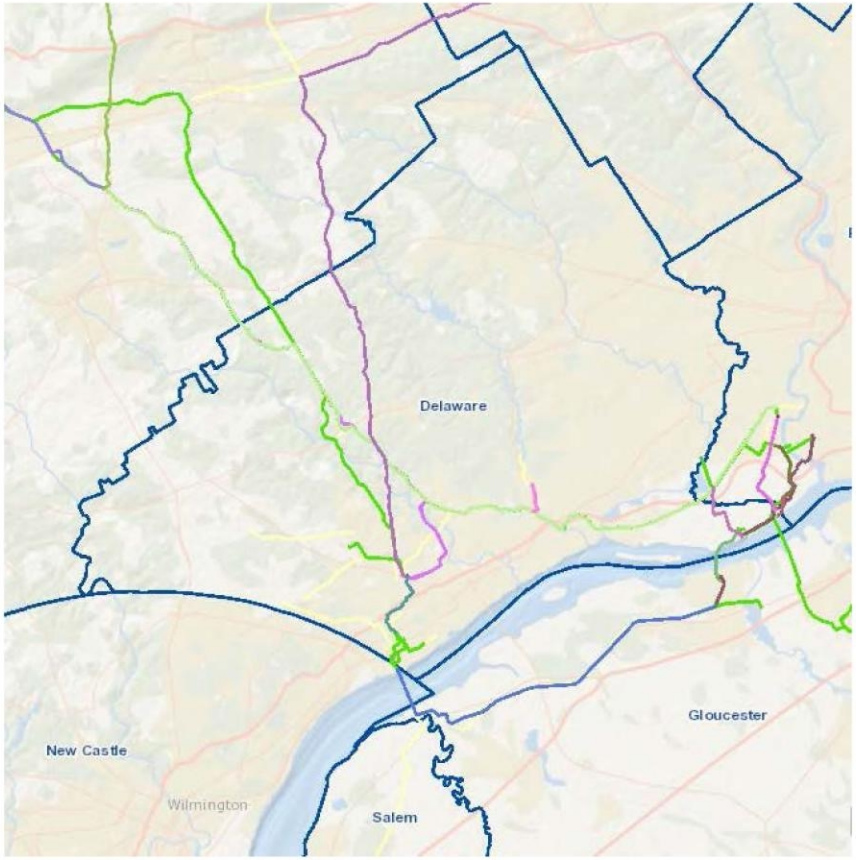
# Delaware County-Overview



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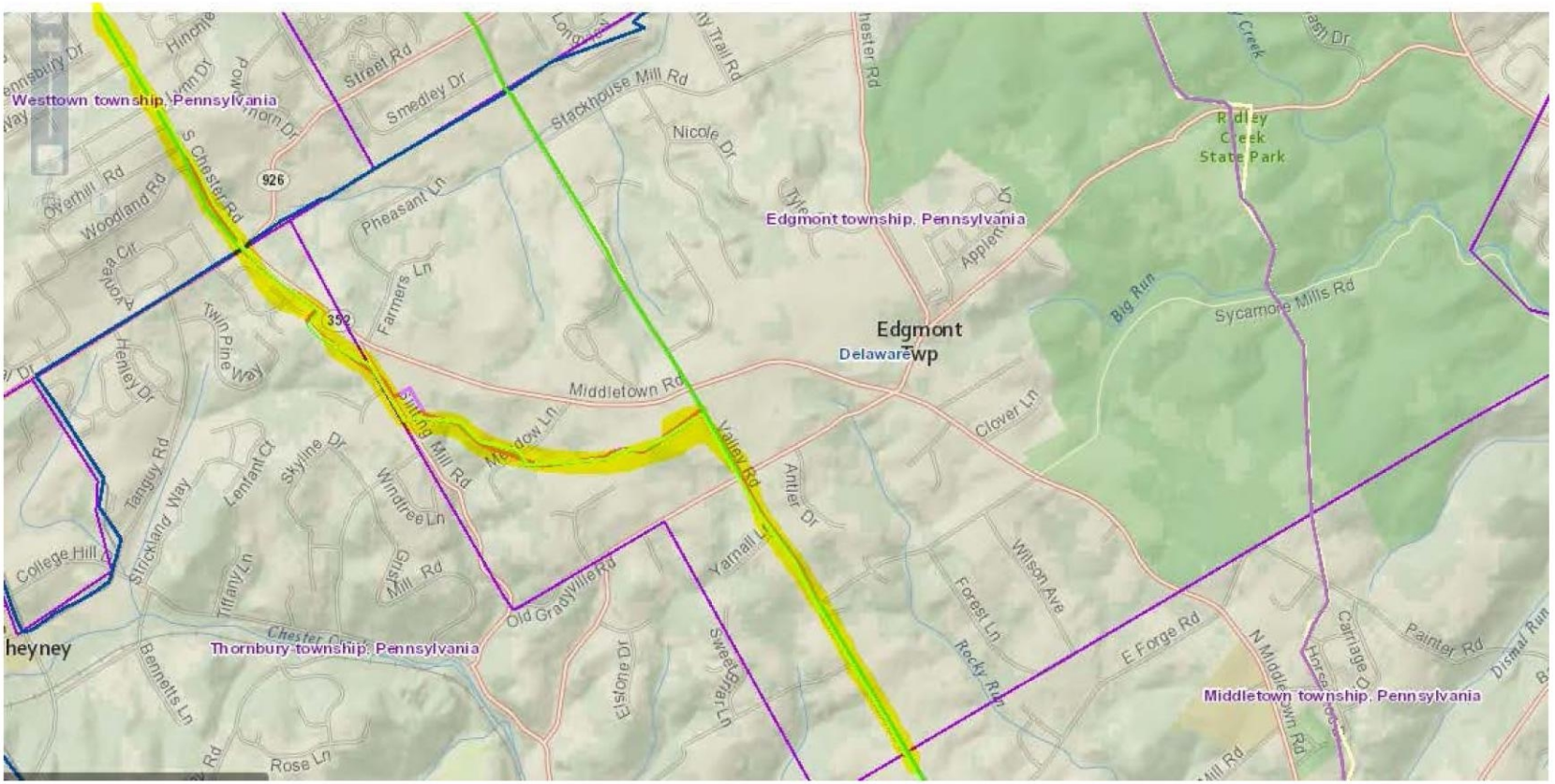
# Delaware County-Edgemont



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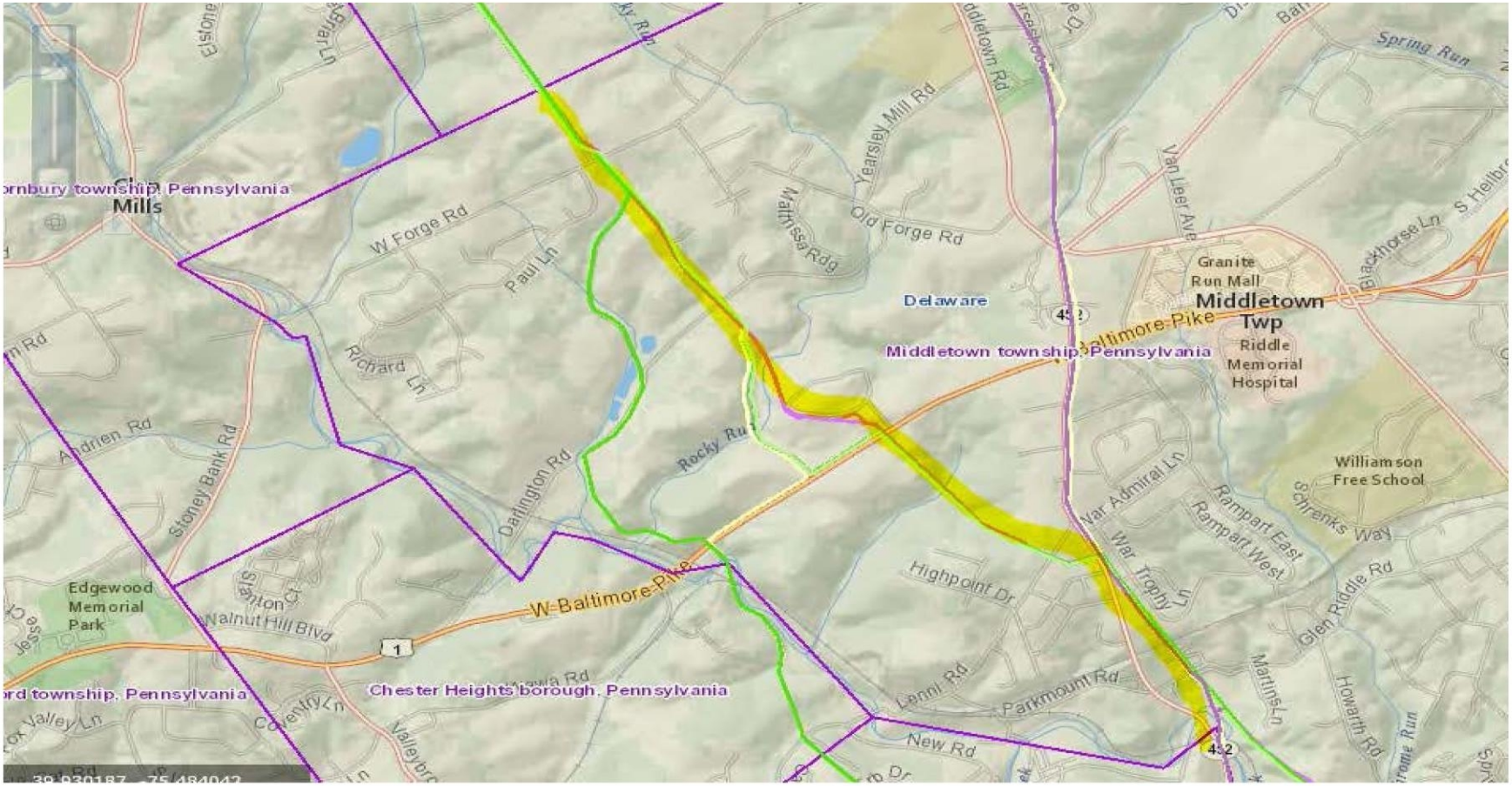
# Delaware County-Middletown



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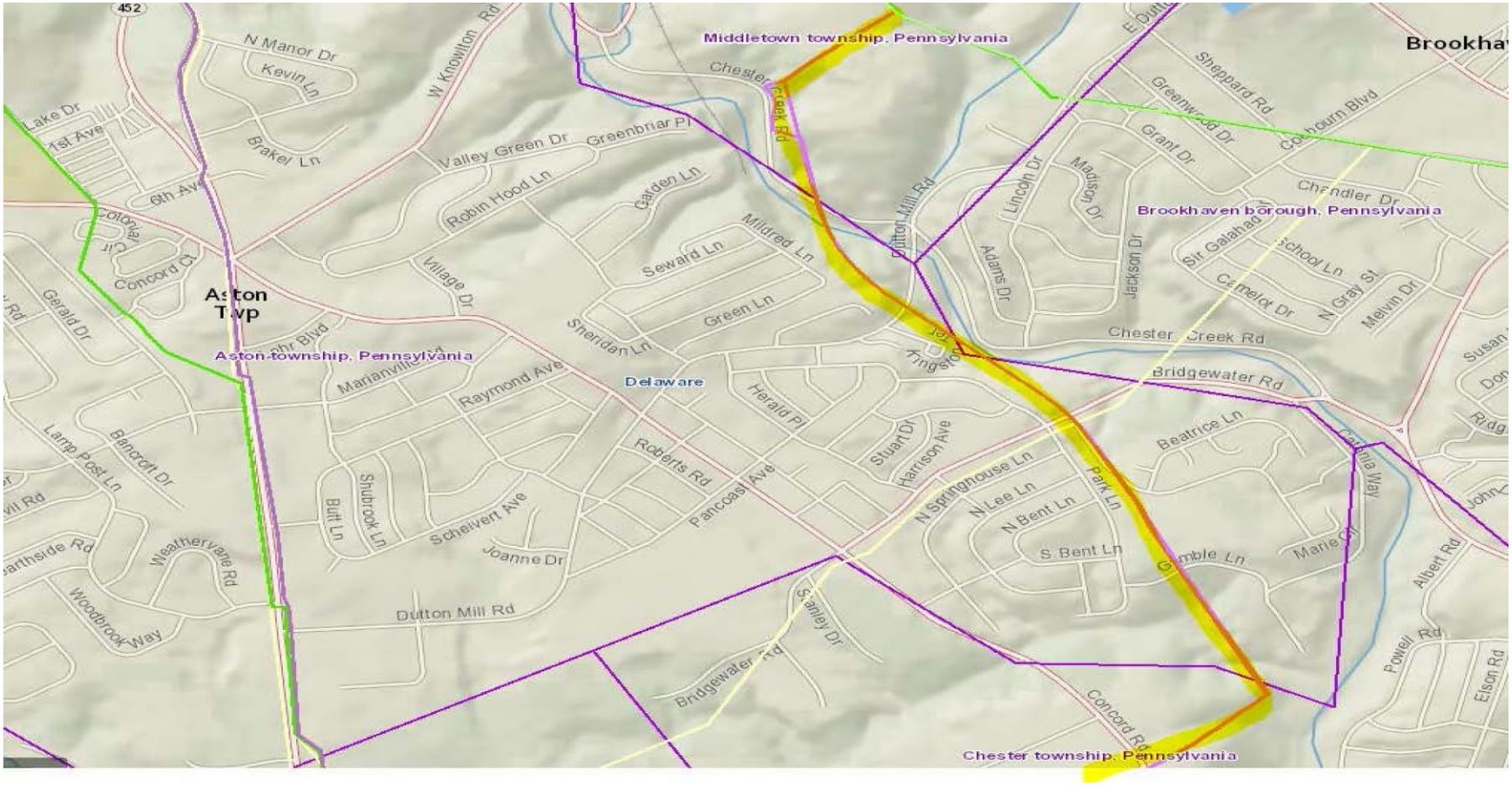
# Delaware County-Aston Township



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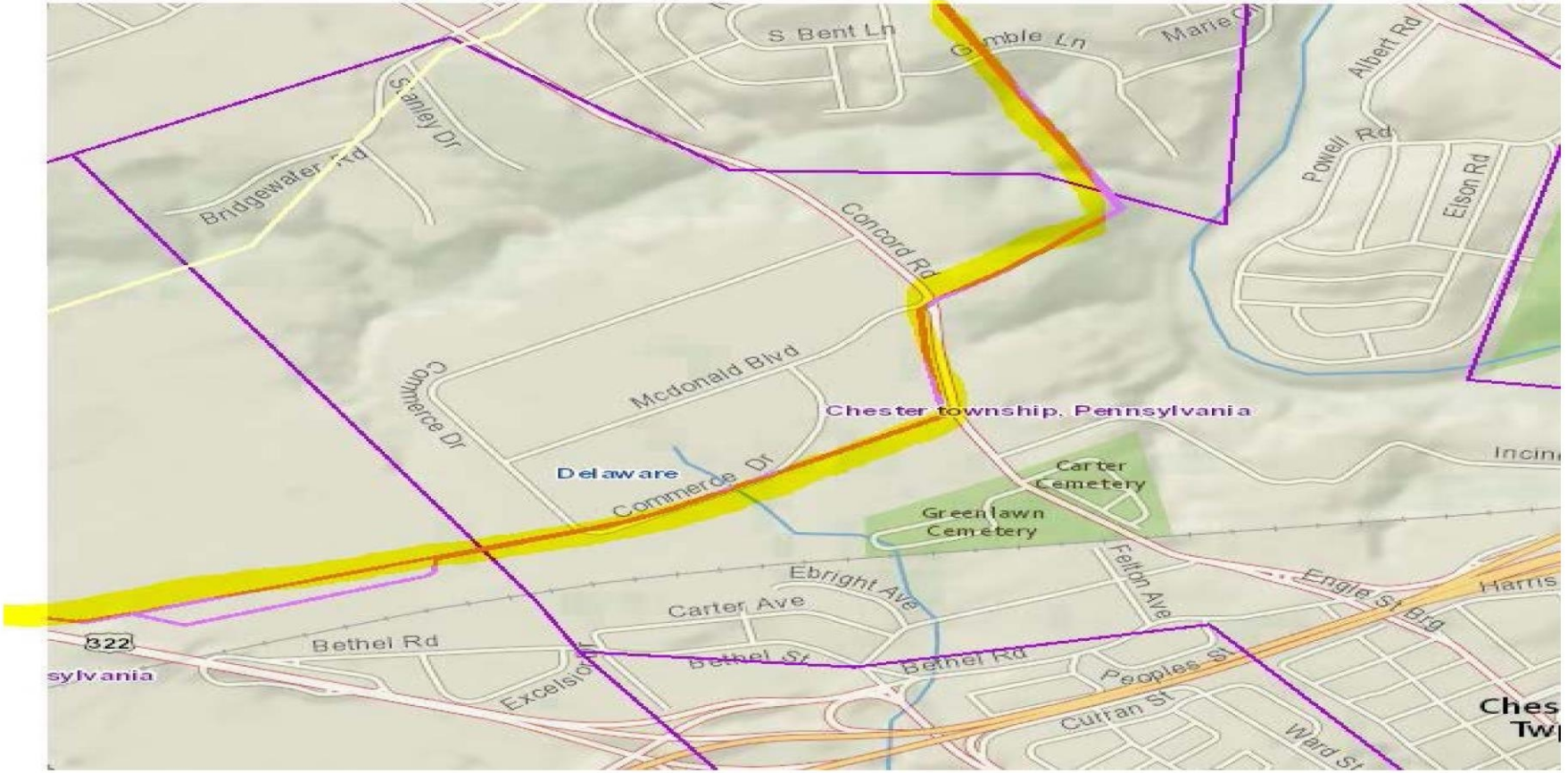
# Delaware County-Chester Township



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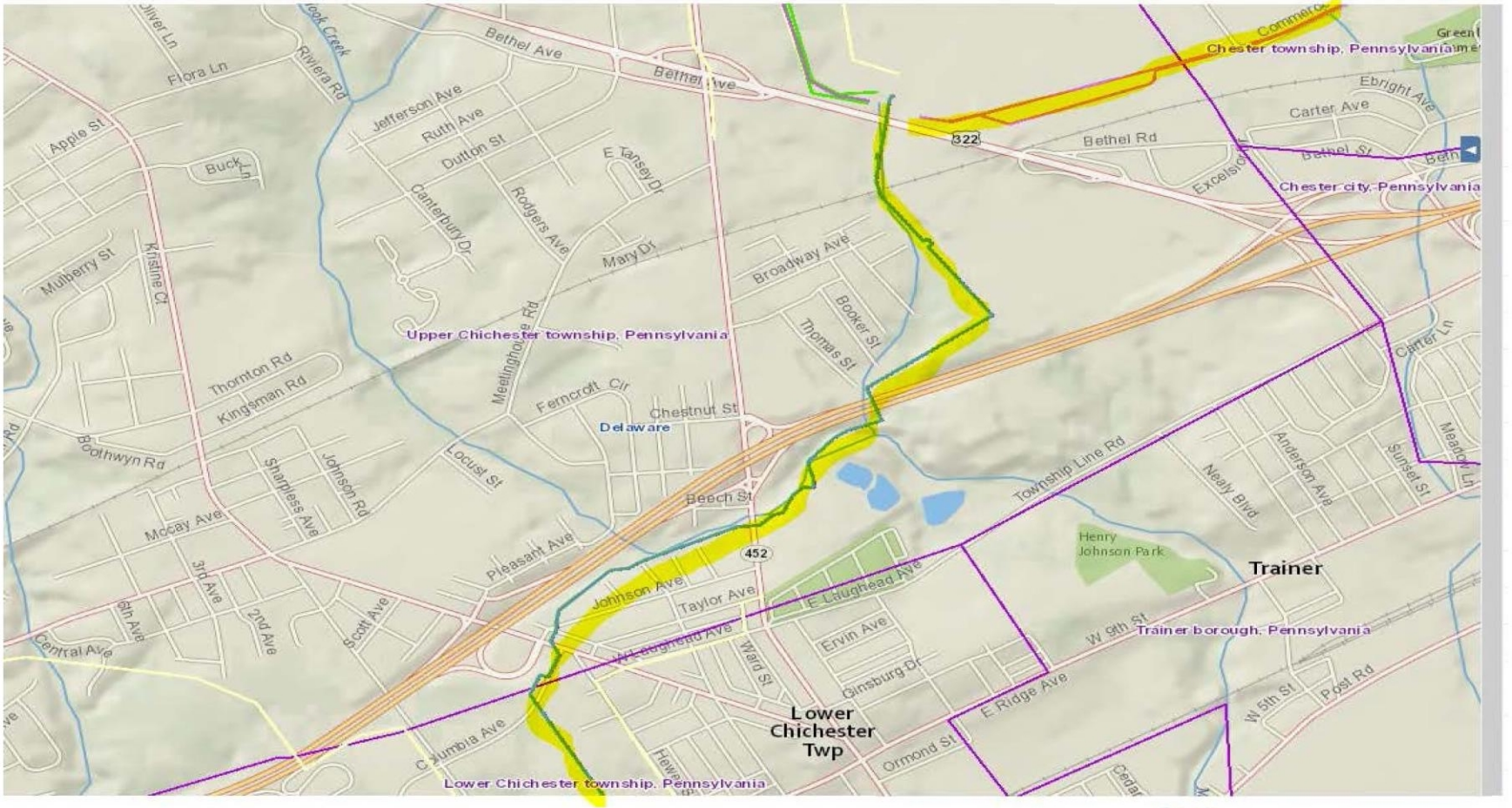
# Delaware County-Upper Chichester Township



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# Delaware County-Lower Chichester & Marcus Hook




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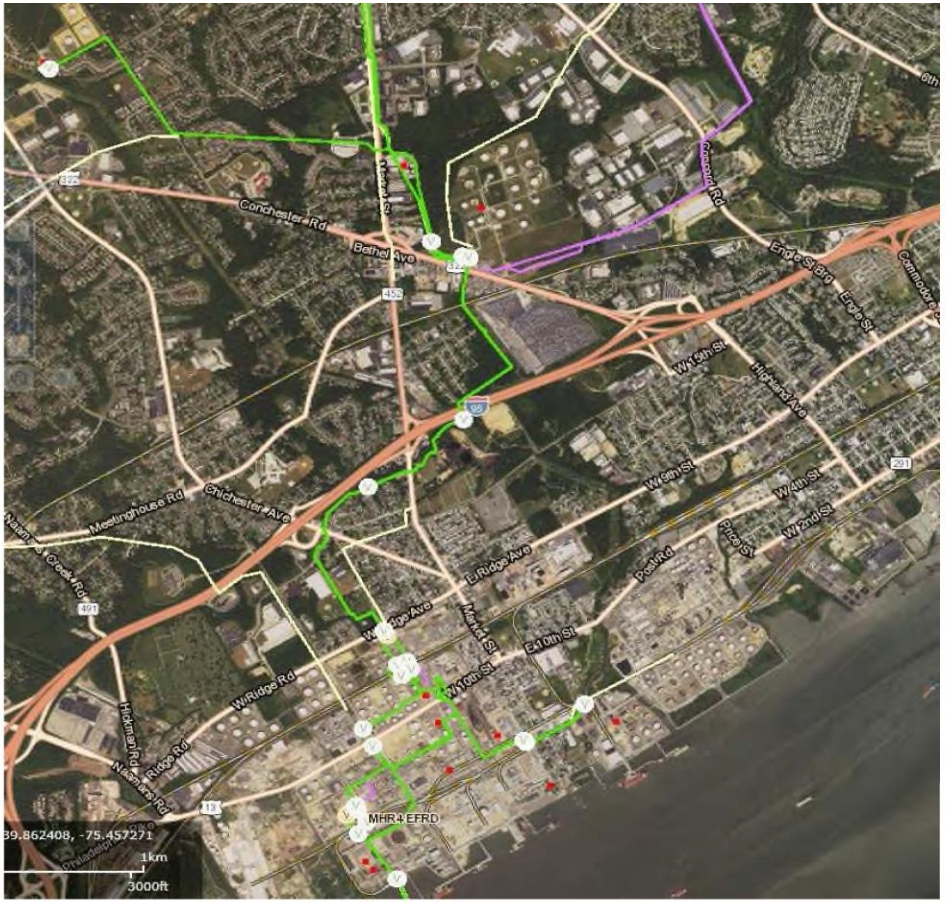
# Delaware County-Twin Oaks to MHIC



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# Pipeline Operations

- Gathering Lines
- Transmission Lines
- Distribution Lines
- Pump Stations
- Valve Sites

Pipeline Operations

# Gathering Lines

- Smaller diameter pipelines from well heads to gas storage and/or treatment facilities
- Sunoco does not operate gathering lines on Mariner projects



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Pipeline Operations

# Gas Processing Plants

- "Cleans & separates" wellhead gas / NGL's to ethane, propane and butane prior to shipment
- Sunoco does not operate gas plants on Mariner Projects



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Pipeline Operations

# Transmission Pipelines

- Larger diameter pipelines that link gathering and distribution networks
- High Volatile Liquid (HVL) products
- ME Projects – 8, 20 and 16-inch diameter pipelines at pressures up to 1,480 psi



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Pipeline Operations

# Distribution Pipelines

- Distribution Lines
  - Move product from the transmission system and storage facilities directly to the consumer
  - Diameters range from 0.5 to 18 inches
  - Pressures up to 250 psi on distribution mains
  - Sunoco does not operate distribution lines on Mariner Projects

Pipeline Operations

# Pump Stations

- Pipeline flow pressure is lost through friction loss and elevation
- Pumps boost and maintain pressure within the pipeline
- Number and location vary with each ME project
- Scenarios include:
  - Electrical Fire
  - Fuel Fed Fire
  - Unignited Vapor Release

# Pipeline Valve Sites

- Valve sites located about every 5 miles along right-of-way
  - Automated valves controlled from Pipeline Control Center (PCC)
  - Manual valves only to be used by pipeline personnel
- Pump stations and valve sites secured with fencing and locked entry
- Responders should not enter a pump station or valve site unless directed by pipeline company officials

# Pipeline Maintenance

- Corrosion counter-measures include pipeline coatings and use of cathodic protection (induced electrical current)
- Inline Inspection (Smart Pig)
  - Inserted into the pipeline for internal inspection
  - Run the pipeline approximately every five years

Pipeline Operations

# Pipeline Maintenance

- Sunoco provides notifications to emergency responders of major maintenance activities:
  - Flaring of product
  - Smart Pig runs
  - Road openings
  - Major excavation



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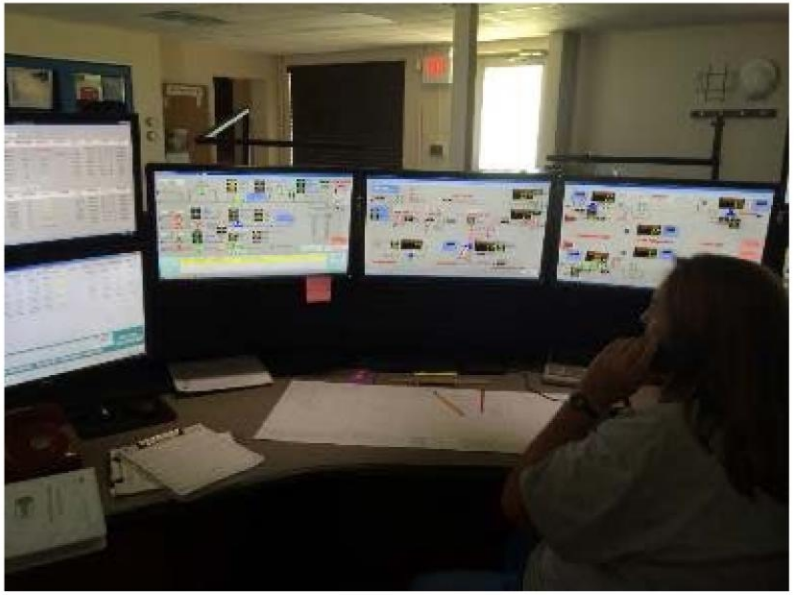
Pipeline Operations

# Pipeline Control Center (PCC)

- Heart of pipeline operations
  - "command & control center for pipeline operations."
- Accomplished through the Supervisory Control & Data Acquisition (SCADA) System
  - Leak Warn System
- Sunoco PCC operates 24/7/365 at **1-800-786-7440**





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# Pipeline Monitoring

- Aviation and Surface Patrols
  - Conduct bi-weekly aerial patrol (weather permitting)
  - Federal requirement - interval not to exceed 21 days
  - Periodic ground patrols of the no-fly zones (class B air space)
  - Drive / walk the pipeline on scheduled flight days when it cannot be flown

Pipeline Recognition & Identification

# Where is the Pipeline Located?

- Pipeline right-of-way clearly identified by pipeline markers along pipeline routes
  - Identify the approximate — ***NOT EXACT*** — location of the pipeline
- Markers provide emergency responders with critical info
- Spaced at intervals that are within sight of the next marker
- Typically seen where pipeline intersects a street, highway, railway or navigable waterway




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Pipeline Recognition & Identification

# Where is the Pipeline Located?

- Every pipeline marker provides:
  - Company that operates the pipeline
  - Product transported
  - Emergency phone number
- Most pipelines are underground - protected from the elements and minimizes interference with surface uses
- Markers ***do not*** indicate pipeline burial depth - this will vary
- Federal crime to deface, damage, remove or destroy any pipeline marker




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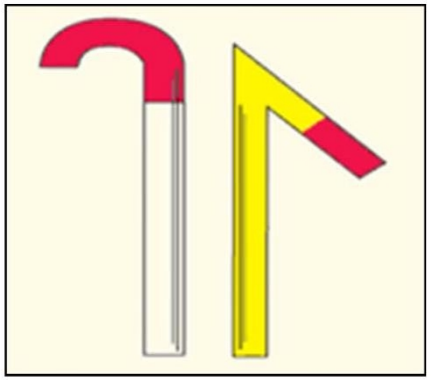
## Pipeline Recognition & Identification

# Where is the Pipeline Located?

- Pipeline Marker
  - Contains Sunoco Pipeline information, type of product, and our emergency contact number
  - Size, shape and color may vary
- Aerial Marker
  - Skyward facing markers are used by patrol planes that monitor pipeline routes
- Casing Vent Marker
  - Indicates that a pipeline (protected by a steel outer casing) passes beneath a nearby roadway, rail line or other crossing


**Pipeline Markers**


**Aerial Marker**



**Casing Vent Markers**



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Pipeline Recognition & Identification

# Where is the Pipeline Located?


Report damaged markers to Sunoco at 1-800-786-7440 (24/7/365)

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Pipeline Recognition & Identification

# Where is the Pipeline Located?



Aerial and Casing Vent Markers



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Mariner Products

# Natural Gas Liquids (NGL)

- Natural gas ($CH_4$) is a hydrocarbon that can be processed to produce natural gas liquids and liquefied petroleum gas (LPG)
- Natural gas from the Marcellus Shale fields (PA, OH, WV) is processed into products such as
  - Ethane ($C_2H_6$)
  - Propane ($C_3H_8$)
  - Butane ($C_4H_{10}$)
  - Iso-butane ($C_4H_{10}$)
  - Pentane ($C_5H_{12}$)

Mariner Products

# Natural Gas Liquids (NGL)

- Products can be used as feedstock in petrochemical plants, burned for home heating and cooking, and blended into gasoline
- Mariner East pipeline projects transport ethane, propane and butane
- ME 2 and 2X pipeline shipments “batched” on multi-day cycle
  - PCC can provide the specific product information

Mariner Products

# Ethane, Propane, Butane – General Hazards

- Vapor Behavior
  - Initially heavier than air, spread along ground and may travel to source of ignition and flash back
  - Colorless, tasteless and odorless
  - Visible vapor cloud?
- Shipped under high pressure
  - Up to 1,480 psi

Mariner Products

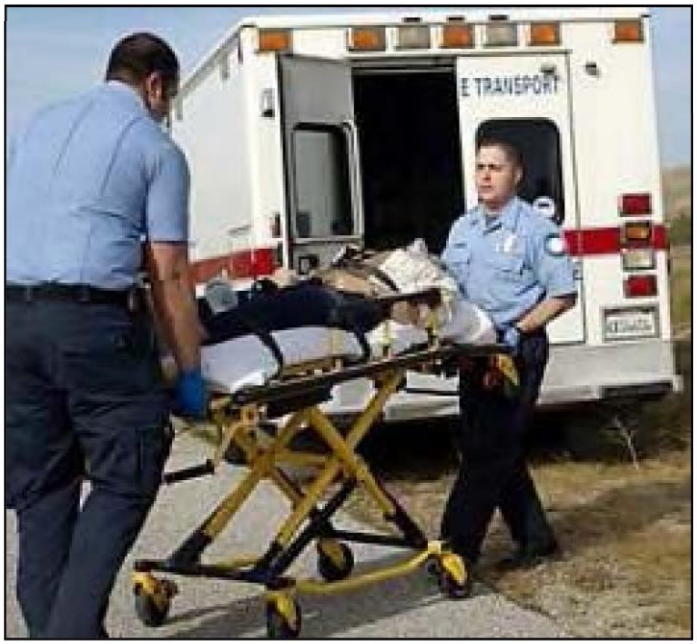
# Ethane, Propane, Butane – General Hazards

- Health Hazards
  - Vapors can be easily ignited & form flammable mixtures with air
  - May cause dizziness or asphyxiation without warning
  - May be toxic if inhaled at high concentrations
  - Skin contact with gas or liquefied gas may cause burns, severe injury and/or frostbite
  - Combustion may produce irritating and/or toxic gases

Mariner Products

# Ethane, Propane, Butane – Medical Care

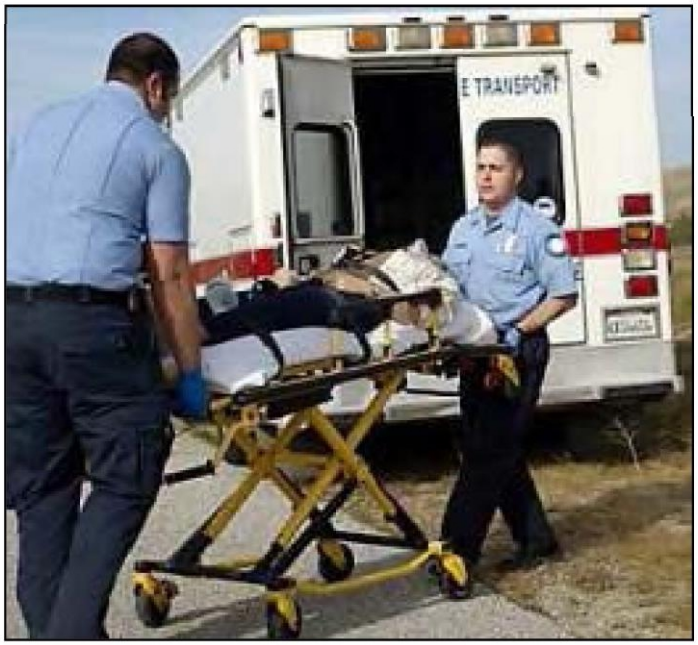
- Remove victim to fresh air
- Provide respiratory support as needed
- Remove and isolate contaminated clothing and shoes
  - Clothing frozen to skin should be thawed prior to removal



Mariner Products

# Ethane, Propane, Butane – Medical Care

- In case of contact with liquefied gas, frosted body parts should be thawed slowly with lukewarm water
- For thermal burns, immediately cool affected areas with cold water
  - Do not attempt to remove clothing that is adhering to burned skin



Mariner Products

# Ethane, Propane, Butane - Properties

- **Boiling Point**
  - Temperature at which a liquid changes its phase to a vapor or gas
  - Boiling point of NGL's
    - Ethane = -127° F
    - Propane = - 44° F
    - Butane = 32° F
  - When released, liquid ethane will immediately vaporize
  - Expansion ratios

Mariner Products

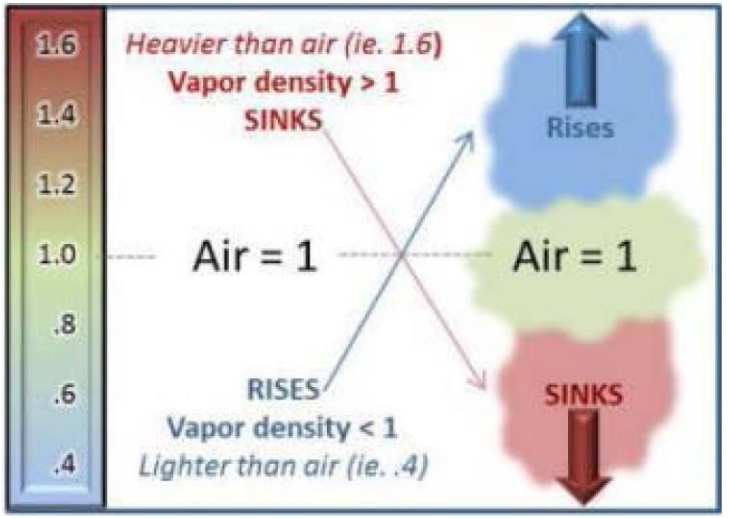
# Ethane, Propane, Butane - Properties

- **Specific Gravity**
  - Weight of a solid or liquid material compared with the weight of an equal volume of water. Water = 1.
  - Specific gravity of NGL's
    - Ethane = 0.546 (lighter than water)
    - Propane = 0.51
    - Butane = 0.58
  - If release is underwater, vapors will rise to surface and vaporize

Mariner Products

# Ethane, Propane, Butane - Properties

- **Vapor Density**
  - Weight of a pure vapor or gas compared with the weight of an equal volume of dry air at same temperature & pressure
  - Informs the responders where vapors will accumulate
  - Vapor density of NGL's
    - Ethane = 1.1
    - Propane = 1.56
    - Butane -= 2.0 (twice as heavy as air)



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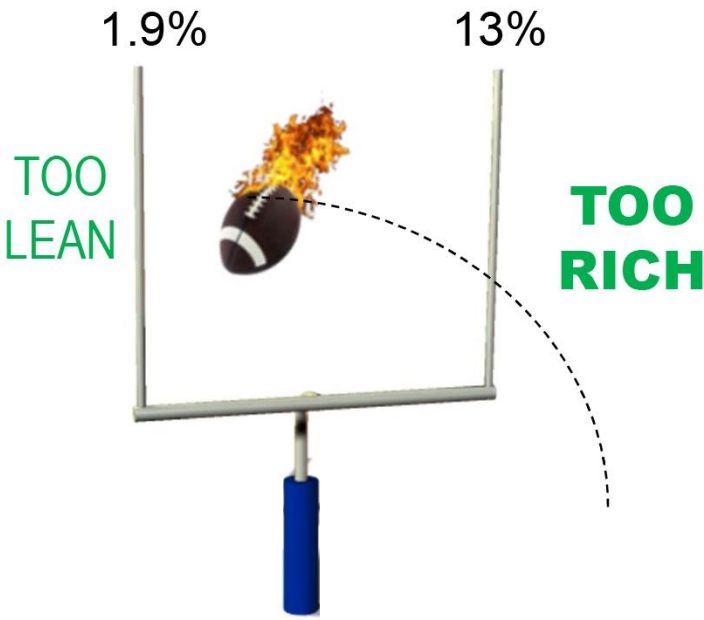
Mariner Products

# Ethane, Propane, Butane - Properties

- **Flammable Range**
  - Range of gas or vapor concentration (% by volume of air) that will burn or explode if an ignition source is present
  - Informs emergency responders as to what concentration of vapors will support combustion
  - Flammable range of NGL's
    - Ethane = 2.9 to 13%
    - Propane = 2.2 to 9.5%
    - Butane = 1.9 to 8.5%



Mariner Products

# Ethane

- CAS Number: 74-84-0
- UN/NA ID: 1035
- Odorless and colorless gas at standard temperature and pressure
- Liquid under high pressure while in the pipeline
- Stable and resistant to reactivity
- Soluble in water
- Flashpoint: -211° F
- Boiling point: -127 ° F
- Flammable Range: 2.9% - 13%
- Vapor Density: 1.1
- Specific gravity: .546

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## Mariner Products

# Propane

- CAS Number: 74-98-6
- UN/NA ID: 1978
- Odorless and colorless gas at standard temperature and pressure
- Liquid under high pressure while in the pipeline
- Stable and resistant to reactivity
- Soluble in water
- Flashpoint: -156° F
- Boiling point: -44 ° F
- Flammable Range: 2.2% - 9.5%
- Vapor Density: 1.56
- Specific gravity: .51




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## Mariner Products

# Butane

- CAS Number: 106-97-8
- UN/NA ID: 1011
- Odorless and colorless liquefied gas at standard temperature and pressure
- Liquid under high pressure while in the pipeline
- Stable and resistant to reactivity
- Very slightly soluble in water
- Flashpoint: -100° F
- Boiling point: 32 ° F
- Flammable Range: 1.9% - 8.5%
- Vapor Density: 2.0
- Specific gravity: .58




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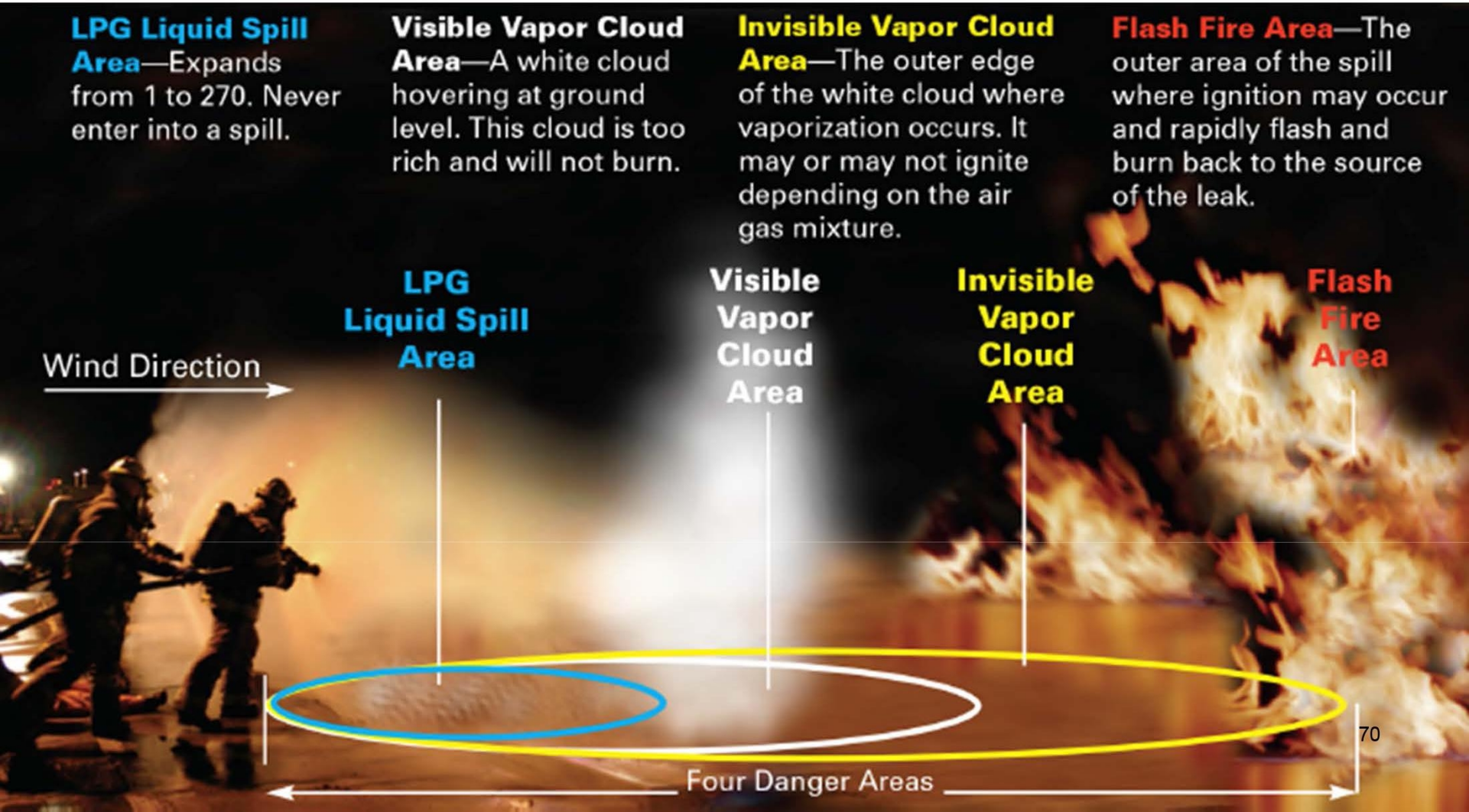
Mariner Products

# NGL Physical Properties

| | PRODUCTS | | |
|---|---|---|---|
| **Property** | **Ethane** | **Propane** | **Butane** |
| *Flashpoint* | -211 F | -156 F | -100 F |
| *Boiling Point* | -127 F | -44 F | 32 F |
| *Expansion Ratio* | 437:1 | 270:1 | 233:1 |
| *Flammable Range* | 2.9%-13% | 2.2%-9.5% | 1.9%-8.5% |
| *Vapor Density* | 1.1 | 1.56 | 2.0 |
| *Specific Gravity* | .546 | .51 | .58 |

# Four Danger Areas of LPG Release



Mariner Products

# Propane Vapor Cloud Video

# Managing the Pipeline Incident

- A leading cause of serious pipeline incidents is damage caused by third party activity
- For the purpose of this training session, pipeline incidents are considered to be releases
- Release scenarios will be considered as:
  - Not ignited
  - Ignited

Pipeline Incidents

# ER Procedures – 911 Dispatch

- 911 / PSAP personnel play a critical role in effective response to pipeline incidents
- Knowing the pipeline operators, their contact information, and the products transported in your respective jurisdiction is critical for a prompt and correct response in the event of a pipeline incident

Pipeline Incidents

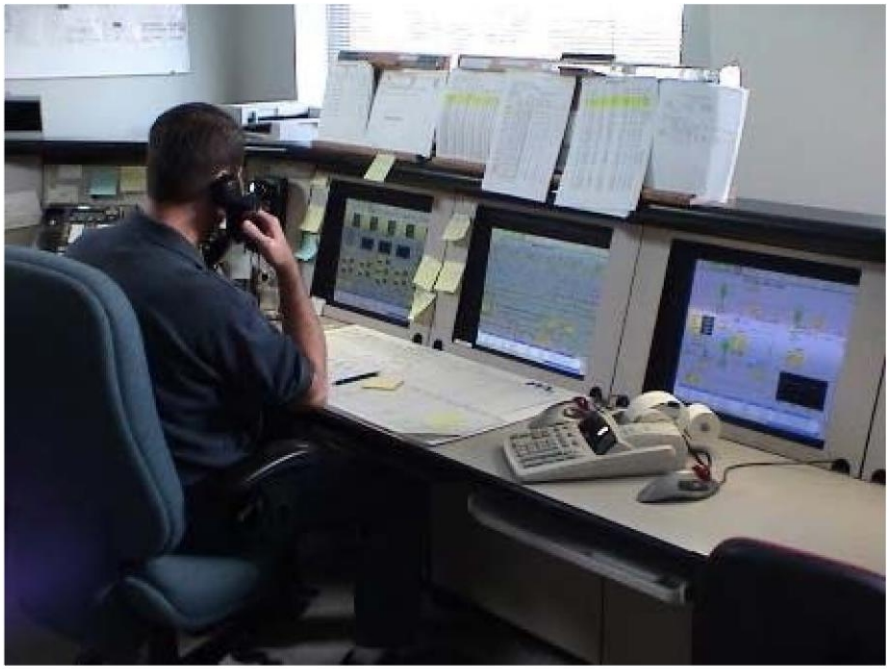
# ER Procedures – 911 Dispatch

- Follow these simple guidelines in the case of a pipeline incident:
  - Gather the proper information *(if possible): pipeline company, product, and release characteristics*
  - Know the appropriate response to the product
  - Know the wind direction at the time
  - Warn of ignition sources if possible
  - Dispatch appropriate emergency responders
  - Contact the pipeline company

    1-800-786-7440 (24/7/365)

# ER Procedures – Pipeline Operator

- **Pipeline Operator needs to know:**
  - Your contact information and location of the emergency
  - Size, characteristics and behavior of the incident, and if there are any primary or secondary fires
  - Any injuries or deaths
  - Proximity to any structures, buildings, etc.
  - Environmental concerns such as bodies of water, grasslands, endangered wildlife and fish, etc.



Pipeline Incidents

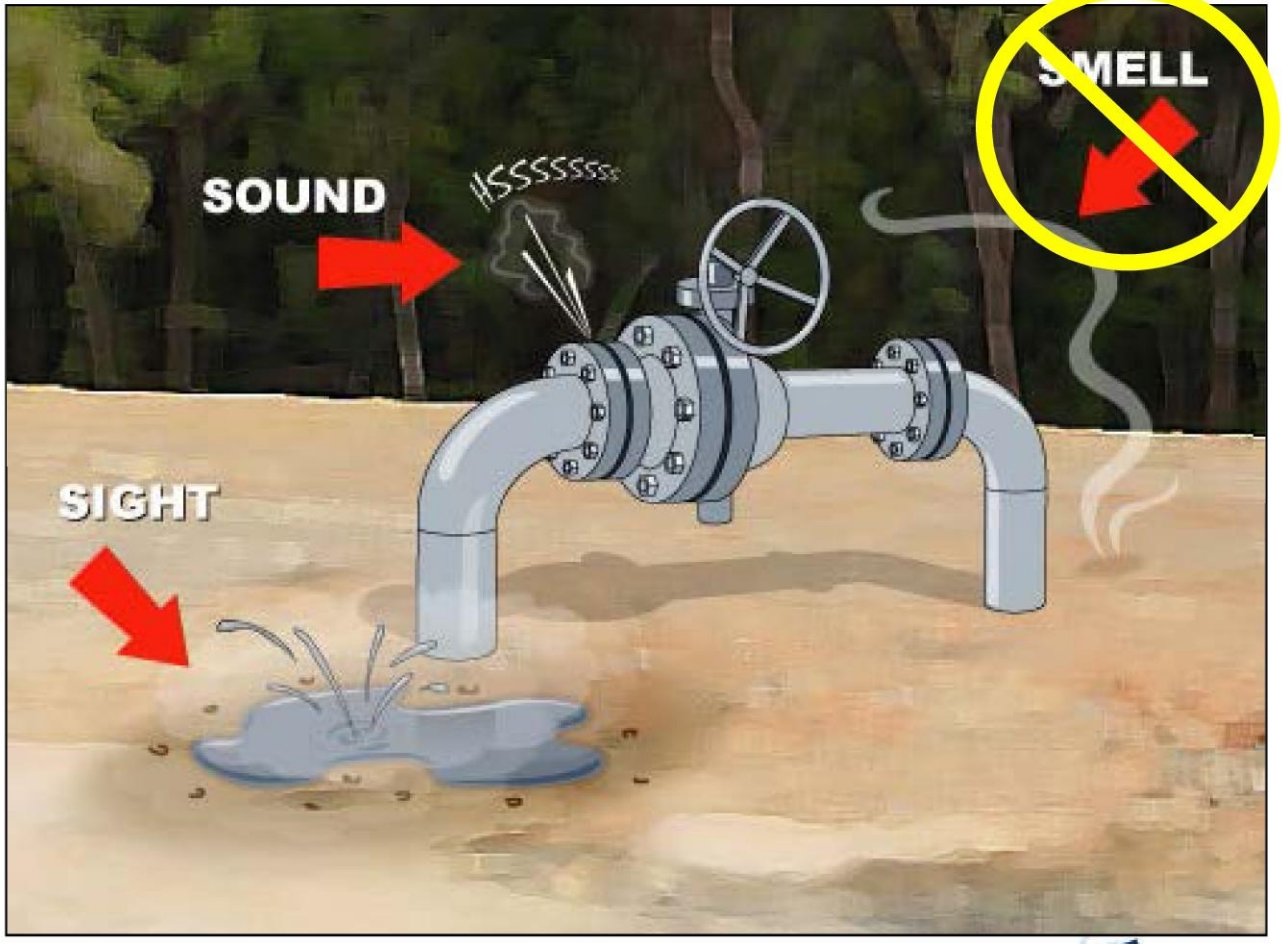
# Emergency Response Procedures

## How would you recognize a pipeline release?

- Sight
  - Discolored or abnormally dry soil/ vegetation
  - Continuous bubbling in wet or flooded areas
  - Oily sheen on water surfaces
  - Vapor fog or blowing dirt around a pipeline area
  - Frozen ground in warm weather
  - On a cold day, a butane release may create a puddle
- Sound
  - Volume can range from a quiet hissing to a loud roar
- Smell
  - Odorless

Pipeline Incidents

# Recognizing a Release



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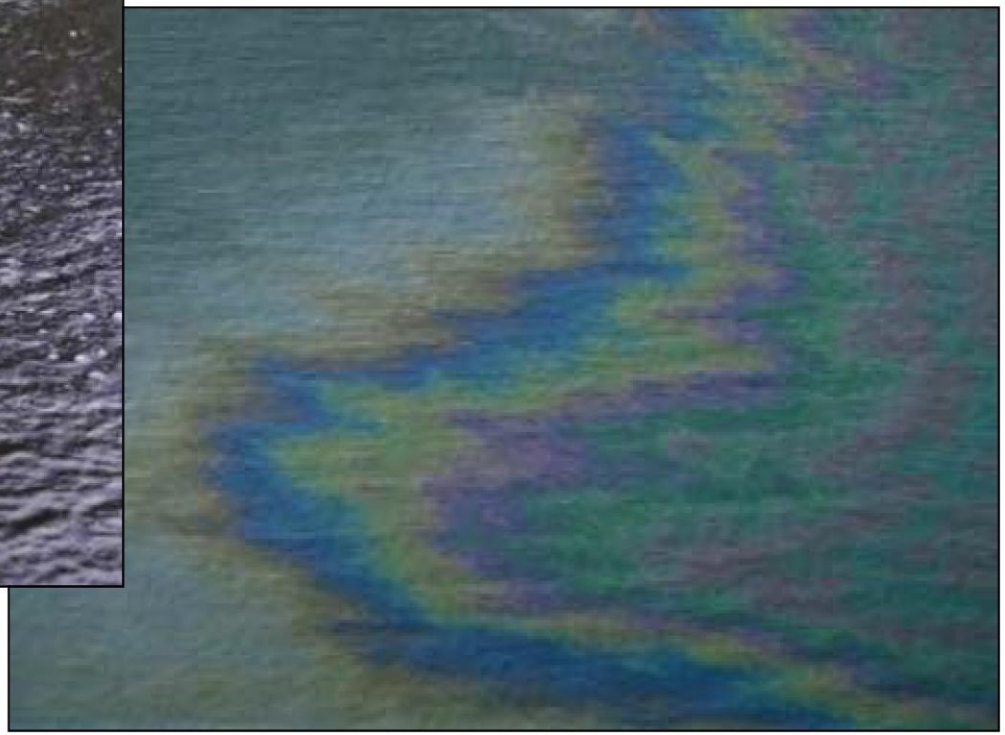
Pipeline Incidents

# Recognizing a Release





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Pipeline Incidents

# Recognizing a Release

Pipeline Incidents

# Recognizing a Release



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# ER Procedures – Incident Command

- Assume command & establish an Incident Command Post (ICP)
  - Use NIMS / ICS
  - Assign a Safety Officer
  - Unified Command
- Isolate the scene and deny entry
- Work & coordinate with Pipeline Reps to develop an Incident Action Plan (IAP)

1-800-786-7440 (24/7/365)



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Pipeline Incidents

# Critical Size-Up Questions

- Determine what is happening?
- Are there any immediate life threatening issues that must be addressed?
- Can responders safely approach the incident?
- Is the incident rapidly increasing in size or scope?
- Do responders fully understand the nature and scope of the problem?




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Pipeline Incidents

# ER Procedures – Initial Actions

- **Secure the area around the release to a safe distance**
  - Identify & verify the product involved – ethane, butane,  propane?
  - Refer to 2016 ERG – Guide 115
  - Control access to the site
  - Highly Volatile Liquid (HVL) vapors
    - Heavier than air
    - Collect in low areas such as ditches, sewers
    - Can migrate great distances
  - Remove all ignition sources from the area
  - If safe, evacuate people from homes, businesses, schools, etc.
  - Sheltering in place may be an alternative




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# GUIDE 115 GASES - FLAMMABLE (INCLUDING REFRIGERATED LIQUIDS)

## POTENTIAL HAZARDS

### FIRE OR EXPLOSION

- **EXTREMELY FLAMMABLE.**
- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.
- Vapors from liquefied gas are initially heavier than air and spread along ground.

**CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966) and Methane (UN1971) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)**

- Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

### HEALTH

- Vapors may cause dizziness or asphyxiation without warning.
- Some may be irritating if inhaled at high concentrations.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and/or toxic gases.

## PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind, uphill and/or upstream.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).

### PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

### EVACUATION

**Large Spill**

- Consider initial downwind evacuation for at least 800 meters (1/2 mile).

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- In fires involving Liquefied Petroleum Gases (LPG) (UN1075); Butane, (UN1011); Butylene, (UN1012); Isobutylene, (UN1055); Propylene, (UN1077); Isobutane, (UN1969); and Propane, (UN1978), also refer to BLEVE – SAFETY PRECAUTIONS (Page 368)

## EMERGENCY RESPONSE

### FIRE

- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

**CAUTION: Hydrogen (UN1049), Deuterium (UN1957) and Hydrogen, refrigerated liquid (UN1966) burn with an invisible flame. Hydrogen and Methane mixture, compressed (UN2034) may burn with an invisible flame.**

**Small Fire**

- Dry chemical or $CO_2$.

**Large Fire**

- Water spray or fog.
- Move containers from fire area if you can do it without risk.

**Fire involving Tanks**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

### SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

**CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.**

### FIRST AID

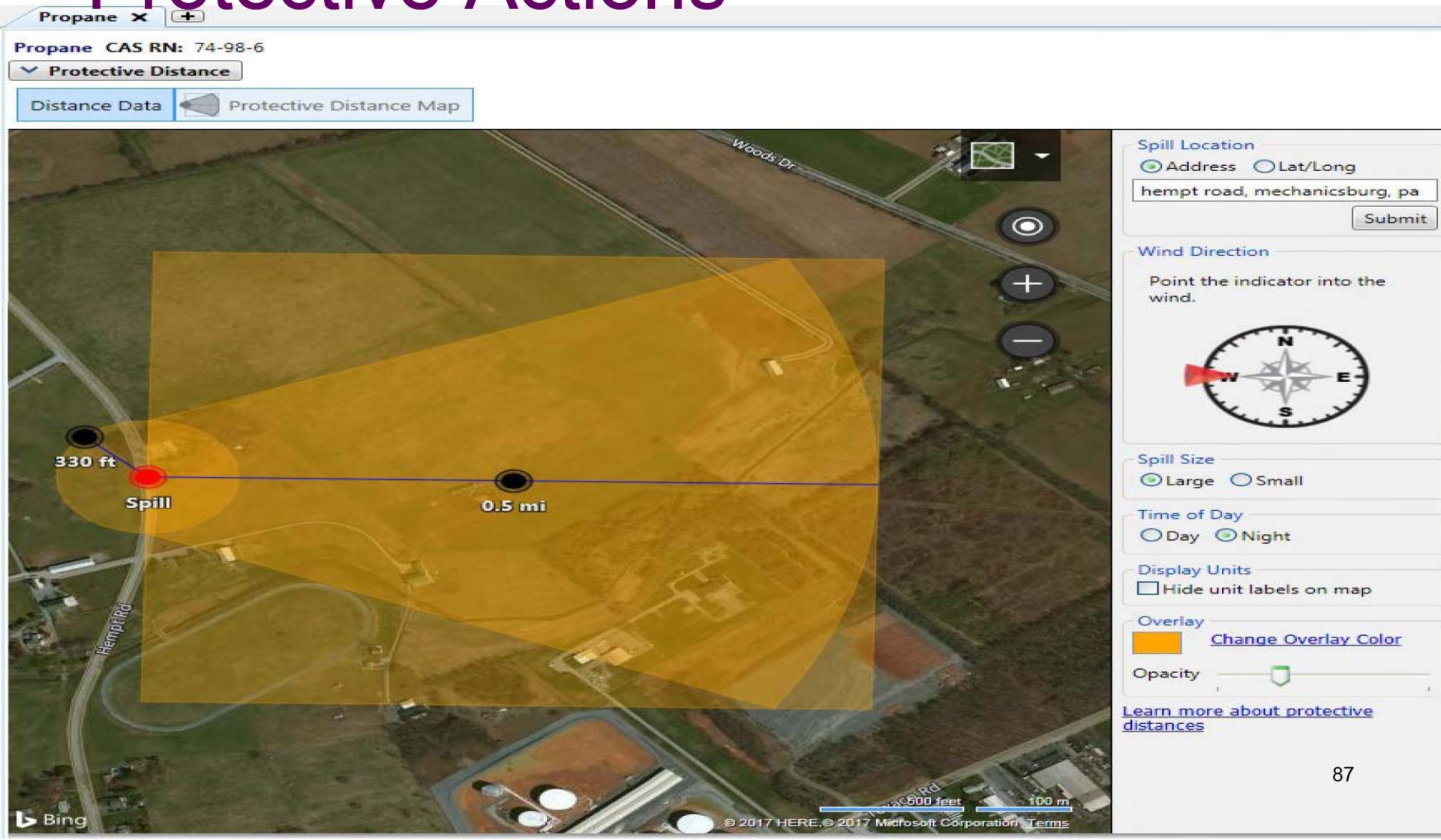
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim calm and warm.

# ER Procedures – Hazard Assessment

- National Library of Medicine's "Wireless Information System for Emergency Responders" (WISER)
  - http://wiser.nlm.nih.gov/
  - Search – "WISER"
- WISER - designed to assist first responders at HM incidents
- Provides information on:
  - Substance identification support
  - Physical & chemical properties
  - Health info
  - Containment and suppression advice

## Pipeline Incidents

# Protective Actions



# ER Procedures – No Ignition

- **If the pipeline release is <u>NOT</u> ignited:**
  - Control all ignition sources (e.g., flares, open flame)
  - DO NOT start motor vehicles or electrical equipment
  - Special considerations for butane liquid in cold temps

# ER Procedures – No Ignition

- **If the pipeline release is <u>NOT</u> ignited:**
  - DO NOT ring doorbells
  - DO NOT drive into a vapor cloud
  - DO NOT attempt to operate any pipeline valves
    - May inadvertently route more product to the release or cause a secondary incident

# ER Procedures – No Ignition

- **Air Monitoring Considerations**
  - To what gas is your meter calibrated? Correction factor to LPG?
  - At what level are you monitoring?
  - Do you have a sampling tube? Lag time?
  - What is the meter telling you? Action levels?

# ER Procedures – Ignition & Fire

- **If the pipeline release <u>IS</u> ignited:**
  - DO attempt to control the ***spread*** of the fire
  - DO protect exposures
  - DO NOT attempt to extinguish a product fire

# ER Procedures – Ignition & Fire

- **If the pipeline release <u>IS</u> ignited:**
  - If extinguished, petroleum products and vapors may collect and explode if reignited by secondary fire
  - DO NOT attempt to operate any pipeline valves
  - May inadvertently route more product to the release or cause a secondary incident

# ER Procedures – Protective Actions

- **Evacuate / Shelter-in-Place**
  - May be necessary to evacuate the public and/or shelter in place
  - Options based upon size and location of incident vs. exposures
  - Use 2016 Emergency Response Guidebook guidance
  - Evacuate to the upwind side of the incident, if necessary
  - Involving the Pipeline Company may be important in making this decision

Pipeline Incidents

# Risk-Based Response – Key Points

- Every incident will arrive at some outcome, whether responders intervene or not.
- Responders goal is to favorably change or influence the OUTCOME of the incident.
- If responders cannot favorably change the natural outcome, defensive or non-intervention strategies may be the best option.

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Pipeline Incidents

# Recognizing Other Hazards

- Hazards to pipeline may extend beyond releases & fires
- Pipeline safety and security concerns exist along ROW
- Observe, investigate, and report suspicious activities and **excavation** in the vicinity of the pipeline
  - "If you see something, say something!"
  - Ask the Excavator if they made a One Call notification and if a pipeline representative approved the operation

**NOTE**: Sunoco Pipeline employee(s) must be present for all excavation near the pipeline

811 Know what's below. Call before you dig.

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# Recognizing Other Hazards

- Vehicles and equipment without any markings or identification
- People surveying the pipeline or access points to the ROW
  - Taking photos in the pipeline ROW
  - Asking specific questions about the pipeline, its location and products
  - Observation of or questions about pipeline security measures
- Signs of vandalism, loitering, or other suspicious activity

Transportation Security Administration


PIPELINE SECURITY
TRANPORTATION SECTOR NETWORK MANAGEMENT (TSNM)
AUGUST 2006



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# Annual Emergency Responder Liaison Meetings

- Meetings normally take place
  - Pennsylvania in August/September/October
- Feature a good meal and important pipeline safety information from different pipeline operators
- Provide email contact info on sign-in sheet
  - Will receive an invite to future training sessions

| Date | Facility | Facility Address | City |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# Sunoco Pipeline LP
# **M**ariner **E**mergency **R**esponder **O**utreach

- Supplemental Information Sources
  - Pipeline Emergencies, 3rd Edition, E-Book
    - Michael Hildebrand and Gregory Noll
    - http://www.pipelineemergencies.com/program.html
  - Pipeline Safety brochure
    - Sunoco Pipeline
  - Sunoco Pipeline website
    - http://www.sunocologistics.com/Public-Awareness/Pipeline-Safety/For-Public-Safety-Officials/72/
  - 2016 Emergency Response Guidebook
    - U.S. Department of Transportation / Pipeline and Hazardous Materials Safety Administration
    - Web version available at: http://phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Hazmat/ERG2012.pdf



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# Shoulder2shoulder.tv

Shoulder To Shoulder

## Video 1: Pipeline Overview

- More than two million miles of pipelines deliver oil, oil products and natural gas
- Pipelines are an important part of our nation's infrastructure
- Operators have numerous programs to ensure the safety of the network
- Every day, operators are committed to monitoring and safely operating their pipelines

## Video 5: Emergency Response Roles

- **9-1-1 dispatcher:** Gathers and relays critical information
- **Firefighter:** Secures the area
- **Pipeline operator:** Controls release of product
- **Law enforcement:** Assists in site security and evacuation
- **Emergency medical services:** Provides medical aid
- **Emergency management:** Coordinates community response

## Video 3: Liquids Pipelines & Hazards of Liquids

*Warning signs of a liquids pipeline release*

- Dead or discolored vegetation
- Sheens on water or flat surfaces
- Pools of liquid not usually present along the right of way (ROW)
- Vapor cloud or mist
- Dirt being blown into the air
- Fire coming from the ground
- Presence of construction equipment near the ROW
- Distinctive hydrocarbon odor
- Hissing or roaring sound

# Workshop Objectives

- Participants will be able to:
  - Describe the general path of the Mariner East 2 pipeline through their community /region
  - Identify component parts of a pipeline operation
  - Describe the hazards associated with Natural Gas Liquids (NGL) products
  - Describe the types of NGL incident scenarios that may involve Mariner East 2 pipeline operations
  - Describe emergency response procedures pertinent to incidents involving the Mariner East 2 pipeline

# Brief Session Evaluation

- Sunoco Pipeline LP thanks you for your participation
- Please ensure that you signed the check-in sheet
- Please complete the brief session evaluation
  - Helps to make future programs more effective
- Thank you for all that you do!

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SUNOCO PIPELINE
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# **M**ariner **E**mergency **R**esponder **O**utreach

Local Field Operations Supervisor:

XXXX (XXX) XXX-XXXX

xxxxxxxxxxxxx@energytransfer.com

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Additional information on the pipelines in your community is available by contacting Sunoco Pipeline at 877-795-7271 or from **www.energytransfer.com**.

Kevin Docherty

Manager – Public Awareness

**Kevin.Docherty@energytransfer.com**

**Thank You!**

# Safety Pipeline LP
# Safe Driving Minute


SUNOCO PIPELINE
An ENERGY TRANSFER Partnership

# Exhibit SPLP GN-3

SPLP
GN-3

# CHESTER COUNTY DEPARTMENT OF EMERGENCY SERVICES

# PIPELINE EMERGENCY PREPAREDNESS & TRAINING TABLETOP EXERCISE

## After Action Report
## May 18, 2018


DEVELOPED FOR CHESTER COUNTY DES

BY

GGN TECHNICAL RESOURCES, LLC

"EMERGENCY PLANNING AND CRISIS MANAGEMENT CONSULTANTS"

LANCASTER, PA

## GOAL

Using a tabletop exercise environment, provide an opportunity for the Chester County emergency preparedness community to assess its capability to effectively plan for, respond to, and manage the initial operational period of a transmission pipeline incident.

This exercise was sponsored through a Technical Assistance Grant provided through the U.S. Department of Transportation – Pipeline and Hazardous Materials Safety Administration (PHMSA)

## OBJECTIVES

The purpose of the tabletop exercise was to implement and evaluate the Chester County Emergency Operations Plan – Pipeline Emergency Annex. Using a discussion-focused tabletop exercise format, the objectives of the exercise were:

1. Assess the guidance and procedures for transmission pipeline emergencies outlined in the Chester County Emergency Operations Plan.

2. Outline the pipeline operator procedures for alerting and notifying 911 / emergency responders when an emergency involves their facilities or pipelines.

3. Outline the critical tasks to be performed by emergency response personnel upon their initial arrival at a pipeline emergency.

4. Assess incident potential and develop initial response objectives as part of a risk-based incident size-up process.

5. Outline the processes for coordinating emergency response operations

## EXERCISE LOCATION AND POINTS OF CONTACT

All exercise activities were conducted at the Chester County Public Safety Training Campus, 137 Modena Road, Coatesville, PA 19320.

The point of contact for the exercise was Chief Frank Sullivan, Chief – Chester County HMRT. Phone: (610) 344-5086 (office). E-mail: FSullivan@chesco.org

The Exercise Facilitator was Gregory Noll, GGN Technical Resources, LLC. Phone: (717) 575-0514. Email: ggnoll@me.com

## EXERCISE PLANNING ASSUMPTIONS

- There are numerous liquid and gas pipeline corridors throughout Chester County. These pipeline right-of-ways are located in urban, suburban and rural environments. The probability of a pipeline release scenario having community impacts is high.

- Any pipeline emergency with a 911 notification will automatically result in a public safety response, with the AHJ's (authority having jurisdiction) Senior Fire Department Officer functioning as the Incident Commander.
- Upon arrival on-scene, pipeline personnel will report to the Incident Command Post (ICP). The initial pipeline representative will likely serve as the initial pipeline liaison to the Incident Commander until the arrival of a supervisor.
- Initial public safety tasks responsibilities will include:
    - Assume command and establish an initial Incident Command Post (ICP).
    - Establish an initial isolation perimeter and hazard control zones.
    - Identify and verify the product(s) being transported by the pipeline
    - Ensure safe isolation and shutdown of the pipeline.
    - Initiate initial public protection actions to protect the public and community.
    - Initiate air monitoring and detection tasks to characterize site hazards.
- As the incident timeline progresses, a unified command organization will be established.
- Emergency responders will employ a risk-based management process based upon incident facts, science and incident circumstances.

## EXERCISE SCENARIOS

The tabletop exercise consisted of two different exercise scenarios. The purpose of each scenario was to serve as a "platform for discussion" for each type of transmission pipeline found in Chester County and was not focused towards a specific pipeline operator or location.

- Scenario #1 – Gas Transmission Pipeline Incident. This incident involved the release of natural gas liquids (NGL) from the Mariner East pipeline. This scenario was a vapor release / non-fire incident in which the initial incident report to 911 was provided by the pipeline operator. Incident location was Boot Road and Wilson Drive in East Goshen Township, between Route 202 and Paoli Pike.
- Scenario #2 – Liquid Petroleum Product Transmission Pipeline Incident. This incident involved a release and fire of liquid petroleum products from the Buckeye pipeline. The initial incident report to 911 was provided via multiple calls from the public at-large and the pipeline operator. Incident location was the 400 block of Peck Road at Anne Griffiths Court in Uwchlan Township.

A Master Scenario Events List (MSEL) and associated photos are attached for each scenario.

## EXERCISE FORMAT AND EVALUATION

The exercise was conducted in a tabletop exercise format using a facilitated discussion process. Scenario information and questions were presented by the Exercise Facilitator

Participants consisted of three primary audiences:

- *On-Scene Personnel*. This group included public safety responders and pipeline personnel who will be on-scene.
- *Key Government and Non-Government Stakeholders.* This group included DES personnel not located on-scene, local emergency management and elected officials from the AHJ, and representatives from facilities and sensitive receptors (i.e., schools, healthcare facilities, senior centers, etc.) impacted by the exercise scenario.

- *Guests and Observers.* This group included all other attendees.

At the conclusion of the exercise, the following evaluation process was used:

- Each individual was asked to complete a two-page Exercise Evaluation Questionnaire. These were then collected and summarized into a single report post-exercise (see Attachment C).
- Participated in a facilitated debriefing to discuss key lessons learned.
- A final After Action Report (AAR) was developed by the Exercise Facilitator and provided to Chester County DES.

## EXERCISE GROUND RULES

- Scenario inputs and related information were provided by the Incident Facilitator.
- No external communications were required outside of the room.
- All times and weather were the actual times and conditions on the day of the exercise.
- This is a Learning Exercise: "Time Outs" were called to facilitate learning and discussions.

## EXERCISE OBSERVATIONS AND RECOMMENDATIONS

Exercise Feedback Reports are included as Attachment C. The following observations and recommendations are based upon inputs from both the exercise participants and the Exercise Facilitator.

### Observations

1. North America is in the midst of an energy renaissance that is having a significant impact upon the emergency planning and response communities. Although southeastern PA has had a long-time historical relationship with the refining and energy transportation sectors, this renaissance has presented a number of new challenges for the emergency preparedness communities. These challenges include "new products" such as natural gas liquids (NGL), liquefied natural gas (LNG) and compressed natural gas (CNG), the construction of new pipelines, pipeline reversals, flammable liquid unit trains (High Hazard Flammable Trains – HHFT), CNG transportation and use, and new gas storage facilities.

2. Nine (9) transmission pipelines currently operate within Chester County and impact urban, suburban and rural communities. This includes 342 miles of liquid transmission pipelines and 252 miles of liquid transmission pipelines bsed upon data provided through the National Pipeline Mapping System (NPMS). Specific pipeline right-of-way information can be referenced from the Chester County Pipeline Information Center Mapping Application (https://chesco.maps.arcgis.com/apps) and the NPMS website (www.npms.phmsa.dot.gov),

3. Chester County has an active Local Emergency Planning Committee (LEPC) that has been engaged with its stakeholders and communities on transmission pipeline issues. Through Chester County DES and LEPC efforts and coordination, a number of pipeline training activities have been made available to the emergency response community. The effectiveness of this process was illustrated by the diversity of attendees at the tabletop exercise, including emergency responders, local and county government officials, pipeline operators, community members, and representatives from sensitive receptors (e.g., schools,

senior centers). Despite the diversity however, there is a significant target audience that is requesting additional training and educational opportunities.

4. Chester County has numerous resources that are available to support both planning and response efforts to transmission pipeline incidents. While most of these are well known to responders, they are not recognized by non-responder stakeholders. These resources include the Chester County HazMat Response Team, Fire Department Foam Units, County DES Incident Support Team, and other public and private resources that can be accessed through mutual aid. In addition, pipeline operators have agreements with environmental contractors and Oil Spill Response Organizations (OSRO), as well as industrial mutual aid organizations such as the Delaware Bay and River Cooperative (DBRC).

5. There was an overall lack of knowledge and familiarity by non-responder stakeholders with National Incident Management System (NIMS) or the Incident Command System. In addition, stakeholders are requesting training and exercise opportunities that reflect larger and more complex response scenarios, especially in the areas of information management (internal and external to the community) and public protection action decision-making.

## Recommendations

1. Chester County is fortunate that its County Leaders have supported the efforts of the LEPC. Unlike a number of its county peers, the "all hazards" focus of the Chester County LEPC has allowed it to serve as a coordination point for issues that go beyond the scope of the original SARA Title III legislation. Chester County DES should continue to ensure there is LEPC representation from many of the groups represented at the exercise, and should strongly support the use of the LEPC as a foundation for assessing and developing collaborative solutions to future pipeline and other "all hazard" challenges and risks to the community.

2. The need for additional training was noted by a number of stakeholders. Given the demands for time in both career and volunteer organizations, pipeline emergency training should complement and build upon First Responder Awareness and Operations level training requirements. The PA State Fire Academy (PSFA) has adopted the Pipeline Emergencies curriculum developed through the US Department of Transportation – PHMSA, which can be delivered in several manners. In addition, Chester County DES is in the process of developing an action plan to increase the availability of pipeline training to the response community. Additional pipeline training can also be accessed through pipeline operators and on-line sources.

3. Due to a range of operational and safety regulations and initiatives targeted towards reducing operational risks, pipeline emergencies are few in number and scope. Given the lack of actual response experience to "working" pipeline emergencies, the need for an ongoing training and exercise program that reflects a range of response scenarios is critical. While transmission pipeline scenarios are just one of a range of "all hazard" scenarios, given local and county risks it should be integrated into the multi-year local and county exercise program.

**ATTACHMENT A**

**MASTER SCENARIO EVENTS LIST (MESL)**

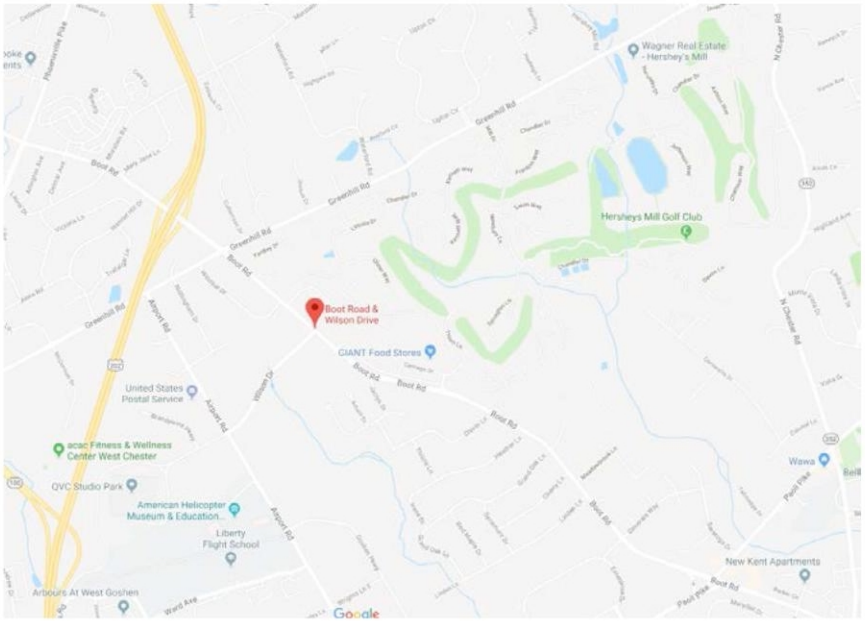
**SCENARIO #1 – GAS PIPELINE**

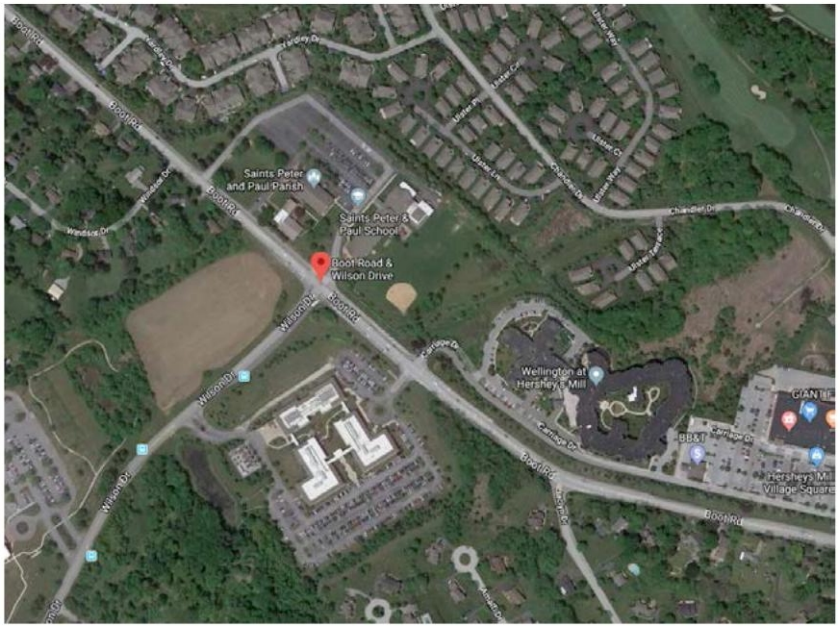
| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 00 | 0900 | Initial exercise briefing | Face-to-Face | All Participants | • Introduction of all participants<br>• Exercise goals, objectives and planning assumptions<br>• Broad overview of exercise scenario #1<br>• Exercise format and evaluation<br>• Exercise ground rules |
| 01 | StartEx | Sunoco Pipeline (SP) Control Center detects a pressure drop on the Mariner East Pipeline along Boot Drive in the area of Wilson Drive in East Goshen Township. | Face-to-Face | SP Reps | • Outline SP process and procedures for assessing the control / alarm information, making notifications to PSAP, and initial SP actions<br>• SP Control Center notifies Chester County 911 – what information will be provided?<br>• |
| 02 | StartEx + 5 min | Initial notification from SP Control Center received by the Chester County PSAP (911) | Face-to-Face | 911 Dispatcher / Supervisor | • Outline PSAP process and procedures for assessing the information, making notifications and initial dispatch assignment. CI should include:<br>○ Pipeline company, product & release characteristics<br>○ Wind direction<br>○ SP call-back info – (800) 786-7440<br>• Identify the initial dispatch assignment for a transmission pipeline incident (gas). |

| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 03 | StartEx + 10 min | Provide visual / physical description of the incident scene | Face-to-Face | All Groups / HMRT | • "Paint the picture" of the problem – initially there are no visible clues; however after 911 notification a visible vapor release / cloud can be seen. No ignition.<br>• Review basic physical and chemical properties of Natural Gas Liquids (NGL) |
| 04 | StartEx + 15 min | Dispatch, response, approach and initial positioning | Face-to-Face | First Due Company OIC / IC | • Outline considerations for initial approach and positioning (visible clues - uphill, upwind, access, water supply) |
| 05 | StartEx + 18 min | SP Pipeliner arrives on-scene | Face-to-Face | SP Pipeliner | • What are the average response times for SP personnel to Chester County locations? How will they get access to the incident location?<br>• Find the Incident Command Post (ICP) and Incident Commander – provide initial briefing<br>• What information would the IC expect to be provided by the SP Pipeliner? |
| 06 | StartEx + 20 min | Incident Size Up | Face-to-Face | Incident Commander | • Identify critical information needs<br>○ Determine what is happening?<br>○ Immediate life safety issues?<br>○ Can scene be safely approached?<br>○ Is incident rapidly increasing in size or scope?<br>○ Do we fully understand the nature & scope of problem?<br>• Identify Incident Priorities (life safety, incident stabilization, property / environmental protection)<br>• What would be initial mode of operations (offensive / defensive / non-intervention)?<br>• Identify initial incident objectives |

| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 07 | StartEx + 30 min | Incident Tactics – Vapor release w/no ignition | Face-to-Face | ER Group | • Tactics to control ignition sources<br>o Air monitoring<br>o Do not ring doorbells<br>o Traffic control / do not drive into a vapor cloud<br>o Do not operate any pipeline valves<br>o Public protective action options<br>• Tactics to control the release<br>o Isolate the source<br>o Water lines to disperse vapors<br>o Downwind air monitoring – where is the problem going?<br>o Public protective action options |
| 08 | StartEx + 40 min | Sensitive Receptors – Public Protective Action Options | Discussion | All Groups | • What information do sensitive receptors need to ensure the safety of their stakeholders? How is this information acquired?<br>• Risk-Based Factors<br>o Size and location of incident<br>o Exposures<br>o Initial Guidance – 2016 ERG<br>o Evacuation vs. Shelter-in-Place |

| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 09 | StartEx + 50 Minutes | Managing the Incident – Problems and Considerations | Discussion | All Groups | • What is the potential worst-case outcome for this incident?<br>• Review what unified command looks like for this scenario? How do you know when UC is working effectively?<br>• Should an IST / IMT be activated?<br>• What are the potential problems / issues / challenges for all stakeholders?<br>o Operations issues?<br>o Safety issues?<br>o Planning issues?<br>o Logistics issues?<br>o Finance / Admin issues?<br>o Public affairs / community relations issues? |
| 10 | StartEx + 65 Minutes | Transfer of command from Emergency Response to Post-Emergency Response Operations (PERO) | Face-to-Face | Unified Command | • Review criteria / process by which emergency response operations are terminated and the incident enters the recovery / investigation phase. |
| 11 | StartEx + 70 Minutes | Termination of Scenario #1 activities | Discussion | All Groups | • Each group will identify its respective critical issues that are specific to Scenario #1. These will be carried over to the final exercise-level Hot Wash. |


Wagner Real Estate - Hershey's Mill
Hershey's Mill Golf Club
Boot Road & Wilson Drive
GIANT Food Stores
United States Postal Service
acac Fitness & Wellness Center West Chester
QVC Studio Park
American Helicopter Museum & Education...
Liberty Flight School
Arbours At West Goshen
Wawa
New Kent Apartments
Google


Saints Peter and Paul Parish
Saints Peter & Paul School
Boot Road & Wilson Drive
Wellington at Hershey's Mill
BB&T
Hershey's Mill Village Square


1398 Wilson Dr
Boot Rd
Google

**ATTACHMENT B**

**MASTER SCENARIO EVENTS LIST**

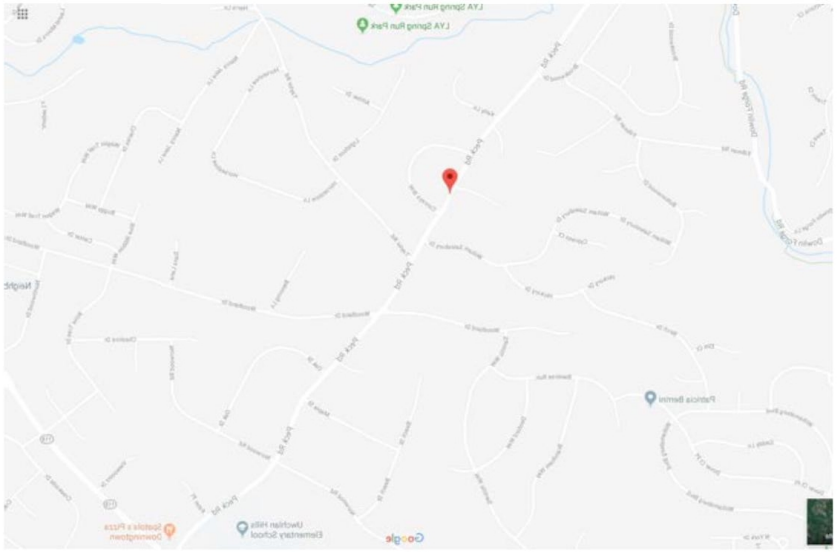
**SCENARIO #2 – LIQUID PRODUCTS PIPELINE**

| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 00 | 1100 | Initial exercise briefing | Face-to-Face | All Participants | • Exercise goals, objectives and planning assumptions<br>• Broad overview of exercise scenario #2<br>• Exercise format and evaluation<br>• Exercise ground rules |
| 01 | StartEx | Chester County PSAP (911) receives multiple phone calls of a large fire in the 500 block of Peck Road. Callers report large amount of fire and thick black smoke. Information ranges from a house fire, vehicle fire and aircraft crash | Face-to-Face | 911 Dispatcher / Supervisor | • Outline PSAP process and procedures for assessing the information, making notifications and initial dispatch assignment.<br>• Identify the initial dispatch assignment based upon the information provided |
| 02 | StartEx + 2 min | Additional phone calls report of several injured workers in the area of Peck Road and Conreys Way. | | 911 Dispatcher / Supervisor | • PSAP update to responding units<br>• Should the response assignment by changed? |
| 03 | StartEx + 5 min | LEO on-scene reports that the incident appears to be a pipeline incident. Confirms that utility construction work is taking place along Peck Road and several workers are injured. | Face-to-Face | 911 Dispatcher / Supervisor | • PSAP update to responding units<br>• Should the response assignment by changed? |

| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 04 | StartEx + 5 min | Notification from Buckeye Control Center received by Chester County PSAP (911) - confirms a pipeline release along the Buckeye / Laurel Pipeline ROW in Uwchlan Township. | Face-to-Face | 911 Dispatcher / Supervisor | • Buckeye Rep – provide critical info to 911 based on Buckeye polices & procedures.<br>o Status of the pipeline?<br>o Product(s) involved?<br>• PSAP update to responding units?<br>o Should the response assignment be changed?<br>• What would be the dispatch assignment for a confirmed liquid products transmission pipeline incident? |
| 05 | StartEx + 5 min | Buckeye Pipeline Control Center initiates its internal emergency alerting and notification processes. | Face-to-Face | Buckeye Control Center | • Review internal Buckeye process and procedures.<br>o Buckeye reps being sent to the scene? Response time? Access? |
| 06 | StartEx + 8 min | Initial response | Face-to-Face | First Due Company OIC / IC | • Based upon the additional information that is being provided by Communications, any changes / modifications to your initial response process? |
| 07 | StartEx + 10 min | Provide visual / physical description of the incident scene | Face-to-Face | All Groups / HMRT | • "Paint the picture" of the problem<br>o Flammable liquid behavior – basic physical and chemical properties<br>o Exposures?<br>o Any underground pathways?<br>o Control vs. extinguishment |
| 08 | StartEx + 15 min | Dispatch, response, approach and initial positioning | Face-to-Face | First Due Company OIC / IC | • Outline considerations for initial approach and positioning (uphill, upwind, access, water supply) |

| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 09 | StartEx + 15 min | Buckeye Pipeliner arrives on-scene | Face-to-Face | Buckeye Pipeliner | • What are the average response times for Buckeye personnel to Chester County locations? How will they get access to the incident location?<br>• Find the Incident Command Post (ICP) and Incident Commander – provide initial briefing<br>• What information would the IC expect to be provided by the Buckeye Pipeliner? |
| 10 | StartEx + 20 min | Incident Size Up | Face-to-Face | Incident Commander | • Identify critical information needs<br>o Determine what is happening?<br>o Immediate life safety issues?<br>o Can scene be safely approached?<br>o Is incident rapidly increasing in size or scope?<br>o Do we fully understand the nature & scope of problem?<br>• Identify Incident Priorities (life safety, incident stabilization, property / environmental protection)<br>• What would be initial mode of operations (offensive / defensive / non-intervention)?<br>• Identify initial incident objectives |
| 11 | StartEx + 30 min | Incident Tactics – Flammable Liquid Release w/Ignition | Face-to-Face | ER Group | • Exposure Protection Tactics<br>• Tactics to control the spill fire<br>o Ensure / verify source control<br>o Aboveground considerations<br>o Underground – storm sewer system<br>• Tactics to control the fire<br>• Tactics to control the release<br>• Public protective action options |

| Event # | Event Time | Event Description | Method of Delivery | Recipient Player(s) | Expected Outcome of Player Action |
|---|---|---|---|---|---|
| 12 | StartEx + 40 min | Sensitive Receptors – Public Protective Action Options | Discussion | All Groups | • What information do sensitive receptors need to ensure the safety of their stakeholders? How is this information acquired?<br>• Risk-Based Factors<br>o Size and location of incident<br>o Exposures<br>o Initial Guidance – 2016 ERG<br>o Evacuation vs. Shelter-in-Place |
| 13 | StartEx + 50 Minutes | Managing the Incident – Problems and Considerations | Discussion | All Groups | • What is the potential worst-case outcome for this incident?<br>• Review what unified command looks like for this scenario? How do you know when UC is working effectively?<br>• Should an IST / IMT be activated?<br>• What are the potential problems / issues / challenges for all stakeholders?<br>o Operations issues?<br>o Safety issues?<br>o Planning issues?<br>o Logistics issues?<br>o Finance / Admin issues?<br>o Public affairs / community relations issues? |
| 14 | StartEx + 65 Minutes | Transfer of command from Emergency Response to Post-Emergency Response Operations (PERO) | Face-to-Face | Unified Command | • Review criteria / process by which emergency response operations are terminated and the incident enters the recovery / investigation phase. |
| 15 | StartEx + 70 Minutes | Termination of Scenario #2 activities | Discussion | All Groups | • Each group will identify its respective critical issues that are specific to Scenario #2. These will be carried over to the final exercise-level Hot Wash. |




Peck Rd
Peck Rd
Peck Rd
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Conreys Way
Conreys Way


Peck Rd
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## ATTACHMENT C
## PARTICIPANT FEEDBACK AND RECOMMENDATIONS

The comments presented below were compiled from 32 participants who completed the feedback form. Comments were transcribed verbatim with minor editing; comments may have also been edited as needed to maintain anonymity of the respondents.

### Part I – Recommendations and Proposed Action

**1. List three strengths that you observed in today's exercise.**

- Interagency teamwork, communications and collaboration between pipeline operators, first responders, community reps (12)
- Feel better about the "process" and relationships already in place for emergency response; explanation of how incidents are handled (10)
- Participation from a wide range of stakeholders – diverse audience; right people were in the room (10)
- Good facilitation and discussions; able to coordinate levels of knowledge in the room (7)
- Knowledge and awareness of the key stakeholders (emergency responders, emergency planners, pipeline operators, agency representatives) (5)
- Well organized exercise; good scenarios that were interactive (5)
- Good Q&A opportunities throughout the exercise; lots of discussion and group participation (4)
- Showing how "all hazards" response processes apply to pipeline scenarios; importance of ICS and how an incident is organized (3)
- Provided a learning experience for some in the room; presentation of different perspectives (2)
- Equipment and resources that are available within the County (2)
- Pre-incident planning by Chester County agencies
- Ability for non-responders to voice their concerns
- Genuine interest and care of our first responders to the community
- Sharing of response objectives among different groups
- Overview of incident management operations for outside groups
- Use of two different pipeline response scenarios allowed for discussion on different tactics
- Demonstrating existing capabilities
- Coordination and knowledge of HazMat Response Teams
- Everyone seems to be on the same page
- Wasn't aware that water could be used to mitigate a vapor cloud

**2. List three areas for improvement based on what you observed in today's exercise.**

- Try to involve more audience members in the discussions (e.g., law enforcement) (4)

- Community notification processes, tools and training (3)
- Educating the public; more information from the pipeline operators (3)
- Additional exercise with major incident management scenario and incorporation of ICS framework (3)
- More operational level training for pipeline emergencies (2)
- Perhaps more coordination amongst the tables rather than the whole room; split into groups for each scenario to see how different groups would have handled the incident (2)
- Interaction with the pipeline operators
- More interactive scenarios with government groups
- More use of scenarios allowing students to participate in decision-making rather than just a discussion
- More of the same with an emphasis on involving the non-responder audiences
- A little more time for each of the scenarios
- More involvement by local Emergency Management Coordinators (EMC)
- Other methods to communicate with the public other than the media
- Couldn't hear all of the replies
- Roles and responsibilities for assisting agencies
- Additional information on public protective actions (i.e., evacuation, shelter-in-place) and how it would take place with children and seniors
- NGL pipelines deserve their own hazards approach, not an "all hazards" given their physical and chemical properties
- Continued focus on communications between all stakeholders
- Continued work of establishing a Joint Information System (JIS) and establish procedures for "unified" PIO's
- Helping non-responders understand the application and use of the Incident Command System (ICS) by emergency responders

3. **Based on what you learned today, what recommendations do you have to improve your organization's ability to plan / react / respond to a transmission pipeline incident.**
   - Continued need for additional pipeline training; development of pipeline props will help pipeline training; additional training for LE personnel who will likely be first on-scene (5)
   - Continual improvement of communications between stakeholders; clarify lines of communication and process to get up-to-date accurate information (2)
   - Create a PIO position to get information out to the public more quickly; review and update public information processes (2)
   - Provide as much communications to public / residents as possible (2)
   - Continue to stress getting to know your first responders (2)
   - Continue to have employees attend these events; I always learn something (2)
   - Public Awareness meetings
   - Continue to interact with other response agencies

- U.S. EPA should work closer with pipeline operators / companies before an incident
- Become more knowledgeable of pipelines and what products are transported (liquid and gas)
- More research into what pipeline resources are available (e.g., OSRO's – Oil Spill Recovery Organizations)
- Update Township Emergency Operations Plan (EOP) to include locations of pipelines within the Township and their respective contact information
- More interaction with industry
- Conduct follow-up exercises with more specific participant play (i.e., functional exercise)
- Conduct similar tabletop exercises in-house
- Meet / plan with local risks (i.e., schools, assisted living, etc.)
- Ensure that parents are educated about the possibilities and even more importantly they recognize the importance of not being impulsive and racing to the school to pick up their child – as hard as that would be!

4. **List one major lesson learned from today that helped you improve professionally.**
   - Establish relationships; have face time with key stakeholders (4)
   - Early communication and cooperation is critical to contain an incident; ensure you know your partners (3)
   - Learned what pipelines do on their side of an incident – both planning and response (3)
   - Wasn't aware of the Ready Chesco "white pages" capabilities
   - Understanding that everyone has the same goal
   - Knowing the amount of additional support that is available at the local and county levels
   - Better understanding of elected official and school reps concerns and capabilities
   - Information on pipeline coordination
   - Helped me to understand things that I had no knowledge of before; to an extent, it calmed some of my fears
   - Partnerships that exist
   - Pre-event planning is key
   - Building relationships with outside Emergency Management officials
   - List of resources that are available
   - Walk through a response from the initial 911 call
   - More of a reminder than a lesson – it's good to see the level of expertise and professionalism that exists among Chester County's emergency services
   - How each fire department handles events and communicated with the pipeline companies
   - Need to have communications with the Incident Command Post (ICP)

## Part II – Exercise Design and Conduct

1. **What is your assessment of how the Tabletop Exercise was designed and conducted?**

   **Rating (1 = strongly disagree; 5 = strongly agree)**

   **4.9** The exercise was well structured and organized.
   **4.9** The exercise scenario was plausible and realistic.
   **4.6** The time allowed to run the exercise was sufficient.
   **4.7** Participation in the exercise was appropriate for someone in my position.
   **4.7** The exercise included the right mix of people and disciplines to accomplish the stated objectives.

2. **Please provide any recommendations on how future Emergency Planning and Preparedness training and exercises could be improved or enhanced.**
   - Provide more exercise opportunities or scenarios (2)
   - Make sure the right experts are in the room
   - Have more elected officials, Township Managers, school reps, etc.
   - Break down and intermix the groups to address the location and areas of the incident (fire, HM, government leaders, etc.)
   - More background information on the scenario
   - Provide an overview / summary at the end of each scenario
   - Continue to offer and conduct these types of exercises to include many of the participating non-responder organizations
   - Have a "less specific" location to the scenario, which causes only those individuals from that area to feel involved in the exercise
   - Involve non-first responders to allow them to see that the plans in-place do work
   - Actual pictures of true incidents, ruptures, etc.
   - On the second scenario, would have liked to see a view showing where the streams are located to get a better understanding where the spill control booms / operations would have been located
   - Perhaps a better detailed map of the incident scenario area
   - Would be great to break out into separate rooms and then report back to the group at large.
   - Involve more public response in the scenarios with social media
   - Public response and containment will be an issue with any visible incident
   - More discussion on communicating with the community and the media (dealing with social media).
   - More discussion on long-term impacts – environmental, sheltering, etc.
   - Exercise was well done. Was good training for all involved parties
   - The size of the group was good, but we should look at multiple small groups. Possibly give the option of signing up for a particular scenario

3. **Additional comments or suggestions that you may have.**
   - Very well organized, highly involved, well participating event (5)
   - Facilitator did a great job – knows his subject matter (2)
   - Opportunity to share ideas
   - Good work – look forward to another exercise with more interaction between numerous organizations
   - Very well run and highly informative
   - Maybe helping attendees understand how or why this training may be relevant to them and their position
   - Invite the Red Cross to attend to explain their capabilities
   - Clarify lines of communication between responders, County, pipeline operator, community, etc. and have back-ups
   - Send important “take-aways” to the participants

SPLP Statement No. 4-RJ
(Rejoinder Testimony Outline of Gregory Noll)

**BEFORE THE**
**PENNSYLVANIA PUBLIC UTILITY COMMISSION**

| | | | |
|---|---|---|---|
| MEGHAN FLYNN et al. | : | Docket Nos. | C-2018-3006116 (consolidated) |
| | : | | P-2018-3006117 |
| MELISSA DIBERNARDINO | : | Docket No. | C-2018-3005025 (consolidated) |
| REBECCA BRITTON | : | Docket No. | C-2019-3006898 (consolidated) |
| LAURA OBENSKI | : | Docket No. | C-2019-3006905 (consolidated) |
| ANDOVER HOMEOWNER'S | : | Docket No. | C-2018-3003605 (consolidated) |
| ASSOCIATION, INC. | : | | |
| | : | | |
| v. | : | | |
| | : | | |
| SUNOCO PIPELINE L.P. | | | |

**REJOINDER TESTIMONY OUTLINE**

**OF GREGORY NOLL**

**ON BEHALF OF SUNOCO PIPELINE, L.P.**

SPLP
N4-RJ

1. Mr. Boyce's testimony identifies his criticisms of the written MERO training materials and the MERO training more generally. Do you have a response to those criticisms?

   A. Any critique of the MERO training program should start with what are the expected emergency responder skills and competencies to a hazmat / pipeline incident. Based upon their assigned duties, all emergency responders are already required to be trained and certified by their Authority Having Jurisdiction (AHJ) to meet the training requirements outlined in *OSHA 1910.120 (40 CFR Part 311) – Hazardous Waste Operations and Emergency Response (HAZWOPER)*. This regulatory requirement has been in-place since 1989 and the training competencies include knowledge of basic hazard and risk assessment techniques.

   B. *NFPA 472 and NFPA 1072 – Competencies for Emergency Response Personnel to HazMat / WMD Incidents* are the emergency response community's standards that provide more specific guidance on the requisite skills and competencies to hazmat incidents. These NFPA standards are used by the PA State Fire Academy, the PA Pipeline Emergency Response Initiative (PA PERI), and other national State Fire Training Agencies as the basis for the certification of emergency responders to hazmat incidents, which would include pipeline emergencies.

   C. In 2004 U.S. DOT/PHMSA developed the Pipeline Emergencies textbook and supporting materials in response to the need for additional information on pipeline emergencies. Now in its 3rd edition and managed by the National Association of State Fire Marshals (NASFM), the Pipeline Emergencies textbook is used as the primary reference source for transmission pipeline emergency response. The MERO training program and the corresponding PowerPoint is based upon the Pipeline Emergencies curriculum. It should be noted that while I am a co-author of the Pipeline Emergencies textbook, the textbook has significant third-party review with approximately 30+ technical reviewers representing both the pipeline industry and the fire service participating in the review process (see pages viii – xi).

   D. Mr. Boyce was invited but did not attend any of the MERO training sessions that Sunoco offered and which I led. His ability to assess the information provided in the MERO sessions is totally based upon the PowerPoint slides, which instructors would view as a briefing document or handout, and which obviously do not capture the questions and discussions that also occur in any training or educational setting. The issues Mr. Boyce identifies as not being directly addressed in the written materials were directly addressed in the training sessions (e.g., whether a release empties the entire existing product in the pipeline). In fact, an important objective of the in-person training is to address the specific questions that emergency responders want answered. No written PowerPoint materials could address every possible scenario, and students have the opportunity to ask question or to read relevant chapters or the entire textbook if they desire.

E. That brings me to another issue with Mr. Boyce's testimony. As noted in 1A, emergency responders, fire, law enforcement and EMS personnel must already meet OSHA / EPA training requirements. The Pipeline Emergencies training and the MERO program are designed to build upon and complement the training and experience that emergency responders already possess. The intent of the MERO training is provide a risk-based response process that responders can apply for a range of possible NGL pipeline scenarios. In comparison, much of Mr. Boyce's testimony focuses on only one possible event scenario – a catastrophic release or pipeline failure. There are other scenarios (e.g., a puncture, a leak, fire vs. non-fire), for which the MERO training provides a process and framework for an effective response.

F. Finally, we have empirical evidence that the MERO training was effective. I conducted a survey after each of the 22 MERO training sessions conducted in 2017 and received over 550 responses to a series of questions regarding the sessions. Over 98% answered positively to each of the following questions:

- Was today's session effective? 565 yes, 1 no – 99.8%
- Do you have a better understanding of pipelines in your area? 560 yes, 3 no – 99.5%
- Did the presentation increase your knowledge about what to do in case of a pipeline emergency in your community? 557 yes, 6 no – 98.9%
- Do you feel you have enough information from Sunoco to respond to an emergency involving our pipeline? 547 yes, 7 no – 98.7%

G. The MERO training program should be viewed as a "living document." While this testimony has focused upon the 2017 deliveries, the initial 2020 MERO sessions are scheduled to start in August 2020. Based upon student feedback and related discussions, additional slides on the risk-based response process and NGL response scenarios has been added to the program and PowerPoint briefing package. These additional slides are attached as SPLP Exhibit GN-1-RJ. In addition, a copy of the Pipeline Emergencies textbook is being provided to each fire department that will attend the MERO training for their department library.

2. Mr. Boyce states, p. 3, lines 39-44, that it is impossible to remove all ignition sources. Do you have a response?

A. Whether or not it is impossible to eliminate all ignition sources is not the correct way to analyze this risk. Frankly, it is extremely difficult to eliminate all ignition sources. However, responders can ensure that they do not become an ignition source through their actions.

B. The goal is to identify and control likely ignition sources based upon their location, the movement of the vapor cloud, and risks to emergency responders.

3. Mr. Boyce states, p. 3, lines 29-37, that the written MERO materials do not refer to the radius of impacts in the event of a maximum accident. Do you have a response?

A. That information is available to those entities through publicly available information and/or from Sunoco by signing a non-disclosure agreement. The municipality or school district incorporates that information into the development of its plan.

B. Once emergency responders arrive on-scene their tasks will include establishing an isolation perimeter (i.e., outer perimeter) to isolate the area and deny entry for the public at-large community (see Pipeline Emergencies, pages 141 – 142). This will be complemented by the establishment of hazard control zones within the perimeter (i.e., hot zone or inner perimeter) for controlling response personnel and operations. As soon as possible, air monitoring should be conducted to determine / verify air concentrations and safe environments, and to adjust these perimeters and hazard control zones.

4. Mr. Boyce states, p. 3, line 46, p. 41, lines 1-25, that it is essential to set up a "perimeter wall" and that term is not used in the MERO training materials. Do you have a response?

A. Mr. Boyce is using a term "perimeter wall" that does not appear in any of the relevant textbooks or standards that have already been vetted by recognized pipeline industry and public safety experts. I have researched numerous authoritative texts on hazmat emergency response and can find no definition or use of the term "perimeter wall." These sources include the NFPA Hazardous Materials Handbook, the NFPA Fire Protection Handbook, Pipeline Emergencies textbook, Propane Emergencies textbook, and current HazMat Operations and Technician level textbooks. I have also reached out to approximately 20 peers, all of whom have more than 20 years of experience and training within the hazmat response community, and none have heard of or are familiar with the term.

B. As I previously noted, the term of "initial isolation perimeter" is used and noted within the MERO training program (see Pipeline Emergencies, pages 141 – 142). If Mr. Boyce is using this term in the context of using water fog streams to control an LPG vapor cloud, that is discussed on Slides 70 – 71 and Pipeline Emergencies, Chapter 6 – Pipeline Emergency Response Operations, and Chapter 7 – Hazard Assessment and Risk Evaluation.

5. Mr. Boyce states, p. 4, lines 26-41, that there is a time gap between a pipeline incident and emergency responders arriving on scene, and that you do not address that. Do you have a response?

A. There is a timeline and an inherent time gap that exists for every emergency. Key elements of this timeline will include (1) initial discovery and notification to a public safety answering point (PSAP); (2) dispatch and assignment of emergency responders; (3) response time to the incident location; and (4) initial size-up and assessment. This time gap is not unique to a pipeline incident; these questions and issues exist for virtually all emergencies including highway and rail incidents involving hazardous materials, fixed facility toxic vapor cloud releases and active shooter incidents.

B. The key objective is to have a multi-faceted program / process to provide information to those special occupancies for making appropriate or actionable decisions prior to the arrival of emergency responders. Tactics for accomplishing this goal include community awareness programs and materials, facility or audience specific planning and guidance, training, and table-top exercises.

6. Mr. Boyce states, p. 5, lines 27-42, that it is unclear what is a safe distance for people to move away from the pipeline incident. Do you have a response?

A. I am on record as testifying that you use sight, sound and smell as a guide before the emergency responders arrive and that you move uphill and upwind away from the release.

C. If there is a conflict between upwind and away from the pipeline, the default is to move away from the pipeline.

D. I am on record in stating that wind direction can be determined by the average lay person.

E. Once emergency responders arrive on-scene they will initiate actions to establish an isolation perimeter, hazard control zones and public protective actions.

# Risk-Based Response (RBR) Process

Determine appropriate response actions based upon:

- Facts
  - Product / Container / Environment
- Science
  - Physical properties (i.e., how the product will behave)
  - Chemical properties (i.e., how the product will harm)
- Circumstances
  - HazMat Behavior (stress / breach / release / impingement)
  - Exposures (i.e., people, property, environment, systems disruption)
  - Emergency responder capabilities

SPLP
GN-1RJ

Pipeline Incidents

# RBR Small Release Scenario

- **Leak Scenario**
  - ¼-inch or smaller breach
  - Release dissipates naturally, with asphyxiation being the primary hazard very close to the release point
  - May need to be close to the leak source in order to discover it
  - Likely no visible vapor cloud
  - May be petroleum-like odor
  - ”Bring science to the process” with air monitoring
  - May not be detected by the PCC

Pipeline Incidents

# RBR Medium Release Scenario

- **Puncture Scenario**
  - Approximate 2-inch breach
  - Visible vapor cloud or other visual clues of a breach
  - Should be detected within several minutes by the PCC
  - Immediate vs. delayed ignition
  - Potential development of a vapor cloud and ignition – remember the “Four Danger Areas”

Pipeline Incidents

# RBR Large Release Scenario

- **Rupture Scenario**
  - Any breach above the puncture scenario, up to full-bore / diameter failure
  - Instantaneous release and high probability of vapor cloud ignition
  - High radiant heat levels
  - Will be detected by the PCC
  - Responder priorities towards public protective actions and exposure protection

SPLP Statement No. 9- RJ
(Rejoinder Testimony Outline of Richard King, P.G.)

**BEFORE THE**
**PENNSYLVANIA PUBLIC UTILITY COMMISSION**

| | | | |
|---|---|---|---|
| MEGHAN FLYNN et al. | : | Docket Nos. | C-2018-3006116 (consolidated) |
| | : | | P-2018-3006117 |
| MELISSA DIBERNARDINO | : | Docket No. | C-2018-3005025 (consolidated) |
| REBECCA BRITTON | : | Docket No. | C-2019-3006898 (consolidated) |
| LAURA OBENSKI | : | Docket No. | C-2019-3006905 (consolidated) |
| ANDOVER HOMEOWNER'S | : | Docket No. | C-2018-3003605 (consolidated) |
| ASSOCIATION, INC. | : | | |
| | : | | |
| v. | : | | |
| | : | | |
| SUNOCO PIPELINE L.P. | | | |

**REJOINDER TESTIMONY OUTLINE**

**OF RICHARD KING, P.G.**

**ON BEHALF OF SUNOCO PIPELINE, L.P.**

SPLP
N9-RJ

1. Witness Fuller, in her surrebuttal testimony, pages 2-5, states that my conclusion that the amount of bentonite present in water samples taken from the Fuller well were minute or miniscule was incorrect. Ms. Fuller points to a RJ Lee x-ray diffraction laboratory sample report, which has a reference to a "major concentration" of bentonite, to allege that my conclusions are incorrect. Ms. Fuller does not understand what the x-ray diffraction testing process, or what the reference to a "major concentration" of a mineral evaluated in the x-ray diffraction process means. My conclusions did not mischaracterize any laboratory report findings. The total amount of bentonite in any sample taken from the Fuller well was minute and miniscule in comparison to the total volume of water in which bentonite, or any other mineral, was present.

    a. The lab reports that Ms. Fuller attempts to analyze and interpret, are x-ray diffraction samples that attempt to identify the potential presence or absence of suspended bentonite in a water sample.

       X-ray testing is ***not*** completed on the water sample. It is completed only on the solid materials (the Total Suspended Solids -TSS) which as clearly stated in the reports, are extracted by filtration from the water sample. As stated in my testimony, the percentage of the crystalline minerals estimated by the laboratory refers only to the percentage of the solids which were filtered out of the water sample.

       The x-ray diffraction test starts by extracting any solids that are suspended within a water sample (the TSS) by filtering the solids from the water sample. These solids are then dried out and placed on a laboratory sampling surface. The laboratory sampling surface is then scanned using an x-ray diffractometer. Crystalline materials in the solid on the laboratory sampling surface reflect the x-rays in patterns that are indicative of the crystalline materials in the solids. By comparing the pattern of the reflections of x-rays with patterns defined by the United States Geological Services Clay Mineral Identification Flow Diagram, which contains standard "known" pattern fingerprints for a given mineral, the laboratory technician can determine if the pattern of peaks in the diffraction pattern of the sample match any known peaks for a given crystalline mineral. If a particular mineral is present, the x-ray diffraction analysis can then be used to provide an estimate of the relative percentage of the various minerals present in the dried out material on the slide compared to the rest of the dried out material on the laboratory sampling surface.

       The concentration of bentonite (or for that matter any other crystalline mineral) detected by the x-ray analysis in the solid material removed from the water sample can be related to its concentration in the original water sample by the following equation:

       Concentration of crystalline mineral in water = Concentration of TSS multiplied by the percentage of the crystalline mineral in the TSS.

The laboratory report itself explains:

> Major concentrations denote phases that are estimated to make up more than 20% of the material by weight, minor concentrations estimate concentrations in the material between 20% and 5% by weight and trace concentration estimates a phases present in the sample at concentrations less than 5% by weight.

b. It is not, as Ms. Fuller alleges, that this sampling process and an indication of a "major concentration" is "defined as greater than 20% of the water being sampled." Fuller Surrebuttal at 3:1; *see also* 5:27 ("more than 20% Bentonite in our water system"), 5:43 ("more than 20% Bentonite in water").

c. Bentonite was reported in the July 1, 2019 pressure tank spigot sample as a "major concentration" of the TSS that was reported to be non-detect at 2.5 mg/L. Bentonite was also reported in the July 19, 2019 sample taken from the well as a "major concentration" of the TSS that was reported to be 4.30 mg/L. Using the equation above and an estimated percentage of 20 % the TSS in the sample, the concentration of bentonite in the July 1, 2019 water samples would be 0.5 mg/L or 0.00005 % of the total water sample. For the July 19, 2019 water sample the concentration of bentonite would be 0.86 mg/L or 0.000086 %.

d. Ms. Fuller's assertions that the water samples contained greater than 20 % bentonite are incorrect. For that to be true, her water would have to contain 200,000 mg/L of bentonite. Even if 100 % of the TSS in the July 19, 2019 sample was bentonite (4.3 mg/L), Ms. Fuller's assertion is incorrect by a factor of 46,511 (200,000 / 4.3 = 46,511). Put another way, the maximum bentonite concentration in the overall water sample would be less than 4.3 mg/L, over 46,500 times lower than Ms. Fuller suggests.

2. Ms. Fuller claims on page 2 of her surrebuttal testimony that her water "turn[ed] brown and smelly" and that the water was a "smelly brown solution." None of the documentation for the well sampling that was performed at the Fuller property reflects that the water exhibited these characteristics.

a. I reviewed the field notes and results of samples that were taken of the well water between August 31, 2017 and October 10, 2019. All the water samples were inspected by the sample team for clarity, color, and odor; all stated that clarity was "clear," color was "colorless," and odor was "odorless." Though black sediment was observed in the sample bottle for the water sample taken on July 19, 2019 from the spigot after potash treatment, it should be noted that no black sediment was reported for the sample taken directly from the well. None of the water samples taken at the property were reported as "smelly brown".

The following table provides the Turbidity, TSS, Clarity, Color and Odor for each of the samples taken at the property, and reflects that none of the samples taken from the residence were "smelly" or "brown."

| Date | Sample Point | Turbidity NTU | TSS mg/L | Clarity | Color | Odorless |
|---|---|---|---|---|---|---|
| 08/31/2017 | Pressure Tank | 1.8 | 2.74 | Clear | Colorless | Odorless |
| 04/08/2019 | Pressure Tank | <0.300 | 2.58 | Clear | Colorless | Odorless |
| 07/01/2019 | Pressure Tank | 0.567 | <2.5 | Clear | Colorless | Odorless |
| 07/19/2019 | Wellhead sample | 0.376 | 4.3 | Clear | Colorless | Odorless |
| 07/19/2019 | Pressure Tank | 0.388 | <2.5 | Clear | Colorless | Odorless |
| 07/19/2019 | Kitchen Sink | <0.300 | <2.5 | Clear | Colorless | Odorless |
| 09/23/2019 | Wellhead sample | <0.300 | 13.7 | Clear | Colorless | Odorless |
| 10/10/2019 | Wellhead sample | 4.59 | 18 | Clear | Colorless | Odorless |

3. On page 4-5 of her surrebuttal testimony, Ms. Fuller disagrees with my conclusion that the presence of bentonite in her well was of short duration, and asserts that I did not include in my testimony facts that SPLP sampled the Fuller well water multiple times. She also asserts that testing on different dates did not test for bentonite, and suggests that was inappropriate. These assertions are not correct.

   a. Exhibit RK-5, Table 1 of my prior testimony provides the results of all the water sample testing completed at the Fuller residence. The August 31, 2017 pre-construction testing did not sample for bentonite for the simple reason that construction had not started, and there would be no reason to suspect that bentonite would be present. Rather, SPLP's standard protocol is to sample for bentonite using the x-ray diffraction method when it receives a landowner complaint when the HDD is currently in construction. The August 31, 2017 testing did however analyze the TSS value, and the result for TSS in that sample was 2.74 ppm. Drilling of the first HDD near the Fuller residence started in late-March 2019,[1] well after the pre-construction sample was taken on August 31, 2017. Subsequent samples taken in July 2019, which were after Fuller complaint was made, returned TSS values that were similar to those pre-construction, i.e. less than 2.5 mg/L to 4.3 mg/L. The July 2019 samples did analyze the samples using the x-ray diffraction method for bentonite, but those tests did not "disclose[] that more than 20% of the water in the samples drawn was contaminated with Bentonite" as Ms. Fuller suggests on page 5 of her surrebuttal testimony – for the reasons explained above.

   b. Furthermore, the presence of bentonite in the Fuller water well samples was short-term. As shown in Exhibit RK-5, Table 1 of prior testimony, bentonite was tested for on July

[1] Construction of the first pipeline installation at HDD #S3-0591, the location near the Fuller residence, began on March 25, 2019, and the first pipe installation was completed on September 4, 2019. The installation of the second pipeline at HDD #S3-0591 began on September 28, 2019, but is currently suspended.

1, 2019 and July 19, 2019 and was detected by x-ray diffraction sampling analysis on both of those dates, but bentonite was not detected on the next sampling date of October 10, 2019. The time between the last reported detection of bentonite and the next sample when bentonite was reported as non-detect was 83 days. This does not constitute a long timeframe.

4. On pages 5-6 of her surrebuttal testimony, Ms. Fuller takes issue with my analysis that a potential source of bentonite present in her water samples may be naturally occurring from the weathered geology on the Fuller property. Ms. Fuller claims that there is "no evidence in this proceeding to suggest that bentonite was present in our water system prior to the time Sunoco began drilling. Ms. Fuller's assertions are incorrect.

    a. First, again, bentonite did not constitute 20% of the water sample, as Ms. Fuller suggests. As explained above, when bentonite was detected in water samples, at most it made up less than 4.3 mg/L, or 0.00043% of the water sample.
    b. Second, Ms. Fuller is also incorrect regarding the lack of identification of scientific papers about weathering of hornblende to montmorillonite. The reference to the scientific paper supporting this conclusion was provided in my prior testimony; it was from W. F. Cole and C. J. Lancucki, 1976 Clays and Clay Minerals, Vol. 24, pp. 79 83.

    Based on the scientific information provided in this paper it is possible for hornblende to weather to montmorillonite (bentonite). Also noted in my prior testimony is the fact that the Baltimore gneiss, which contains abundant hornblende, has underlain the area below and around the Fuller residence for tens of millions of years, ample time for weathering of the bedrock materials. Factual information obtained from geotechnical boreholes completed in the vicinity of the Fuller residence and geophysical survey information obtained along the HDD alignment shows that up to 30 to 40 feet of overburden soils derived from the weathering of the Baltimore gneiss have developed over time. Hence the origin of the miniscule amount of bentonite detected in the Fuller well need not, necessarily, be the bentonite used in the drilling mud for the HDD.

5. On page 6 of her surrebuttal testimony, Ms. Fuller attempts to respond to the fact that bentonite is not a hazardous substance or contaminant by comparing it's presence in the Fuller well water to dumping 100,000 gallons of maple syrup or soy sauce into Pennsylvania waters. I disagree with this comparison or that it has any relevance to my analysis and conclusions.

    a. This comparison has no relationship to the temporary presence of potentially naturally occurring bentonite at a concentration of less than 4.3 ppm (0.00043%) in her water well samples. There is no indication whatsoever of the presence of large quantities of bentonite in any samples taken from the Fuller water system. In fact, the information that is available indicates very low concentrations of bentonite (less than 4.3 mg/L) or none. It is also undisputed that bentonite is not recognized as a contaminant under any applicable environmental regulatory standard.

6. Ms. Fuller states on pages 8-9 of her surrebuttal testimony that she has no knowledge regarding the construction of her well. This statement is contradicted by documentation I reviewed and obtained from an assessment of the well performed by a professional geologist in response to her complaint, dated October 21, 2019. This assessment described the construction of the well, and that it was reported by the homeowner that the well did not have grouting.

7. Ms. Fuller on page 9 of her surrebuttal testimony stated that she does not pump her well continuously when the pool on her residence is filled. This statement is again contradicted by the October 21, 2019 assessment of the Fuller well complaint. This assessment described the geologist's interview of Ms. Fuller, and that she stated that on the day prior to sediment being observed in the well, that the well had been continuously operated for 2-3 hours to fill the pool.

    a. Normal operation of a residential water supply well is typically for quite short periods of time; minutes rather than hours, followed by longer, non-pumping periods (tens of minutes to hours) during which time the water level in the well recovers. Drawdown tests were completed on the Fuller well on four occasions and showed that the well could sustain a yield of between 4 and 5 gallons per minute for at least 30 minutes without excessive drawdown. All these tests returned similar data, indicating that the well yield remained constant from before HDD construction to after Ms. Fullers complaint.
    b. Water drawn to a well drilled into bedrock of the type that underlays the Fuller residence comes mainly from features such as joints and bedding planes (secondary porosity) rather than pore spaces within the bedrock material (primary porosity). This secondary porosity can be quite low (less than 1 % to 5 % of the rock mass) and result in relatively low specific yield or drainable porosity. Continuous pumping of bedrock wells with relatively low specific yield for hours, rather than minutes, can result in relatively stable initial drawdown conditions followed by sudden excessive drawdown when the available specific yield is insufficient to replenish the extracted water. No long-term pumping tests have been completed on the Fuller well so the long-term specific yield of the well is not known. However, my experience gained over 50 years indicates that long term continuous pumping of wells in bedrock can result in such rapid draw down conditions.
    c. If such a condition occurs in a well that has casing that was not grouted to seal the annular space between the casing and the overburden, sediments and soils can be drawn into the well bore.

8. On pages 9-10 of her surrebuttal testimony Ms. Fuller takes issue with my conclusion that there is not a fracture trace across the Fuller property and claims that this was not a "fact-based conclusion." Ms. Fuller is incorrect in her assertion that there is no fact-based evidence regarding the presence or absence of a "fracture trace" across her property.

    a. As noted in my prior testimony, photogeological interpretation can provide a preliminary, rapid review of ***potential*** conditions along road and pipeline routes and guidance in where to complete specific investigations with boreholes and geophysical

surveys. Three boreholes were completed into the bedrock along the alignment of the HDD and confirmed the area is underlain by Baltimore Amphibolite Gneiss.

b. As noted in my prior testimony, a continuous geophysical survey was completed along the alignment of the HDD. Based on Ms. Fuller's measurements this would be approximately 150 feet from the Fuller property well. This detailed geophysical survey provided factual information that there was no evidence of a fracture system at the location indicated as a potential fracture trace crossing the Fuller property and the HDD alignment.

9. Ms. Fuller asserts in her surrebuttal testimony on page 10 that there are "recurring sinkholes" in the area. This question and Ms. Fuller's statements are misleading and not relevant to the geological and geotechnical conditions at the Fuller residence. The areas mentioned by Ms. Fuller are located in Chester County, over 11 miles to the northwest of her residence in Delaware County. Moreover, those areas are underlain by completely different geological conditions to those underlying her home. The bedrock beneath the Fuller property is composed of Baltimore Gneiss, which is not susceptible to solution weathering and is not known for development of subsidence or sinkholes.

10. On page 10 of her surrebuttal testimony, Ms. Fuller asserts that she has not had prior problems with the filter system, experienced a build-up of sediment in her system, or a decreased water pressure prior to SPLP's construction activities.

    a. As stated previously, the amount of bentonite reported in two samples taken in July 2019 from the Fuller well was at very low concentrations. Bentonite was not detected in the water sample taken on October 10, 2019.
    b. Photographs of the water filter in the basement of the Fuller residence were taken on August 31, 2017, April 8, 2019, July 1, 2019, July 19, 2019 and September 23, 2019 by the GES sampling team. All the photographs, including the photograph taken before HDD construction began (i.e., the sample taken on August 31, 2017) showed a dark grey to black in-line water filter indicating the filter was collecting dark grey or black particulates prior to HDD construction and during HDD construction. Note that the TSS in the sample taken before HDD construction started was similar to the TSS in the samples taken during HDD construction.
    c. The perceived decrease in water pressure could result from build-up of particulates in the filter restricting the flow of water. If the in-line filter is blocked it will restrict the flow of water from the well.

SPLP Statement No. 15- RJ
(Rejoinder Testimony of Brian Magee, Ph.D.)

**BEFORE THE**
**PENNSYLVANIA PUBLIC UTILITY COMMISSION**

| | | |
|---|---|---|
| MEGHAN FLYNN et al. | : | Docket Nos. C-2018-3006116 (consolidated) |
| | : | P-2018-3006117 |
| MELISSA DIBERNARDINO | : | Docket No. C-2018-3005025 (consolidated) |
| REBECCA BRITTON | : | Docket No. C-2019-3006898 (consolidated) |
| LAURA OBENSKI | : | Docket No. C-2019-3006905 (consolidated) |
| ANDOVER HOMEOWNER'S | : | Docket No. C-2018-3003605 (consolidated) |
| ASSOCIATION, INC. | : | |
| | : | |
| v. | : | |
| | : | |
| SUNOCO PIPELINE L.P. | | |

**POTENTIAL REJOINDER TESTIMONY OUTLINE**

**OF BRIAN MAGEE, Ph.D.**

**ON BEHALF OF SUNOCO PIPELINE, L.P.**

***(PENDING OUTCOME OF MOTION IN LIMINE TO LIMIT TESTIMONY OF ROSEMARY FULLER)***

SPLP
N15-RJ

A. Witness Qualifications

1. I am a Senior Vice President and Principal Toxicologist with Arcadis U.S., Inc. I have over 35 years' experience in the fields of toxicology and risk assessment. A copy of my curriculum vitae is attached as Exhibit "SPLP BM-1-RJ."

B. Fuller claims regarding the presence of bentonite clay in her well water

1. Witness Fuller, in her surrebuttal testimony, pages 4-5, makes statements that bentonite clay was present in her well water at a concentration of 20% or more. These statements are not correct.

    a. R.J. Lee company did not analyze well water from witness Fuller's home. Rather, they analyzed the ***solid materials*** present as Total Suspended Solids (TSS) from samples of Fuller's well water.
    b. The levels of TSS in the two samples in which bentonite clay was detected (at two different times) were non-detect (less than 2.5 mg/L) in one and 4.3 mg/L in the other. In percent terms, these are less than 0.00025% and 0.00043% of the total volume of water sampled.
    c. If bentonite clay was 20% of the suspended solids in the water sampled, the percent of bentonite clay in Fuller's well water was less than 0.00005% and 0.00009%.
    d. Bentonite present in water at a concentration of 0.00009% or less is a ***trace*** constituent in that water sample.
    e. Knowing the correct concentration of a constituent in well water is necessary to make estimates of risk associated with the use of that well water, because risk is a function of both the inherent hazard potential of the constituent and the actual exposure to that constituent. If the exposure to a constituent in well water is sufficiently low, the health risk is essentially zero, even if the constituent has a high level of inherent hazard, which, as explained below, bentonite does not.

C. Fuller claims regarding the toxicity of bentonite clay

1. Witness Fuller, in her surrebuttal testimony, pages 6-8, states that several specific brands of bentonite clay products are carcinogenic because they contain crystalline silica (quartz). She further states that the presence of bentonite clay in her well water is harmful to her and her family's health because they have been exposed to bentonite through ingestion, dermal contact, and inhalation exposures. I disagree that any bentonite clay in the Fuller residence well water is causing or has caused harm to witness Fuller or her family.

    a. Bentonite is a non-toxic natural clay mineral.
        i. Bentonite is a food additive approved by the U.S. Food and Drug Administration with no concentration limitation.

ii. Bentonite is approved by the World Health Organization as a food additive.
iii. Bentonite is a drinking water safe product that is certified for use in the construction of home water supply wells.
iv. Bentonite is used in animal feed.
v. Bentonite is used medicinally.
vi. Bentonite is used in pet litter products.

b. Bentonite products are specifically excluded from U.S. Occupational Safety and Health Administration (OSHA) rules governing exposures to crystalline silica because of their low toxicity.
   i. Although bentonite products do contain varying amounts of crystalline silica, such as quartz, the crystalline silica is occluded (coated with clay) and not toxic like the crystalline silica in many other minerals.
   ii. When OSHA promulgated the new crystalline silica rule in 2016, they specifically excluded bentonite clay from the scope of the rule because of its low toxicity.
   iii. Witness Fuller presented this fact in the excerpt from the Max Gel Safety Data Sheet on page 7 of her surrebuttal testimony. It states for carcinogenicity: "OSHA: Not regulated."

c. Despite the fact that bentonite is excluded from the OSHA crystalline silica rule, manufacturers of bentonite products list the presence of crystalline silica on the Safety Data Sheets because product manufacturers are required to list all ingredients that have been shown in any studies to have posed potential hazards. In the case of crystalline silica, workers in the hard rock mining industries who repeatedly breathed extremely high levels of respirable crystalline silica day after day throughout their working lifetimes developed several diseases, including lung cancer. As required by law, the warnings on any products that contain crystalline silica at levels exceeding 0.1% must state that there is a carcinogenic hazard posed by respirable crystalline silica, even when the actual risk is extremely low. For instance, the Safety Data Sheet for "Playsand", which is "sand for use in children's sand boxes," lists silicosis, lung cancer, tuberculosis, autoimmume and chronic kidney diseases, and non-malignant respiratory diseases, such as chronic bronchitis and emphysema as potential health effects even though the risks to children are essentially zero.

d. Crystalline silica poses risks to humans only when it is present at high levels in the air as an extremely fine respirable dust, less than 10 microns in diameter, and inhaled over many years. It is not an ingestion or dermal hazard, and it is not an inhalation hazard if the particles are larger than 10 microns, such the size of particles of dust produced by driving a vehicle over an unpaved dirt road.

e. Crystalline silica, such as quartz, is ubiquitous in the rock and soil that make up our environment, such as sand, gravel, concrete, stone and mortar. In fact, quartz

(silicon dioxide) is the most abundant mineral on the earth's surface. It only poses risks to workers who drill or grind quartz minerals and create respirable dust to which they are exposed repeatedly for years.

f. Silica, including crystalline silica, is present in the ambient air throughout the United States.

D. Fuller's claims regarding the risks posed by dermal exposure to water containing crystalline silica.

1. Witness Fuller, in her surrebuttal testimony, page 8, states, when discussing the hazards of crystalline silica in well water, that dermal exposure to organic compounds can occur in the home and that showering can volatilize organic compounds and result in exposure through the skin. The statement is irrelevant.

    a. Crystalline silica, such as quartz, is a solid mineral.
    b. Crystalline silica, such as quartz, is not an organic compound.
    c. Crystalline silica, such as quartz, is not volatile.
    d. Showering with water containing crystalline silica, such as quartz, would not result in dermal exposure.

E. Fuller's claims regarding the risks posed by inhalation exposure to water containing crystalline silica.

1. Witness Fuller, in her surrebuttal testimony, page 8, states, when discussing the hazards of crystalline silica in well water, that showering can produce respirable droplets that can be inhaled. The statement is misleading and inhalation risk from silica in shower water is essentially zero.

    a. The inhalation dose from showering with the water containing low levels of crystalline silica is *de minimis* and would cause no harm.
    b. Using the results of the paper cited by witness Fuller, Zhou et al. (2007), a hot shower could produce aerosol droplets within a shower stall at the concentration of 5-14 $mg/m^3$.
    c. Using the data from July 1, 2019 when bentonite clay was detected in the water, the Total Suspended Solids (TSS) measurement was non-detect (less than 2.5 mg/L), but it is assumed that TSS was 2.5 mg/L.
    d. Based on the RJ Lee Group's X-ray diffraction result, it is assumed that the bentonite was present at 20% in the TSS sample.
    e. Based on the 2019 Safety Data Sheet for CETCO Super Gel-X®, the product used at the site near the Fuller residence, the quartz content of this specific bentonite product was between 5% and less than 10%. It is assumed that quartz was present at 10%.

f. Based on these calculations, the maximum potential quartz content in the shower water was 0.000005%.
g. It is not known if the quartz in the bentonite present in the two samples of witness Fuller's well water is of respirable size, less than10 microns in diameter. But, conservatively assuming that all of the solid quartz in the water was less than10 microns in diameter and remained in the microscopic droplets present at a concentration as high as 14 mg/$m^3$, the concentration of quartz in the aerosol droplets would be 0.0007 ug quartz/$m^3$ of air.
h. Air in a shower stall containing 0.0007 ug quartz/$m^3$ of air would be inhaled for only a few minutes during showering. The concentration of shower droplets in the bathroom and the rest of the house would be lower. A daily dose of inhaled quartz this low is *de minimis* and would cause no harm. Such a dose is more than ***70,000 times lower*** than the Federal Permissible Exposure Level for respirable crystalline silica set by the U.S. Occupational Safety and Health Administration.

F. Fuller's claims regarding the hazards of bentonite clay based on Safety Data Sheets.

1. Witness Fuller, in her surrebuttal testimony, pages 6-7, makes claims about the risks posed by the presence of trace levels of bentonite clay in her well water based on statements from Safety Data Sheets required by the U.S. Occupational Safety and Health Administration Hazard Communication Standard. Witness Fuller does not understand the purpose of Safety Data Sheets and the difference between hazard and risk.

a. Safety Data Sheets convey information on hazards, not risks.
b. A hazard is an inherent property of a chemical or mineral.
c. A hazard can be present and not harm anyone if they are not exposed to it at a high level for long periods of time.
d. A risk exists if there is a hazard present ***plus*** there is exposure at a high enough level to cause harm or overpower the body's defenses.
e. The U.S. Occupational Safety and Health Administration clearly states this in their Guidance For Hazard Determination For Compliance With The OSHA Hazard Communication Standard (29 CFR 1910.1200): "Hazard determination does not involve an estimation of risk. The difference between the terms hazard and risk is often poorly understood. Hazard refers to an inherent property of a substance that is capable of causing an adverse effect. Risk, on the other hand, refers to the probability that an adverse effect will occur with specific exposure conditions. Thus, a substance will present the same hazard in all situations due to its innate chemical or physical properties and its actions on cells and tissues. However, considerable differences may exist in the risk posed by a substance, depending on how the substance is contained or handled, personal protective measures used, and other conditions that result in or limit exposure."
f. All of the statements listed by witness Fuller that were found in Safety Data Sheets refer to studies with workers who breathed high levels of respirable silica

dust daily for a working lifetime, and such studies have no relevance to the general public.

g. Safety Data Sheets are available for many products that people use at their homes without fear of harm, because their exposures are low and hence the risks are *de minimis*. For instance, the Fuller residence uses potassium hydroxide as a pH control agent for the well water. This chemical has hazardous properties, such as those listed in the Safety Data Sheet from ThermoFisher Scientific: "serious eye damage/eye irritation, skin corrosion/irritation, respiratory irritation, harmful if swallowed, etc." It is not likely that the Fuller family has ever been harmed by the hazardous potassium hydroxide that has been intentionally added to the well water, because the risks of harm are *de minimis*.

   The Fuller residence also has a swimming pool. It is very likely that they use ozone, chlorine, or bromine sanitizing chemicals to keep the pool water safe and fresh. All of these chemical products are extremely hazardous if not managed properly. For instance, the Safety Data Sheet for Pool Time® 3" Tablets Stab Chlorinator for sanitizing pools states the following hazards:
   "Corrosive, oxidizer, causes serious eye damage, causes skin burns, may be fatal is absorbed through skin, harmful or fatal if swallowed, may be fatal if inhaled, causes respiratory tract irritation, and avoid breathing dust or vapor." This product is intended to be added directly to swimming pools where the pool users would have dermal, inhalation and incidental ingestion exposures. Routine pool users would not be harmed by swimming in the water because their exposure to the hazardous chemicals are extremely low, making their actual risks very low.

   Members of the Fuller family also likely come into contact with gasoline from time to time when fueling the car, lawnmower, or snow blower. As an example, the Safety Data Sheet for unleaded gasoline from Valero states the following hazards: "Extremely flammable liquid and vapor. Causes skin irritation. May cause genetic defects. May cause cancer. Suspected of damaging fertility or the unborn child. May cause drowsiness or dizziness. May cause damage to organs (blood, liver, kidney) through prolonged or repeated exposure." Many members of the general public routinely use gasoline without experiencing any of the listed adverse health effects, because their exposure to the hazardous product, gasoline, is minimal.

   These examples of Safety Data Sheets for products commonly used by homeowners are presented to illustrate that Safety Data Sheets are intended to convey the worst case hazards that could occur if one was exposed to extremely high levels for long periods of time. In most cases, exposures are *de minimis* and hence risks are *de minimis*. The same is true regarding the risks of crystalline silica in bentonite clay in well water at a level of 0.000005%.

G. Fuller's claims regarding the risks of inhaling the air near HDD projects.

1. Witness Fuller, in her surrebuttal testimony, pages 7-8, states that she was never informed about, warned about or protected against "carcinogenic dust" at HDD sites. The statement is misleading and inhalation risk to passersby from respirable crystalline silica is essentially zero at HDD sites

    a. Bentonite clay dust is not a "carcinogenic dust" because bentonite clay dust has not been shown to cause cancer in animals or humans.
    b. As noted above, the crystalline silica (quartz) in bentonite clay products is occluded (coated with clay) and is much less toxic than the quartz in other minerals, which is why the U.S. Occupational Safety and Health specifically excluded bentonite clay products from the standards for crystalline silica.
    c. Workers at any sites or factories where dust can be present often wear dust masks, because they work every day often for 25 or more years at locations where dust levels can be high. This is true even for bakery workers who can be exposed to flour dust or for lawn workers who can be exposed to soil dust.
    d. Passersby who might walk by any construction site might be exposed for a short time to some dust, but most dust at construction sites is not respirable. Passersby would have low risks from inhaling respirable dust because the amount of respirable dust would be low, and the frequency and duration of their exposure would be low. Accordingly, their risk would be *de minimis*.
    e. Because the risks associated with a member of the public passing by a construction site is *de minimis*, there is no need to issue personal protective gear to members of the community and there is no need to install warning signs.

SPLP Statement No. 15- RJ
(Rejoinder Testimony of Brian Magee, Ph.D.)

# Exhibit SPLP BM-1-RJ

SPLP
BM-1-RJ

ARCADIS Design & Consultancy for natural and built assets

**Education**

Ph.D., Toxicology, Massachusetts Institute of Technology, Cambridge, 1986

M.P.A., Science and Public Policy, University of Washington, Seattle, 1978

M.S., Chemistry, University of California, San Diego, 1975

B.S. Chemistry, University of Virginia, Charlottesville, 1973

**Years of Experience**

Total - 36

With ARCADIS – 10

**Professional Qualifications**

Member, Governor's Pesticide Board

Member, Society of Toxicology

Member, American College of Toxicology

Member, International Society for Regulatory Toxicology and Pharmacology

Member, Society for Risk Analysis

Member, Society for Environmental Toxicology and Chemistry

Member, Society of the Sigma XI

# Brian Magee, Ph.D.

## Senior Vice President/Principal Toxicologist

Dr. Magee has over 35 years' experience in toxicology and risk assessment. Dr. Magee directs site and community risk assessment projects for a wide range of industrial and governmental clients and provides senior technical review of projects in which the critical evaluation of toxicological and pharmacokinetic data is essential. Dr. Magee has performed community risk assessments of former and operating phosphate and hard rock mines, former manufactured gas plants, petroleum refineries, operating chemical plants, landfills, and petroleum spill sites. In addition, he has derived risk-based clean-up criteria for numerous CERCLA, RCRA, and state-listed sites. Dr. Magee has also performed community risk assessments for over 20 combustion facilities, which include municipal solid waste combustors, hazardous waste combustors, petroleum- and petroleum coke-fired power plants, coal-fired power plants, cement kilns, and industrial boilers. Additionally, Dr. Magee has provided expert testimony regarding the risks posed by exposure to ammonia, formaldehyde, chlorinated solvents, petroleum mixtures, including creosote, diesel fuel, and fuel oils, chlordane, lead, complexed cyanides, and other chemicals.

## Summary of Core Skills

### Risk Assessment

Dr. Magee has performed hundreds of site and community risk assessments for Superfund, RCRA, and state-lead waste sites. These include baseline risk assessments, derivation of risk-based clean-up levels, risk assessments to evaluate the efficacy of proposed corrective actions, development of risk-based sampling plans for site investigations, risk calculations in support of litigation, and community risk assessments as requirements for permitting activities.

### Toxicological Evaluations/Investigations

Dr. Magee has performed numerous toxicological evaluations in support of regulatory compliance activities, risk assessments, and litigation support. These activities include the design, execution, and evaluation of primary toxicological research, such as the derivation of toxicologically relevant analytical method development and the design of animal experiments to support bioavailability adjustment factors. Toxicological research also involves summarization and evaluation of primary literature to determine health-based dose levels and evaluate the ability of a chemical to cause specific adverse effects.

### Expert Witness and Litigation Support

Dr. Magee has performed courtroom testimony, prepared affidavits, undergone depositions, prepared written testimony for submission to courts, and provided strategic consulting for litigation regarding toxic torts and regulatory compliance cases with respect to chlorinated solvents, combustor emissions, heavy metals, creosote, coal tar, naphthalene, metal-cyanide complexes, formaldehyde, and other chemicals.

### Regulatory Toxicology

Dr. Magee has written and evaluated environmental laws and regulations. He has prepared regulatory comments on many proposed rules, guidance manuals, and proposed methodologies that affect his clients. These comment documents are submitted to the relevant regulatory agency and become part of the docket for the proposed legal action.

## Representative Project Experience

### Community Health Risk Assessment Projects

**Nu-West Mining, Inc., ID –**Providing senior oversight on human health and ecological risk assessments of the Georgetown Canyon Phosphate Mine Site in Bear Lake and Caribou Counties, Idaho. Constituents of potential concern include aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, zinc and selected volatile and semivolatile compounds. Provided detailed critique of non-radiological toxicity factors for uranium.

**NuWest Mining, Inc., ID –**Providing senior oversight on human health and ecological risk assessments of the Champ Phosphate Mine Site in Caribou County, Idaho. Constituents of potential concern include aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, zinc. Provided detailed critique of toxicity factors for thallium and selenium.

**NuWest Mining, Inc., ID –**Providing senior oversight on human health and ecological risk assessments of the Mountain Fuel Phosphate Mine Site, Caribou County, Idaho. Constituents of potential concern include aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, zinc. Provided detailed critique of toxicity factors for thallium and selenium.

**Public Works and Government Services Canada, Canada** – Provided toxicological and risk community assessment technical support for the design and execution of a perimeter and community air monitoring program for arsenic for the Giant Mine Remediation Project to clean up a former gold mine contaminated with tons of arsenic trioxide waste materials. Derived Risk-Based Action Levels for arsenic and PM10 for numerous specific activities, including roaster building demolition, mine tailings working, above and below ground drilling, and asbestos waste re-packaging. Provided toxicological support concerning the derivation and implementation of a worker Biological Exposure Index for arsenic in urine and the influence of dietary arsenic exposure on urinary arsenic. Performed a Lessons Learned conference concerning on-site and off-site air monitoring during 2014 and made recommendations on changes to the 2015 air monitoring program. Summarized 2014 air monitoring data and made presentations to the Technical Working Group overseeing the remediation.

**Freeport-McMoRan, AZ –** For an operating open pit copper mine (Sierrita), provided planning and senior oversight of a comprehensive community human health risk assessment of metals (copper, molybdenum, arsenic, et al.) and radionuclides (uranium and radium) in mining waste tailings and waste rock stockpiles.

**Freeport-McMoRan, AZ**- For an operating open pit copper mine (Cyprus Tohono) on land leased from the Tohono O'odham Nation, provided senior oversight for a community human health risk assessment. Constituents evaluated included arsenic, lead, copper, other metals, organic constituents, and radionuclides in soil, groundwater, sediment, and water. Human health exposure scenarios evaluated include residential and commercial as well as recreational (swimming, irrigation, wading and fishing) scenarios.

**Confidential Client, Southwest**. For an operating copper mine that is planning to expand operations into the future, provided senior oversight for a comprehensive community human health risk assessment of impacts of metals and radionuclides in dust that may be transported to off-site receptors. Sources of dust included numerous point and nonpoint sources. Exposure pathways include direct inhalation, deposition onto surfaces, and uptake from garden soil into vegetables and fruit. Time points will include current and future emissions.

**Confidential Client, Midwest.** Critically evaluated an EPA RI/FS on lead and arsenic affected residential community adjacent to former smelting and metal refining facilities. The project was an investigation effort to evaluate EPA's RI/FS, determine if errors were made, prepare *de novo* remedial goals, prepare detailed comments, and determine alternate remedial cost estimates.

**City of El Paso, TX** – Served as the Mayor's office and the City Health Department's expert on the exposure assessment and community risk assessment of lead in soil in ten residential neighborhoods near a smelter site that EPA was considering listing as CERCLA sites. Made presentations to EPA, TDOH, TNRCC, and ATSDR on City's behalf and served on working groups with the above agencies as the City's designated representative. Evaluated and commented on work plans for and results of residential soil sampling, site-specific testing for model parameterization of EPA's Integrated Exposure Uptake Biokinetic Model for lead in children, site-specific bioavailability studies, and heath surveys attempting to identify the principal causes of children's lead levels in those with levels higher than 10 ug/dL in the study area. Compiled and evaluated historical and current children's blood lead levels in the study area, other areas in El Paso County, and other jurisdictions. investigated other sources of children's blood lead levels besides residential soil. Participated in derivation of site-specific action levels and identification of potential remedial approaches.

**Confidential Client, Washington, D.C. –** Prepared generic community multipathway risk assessment for lead emissions from 21 cement kilns permitted by RCRA to combust hazardous waste according to EPA's 1994 Screening Level Risk Guidance. Compared estimated child blood lead levels and estimated lifetime cancer risk associated with baseline emissions levels and proposed MACT standards. Direct and indirect pathways were evaluated, including beef, pork, chicken, egg, dairy product, and fish ingestion.

**Covanta Energy, Fairfield, New Jersey –** Managed the preparation of an Environmental Impact Statement and Clean Air Act PSD permit application for the expansion of the City and County of Honolulu's H-POWER Energy-from-Waste facility. The proposed project involved the addition of a new Mass Burn boiler and a new electric generation turbine. Constituents of concern include SOx, NOx, PM10, PM2.5, dioxins/furans, mercury, and others.

**Covanta Energy, Fairfield, New Jersey –** Performed human health risk assessment for and provided senior technical oversight of an Environmental Impact Statement and Clean Air Act PSD permit application for the expansion of the City and County of Honolulu's H-POWER

Energy-from-Waste facility. The proposed project involved the addition of a third Refuse Derived Fuel boiler unit to the currently operating facility. The project was not built due to the decision of the City Council in 2005.

**Covanta Energy, Fairfield, New Jersey –** Performed community human health risk assessment of PM10 and PM2.5 from Covanta's Marion County, Oregon Energy-from-Waste facility using published concentration-response functions. Estimated levels of increased mortality and morbidity from all causes and from selected specific causes. Demonstrated that not one person would die or become ill from emitted fine particulate matter due to the facility expansion even using conservative concentration-response functions from epidemiological studies that have debatable scientific soundness.

**Covanta Energy, Fairfield, New Jersey –** Performed community human health risk assessment of PM10 and PM2.5 from Covanta's Minneapolis, Minnesota Energy-from-Waste facility using published concentration-response functions. Estimated levels of increased mortality and morbidity from all causes and from selected specific causes. Demonstrated that not one person would die or become ill from emitted fine particulate matter due to the facility expansion even using conservative concentration-response functions from epidemiological studies that have debatable scientific soundness.

**City and County of Honolulu, Honolulu, Hawaii –** Performed a multipathway community human health risk assessment of emissions from the combustion of municipal solid waste at the City's combustor facility in advance of a permit application to build and operate a third boiler unit. Chemicals evaluated included lead, other heavy metals, polycyclic aromatic hydrocarbons and dioxin and furan congeners. Indirect risk assessment was performed in accordance with U.S. EPA combustor risk assessment guidance and included residents, farmers and fishers. Pathways included inhalation, ingestion of soil, ingestion of backyard produce, ingestion of drinking water, ingestion of fish, and ingestion of farm products. Using site-specific data the algorithms for the fate and transport of mercury were modified from EPA default values.

**New Brunswick Power, Fredericton, New Brunswick –** Performed toxicological evaluation of respirable particulate matter. Approximately fifty epidemiology studies and government documents allegedly linking quantifiable cases of health effects with respirable particulate matter were evaluated and critiqued. These documents included the Canadian "National Ambient Air Quality Objectives for Particulate Matter," the U.S. "Air Quality Criteria for Particulate Matter," and dozens of scientific papers from the primary literature. In addition, several computer models allegedly estimating quantifiable cases of health effects were evaluated and critiqued. These include the Illness Costs of Air Pollution (ICAP) model developed for the Ontario Medical Association and the Air Quality Valuation Model (AQCM) developed by Health Canada/Environment Canada.

**Department of Public Works, Sydney, Nova Scotia –** Performed Environmental Impact Analysis for air emissions associated with the environmental remediation of the Tar Ponds and Coke Ovens sites, which comprise over 100 hectares of industrial property containing 560,000 tonnes of soil contaminated with petroleum hydrocarbons, PAHs, and metals, 1,300 tonnes of PAH-contaminated sediments, 25,000 tonnes of coal-tar contaminated soil, 700,000 tonnes of sediments contaminated with PAHs and metals, and 35,000 tonnes of PCBs in excess of 50 ppm. Airborne constituents of concern included SOx, NOx, CO, and particulate matter from construction vehicles, particulate matter from excavation and grading activities, and site-related VOCs from excavation and stabilization activities. Evaluated air monitoring program and health-

based air criteria. Attended public consultation meetings, meetings with local medical specialists, and meetings with public health officials. Performed a multipathway risk assessment of emissions from a proposed PCB combustor, which included PCBs, dioxins/furans, PAHs, and selected metals as Constituents of Potential Concern. Performed a worker and off-site resident risk assessment of the remediation of pond sediments containing PCBs, PAHs, other organic constituents and metals as well as similar risk assessments for the remediation of soils, groundwater, stream sediments, and surface waters in other areas of the sites.

**Belt Collins Hawaii Ltd., Honolulu, HI –** For the Mamalahoa Highway – Kawaihae Road Connector Project in Waimea, HI, performed a community human health and environmental assessment of the impacts of the proposed roadway with regards to both the road's impact on adjacent agriculture and the impact of agricultural practices on individuals using the road. Constituents of concern were SOx, NOx, CO, and particulate matter from vehicles using the roadway and selected pesticides and herbicides from the farm operations.

**Westinghouse, Pittsburgh, PA –** Prepared a protocol document for a multipathway community risk assessment of a proposed PCB incinerator in Bloomington, IN. Derived absorption adjustment factors for PCBs. Attended meetings with and negotiated approaches and assumptions with EPA Region V.

**Beazer East, Inc., Nashua, NH –** Designed and executed a NHDES-approved air monitoring program to ensure that community public health was adequately protected against exposure to respirable particulates, volatile & semivolatile constituents, and metals during site regrading activities at a former wood treating site which had historical releases of naphthalene, creosote, and other constituents. Monitors included Hi-Vol sampling and analysis for metals, SVOCs and VOCs using EPA approved methods. Real time PM10 monitoring was also performed using fixed location and hand-held monitors. Derived health-based fence line criteria that were protective of nearby residents' health for respirable particles and for individual chemicals present in site soils.

**New Brunswick Power, Fredericton, New Brunswick –** Performed multipathway community human health risk assessment of emissions from the combustion of Orimulsion© (Venezuelan bitumen product) as fuel in the proposed refurbishment of an existing heavy fuel oil-fired power generation facility in Lorneville, New Brunswick. The risk assessment was a component study used to prepare an Environmental Impact Assessment required for a governmental operating permit. Approximately fifty epidemiology studies and government documents allegedly linking quantifiable cases of health effects with respirable particulate matter were evaluated and critiqued. These documents included the Canadian "National Ambient Air Quality Objectives for Particulate Matter," the U.S. "Air Quality Criteria for Particulate Matter," and dozens of scientific papers from the primary literature. In addition, several computer models allegedly estimating quantifiable cases of health effects were evaluated and critiqued. These include the Illness Costs of Air Pollution (ICAP) model developed for the Ontario Medical Association and the Air Quality Valuation Model (AQCM) developed by Health Canada/Environment Canada. Evaluated criteria and noncriteria chemical emissions. Chemicals evaluated included sulfur dioxide, nitrogen oxides, particulate matter, metals, polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds. Indirect risk assessment was performed in accordance with U.S. EPA combustor risk assessment guidance and included residents, farmers and fishers. Pathways included inhalation, ingestion of soil, ingestion of backyard produce, ingestion of drinking water, ingestion of fish, and ingestion of farm products. Attended meetings with and presented results

to regulatory officials, members of the public and members of intervener groups. Risk assessment results were well received and did not precipitate any adverse comments from any members of the governmental Technical Advisory Committee, which accepted and approved the report as written.

**New Brunswick Power, Fredericton, New Brunswick –** Performed community multipathway human health risk assessment of emissions from the combustion of a mixture of Heavy Fuel Oil and Petroleum Coke. Pathways included inhalation, ingestion of soil, ingestion of backyard produce, ingestion of drinking water, ingestion of fish, and ingestion of farm products.

**Department of Public Works, Sydney, Nova Scotia –** Performed dust and volatile chemical emission modeling and community risk assessment of coke, coal, and coal tar in support of the definition of exclusion zones for demolition of a former coke oven facility and coal tar distillery. Used EPA-approved models for estimation of PM10 emission factors associated with excavation, trucking, and storage activities and for estimation of volatile chemical emissions. Derived health-based criteria that were protective for nearby residents for short-term and long-term emissions of respirable particles, naphthalene, other volatile and semivolatile chemicals and selected metals. Performed risk assessment of deposited dust onto soil and garden produce. Derived emission factors for volatile chemicals for sludge excavation, dewatering, and stockpile storage associated with sewer pipe installation activities.

**Covanta Energy, Inc., Haverhill, MA (MSW Combustion Ash) –** Prepared a Scope of Work for the community multipathway human health risk assessment of a landfill disposal area for municipal solid waste combustion ash in accordance with MADEP guidance using EPA combustor risk assessment guidance. Designed and performed a site-specific monitoring program to measure total and respirable suspended particulates with Hi-Vol samplers and NIOSH personal monitors and to measure PM10 levels with a Personal DataRAM real-time monitor. In addition, total metals, such as arsenic, nickel and mercury, were analyzed, as was diesel particulate (organic and elemental carbon). Prepared report arguing that dust levels attributable to ash disposal were caused by diesel exhaust and not ash dumping or compacting.

**Department of Public Works, Sydney, Nova Scotia –** Performed dust and volatile chemical emission modeling and community risk assessment of coke, coal, and coal tar in support of the definition of exclusion zones for demolition of a former coke oven facility and coal tar distillery. Used EPA-approved models for estimation of PM10 emission factors associated with excavation, trucking, and storage activities and for estimation of volatile chemical emissions. Derived health-based criteria that were protective for nearby residents for short-term and long-term emissions of respirable particles, arsenic, lead, other metals, naphthalene, PAHs, and other volatile and semivolatile chemicals. Performed risk assessment of deposited dust onto soil and garden produce. Derived emission factors for volatile chemicals for sludge excavation, dewatering, and stockpile storage associated with sewer pipe installation activities.

**City and County of Honolulu, Honolulu, HI –** Prepared a scope of work for a field sampling program to measure respirable particulate generation during asphalt roadway demolition using cold planer machines by cold planing. Executed a field sampling program for particulate monitoring using NIOSH total and respirable dust methods and real-time PM10 monitors during roadway demolition. Concluded that respirable particulate generation from asphalt road demolition does not pose a significant risk to people adjacent residents or to workers. Prepared a report entitled "Air Monitoring of Roadway Demolition Activities, Beneficial Use of H-POWER Municipal Solid Waste Ash as an Aggregate for Road Materials.

**City and County of Honolulu, Honolulu, HI –** Designed and performed sampling for total particulates and respirable particulates and analyzed for metals, crystalline silica, and particle-bound and vapor phase mercury in ambient air at an operating municipal solid waste landfill adjacent to a residential development during a demonstration project in which municipal solid waste ash was used as daily landfill cover. Evaluated and validated laboratory data. Prepared risk assessment reports that addressed the health of landfill workers, members of the public that visited the landfill, and nearby residents. Concluded that use of ash as alternate daily landfill cover does not pose significant adverse human health risks. Provided technical support on issues raised during the public hearing process with regard to a proposal to extend the landfill operating permit.

**NiSource, Merrillville, IN –** Provided community risk assessment and toxicology consulting to gas utility concerning elemental mercury vapor because of Region V regulatory actions. Predicted indoor air mercury levels at various times assuming various spill scenarios using EPA models. Evaluated levels of mercury vapor commonly detected in dentists' offices and in locations of historical mercury spills. Evaluated health based criteria for mercury vapor exposure. Evaluated mercury vapor detection instruments.

**Gas Research Institute, Pittsburgh, PA –** Performed detailed review of a computer-based model developed to evaluate exposures and risks posed by mercury in surface and subsurface soils. Evaluated fate and transport, exposure assessment, and toxicity aspects of this model.

**Confidential Client, New Brunswick, Canada –** Critically evaluated report prepared for a medical waste combustor in support of an argument than a carbon injection air pollution control system to control mercury emissions was not required for government approval to increase the waste combustor operating conditions.

**Dominion Energy, Richmond, VA (Coal Combustion) –** Managed community multipathway risk assessment for proposed coal fired power plant permit. Selected contaminants of concern, relevant receptors, and exposure pathways. Oversaw calculations and prepared documentation.

**Hilo Coast Power Company, HI (Coal Combustion Ash) –** Performed risk assessment consulting on risks posed by leaching of metals from coal combustion ash. Evaluated laboratory methods and reporting limits. Evaluated the need to sample ash for additional metals based on the probability that such metals are present in coal ash. Performed fate and transport modeling and human health risk assessment. Participated in meeting with Hawaii Department of Health concerning beneficial reuse permit.

**AES, HI (Coal Combustion Ash) –** Performed community risk assessment consulting on risks posed by leaching and surface runoff of metals from coal combustion ash. Commented on proposed beneficial use permit. Performed fate and transport modeling and human health risk assessment.

**Ogden Projects, Inc., Stanislaw, CA –** Performed technical oversight of air dispersion modeling of a hypothetical accidental release of anhydrous ammonia. Conducted toxicological evaluation of acute toxicity data on ammonia. Determined appropriate health-based benchmarks for various exposure times.

**American Ref-Fuel, New York –** Provided peer review for a community multipathway risk assessment prepared by another company for a proposed municipal solid waste combustor.

Provided strategic risk assessment consulting. Chemicals of potential concern included dioxins/furans and metals.

**American Ref-Fuel, New York –** Provided strategic risk assessment consulting services by critiquing and modifying a previously prepared protocol for a hazardous waste combustor. Chemicals of potential concern included dioxins/furans and metals. Met with NYSDOH and NYSDEC on numerous occasions. Negotiated innovative and more realistic approaches with the agencies.

**Hazardous Waste Treatment Council, American Industrial Health Council, Chemical Manufacturer's Association, Washington, D.C. –** Prepared comprehensive comments on EPA's draft indirect risk assessment guidance for submission to the Agency. Evaluated EPA's proposed approach for evaluating uptake of dioxin vapor directly into plants and developed an alternative method.

**Hazardous Waste Treatment Council, Washington, DC –** Presented a seminar on multipathway risk assessments for incinerators and industrial furnaces to the Thermal Treatment Committee. Discussed the implications of the EPA's 1993 risk assessment initiative and critical strategic issues in performing risk assessments for these facilities.

**Covanta Energy, Inc., Salinas, CA –** Performed screening level air dispersion modeling of emissions from an internal combustion engine burning landfill gases. Evaluated risk assessment methodology used to determine compliance with State regulations.

**American Envirotech, Inc., Houston, Texas** – Prepared indirect pathway community risk assessment for proposed hazardous waste incinerator in accordance with major aspects of EPA's draft Addendum: Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions. Prepared a detailed protocol document in negotiation with the Texas Natural Resources Conservation Commission. Developed alternate approach for assessing direct uptake of dioxin vapor into plants. Evaluated risks for six different receptors and performed risk zone analysis per EPA and TNRCC requests.

**Environmental Technology Council, Washington, D.C. –** Submitted Affidavit, Supplemental Affidavit, and Expert Report to Federal District Court in Louisiana in support of litigation against GTX, Inc. Hazardous Waste Combustor, Morgan City, Louisiana (formerly Marine Shale, Inc.). Chemicals of potential concern included dioxins/furans and mercury. Evaluated risk assessments prepared for GTX, Inc. using the 1998 *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (1998)* with a commercial risk assessment program, IRAP-h, sold by Lakes Environmental. Evaluated the IRAP-h model for consistency with documentation requirements that are standard in the field of risk assessment and with the 1998 EPA guidance. Programmed and executed a side-by-side risk assessment using all of the same input parameters to test the accuracy of the IRAP-h model. Discovered many errors and flaws in the GTX risk assessments, including the inability of the IRAP-h program to allow reviewers to verify the correctness of the internal code. Prepared detailed summary report that outlined deficiencies in the GTX risk assessments and prepared a comprehensive risk assessment document using the EPA guidance.

**Environmental Technology Council –** Prepared comments on 1998 *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (1998)* for submission to EPA. Protocols and methodologies were taken from a more generic document that has not yet been released to the public: *Methodology for Assessing Health Risks Associated with Multiple*

*Exposure Pathways to Combustor Emissions*. Major aspect of the evaluation focused on the treatment by USEPA of mercury emissions from combustion facilities, including the vapor/particle partitioning, the valence state interactions, and the methylation processes.

**ENSCO, El Dorado, AR –** Prepared a Scope of Work for the multipathway human health risk assessment of the emissions from a hazardous waste combustor facility in accordance with U.S. EPA combustor risk assessment guidance and in accordance with comments from state regulators.

**Municipal Solid Waste Combustor, Pennsylvania –** Performed a multiple exposure pathway, multiple compound, multiple media risk assessment for permitting a new combustor in accordance with Pennsylvania and state-of-the-art guidelines. Projected emissions dispersion and performed deposition modeling to provide ground-level ambient concentrations and accumulation of emitted materials in solids, dusts and food chains. Chemicals of potential concern included dioxins/furans and metals. Although food chain exposures posed the largest potential risks, no unacceptable risks were identified by the assessment. Attended public meetings.

**UCAR Carbon, Nashville, TN –** Evaluated coal tar pitch volatile emission data from various carbon anode preparation unit activities and toxicology literature on PAH-containing mixtures. Prepared recommendations concerning monitoring protocols for coal tar pitch volatiles and fence-line concentrations that are protective of human health.

**Energy Answers, Rochester, MA (MSW Combustion Ash) –** Performed risk assessment of the use of aggregate material produced from municipal solid waste combustor bottom ash in asphalt roadway construction. Evaluated leaching of lead and other metals from ash-aggregate-amended asphalt. Performed human health and environmental risk assessment of surface runoff and groundwater leachate. Participated in negotiations with MADEP. Assisted in preparation of Beneficial Use Permit.

**Norlite Light Aggregate Kiln, NY (Fossil Fuel Ash Aggregate) –** Performed risk assessment consulting to light aggregate kiln that was co-firing fuel oil and hazardous waste solvents and was producing an aggregate material that was mixed with combustion ash. Assisted in decision-making regarding the marketability of the product. Risk assessment activities focused on lead.

**Ogden Projects, Fairfield, NJ (MSW Combustion Ash) –** Performed critical evaluation of risk assessment documents addressing the beneficial reuse of municipal solid waste combustor ash from two municipal waste combustors. Risk assessment activities focused on the presence of lead in the combustor ash. Prepared a technical memorandum and participated in client conferences with the document authors.

**Confidential Client, Washington, D.C. –** Prepared generic multipathway risk assessment for lead emissions from 21 cement kilns permitted by RCRA to combust hazardous waste according to EPA's 1994 Screening Level Risk Guidance. Compared estimated child blood lead levels and estimated lifetime cancer risk associated with baseline emissions levels and proposed MACT standards. Direct and indirect pathways were evaluated, including beef, pork, chicken, egg, dairy product, and fish ingestion.

**City and County of Honolulu, Honolulu, HI (MSW Combustion Ash) –** Prepared three human health risk assessments of the beneficial use of municipal solid waste combustion ash from the City and County of Honolulu's H-Power facility. One project considered the proposed

use of the ash *in lieu* of clay as part of the final cover in the closure of a city-owned landfill. The risk assessment considered risks from lead, other heavy metals, and dioxin and furan congeners. Risks during and after the closure were evaluated under several potential scenarios using EPA's IEUBK model and California's LeadSpread model. Receptors included workers, on-site trespassing children, and off-site children. Affected media included the ash, ash leachate, ash-derived dust, surface water and sediment, and fish. Dust generation and dispersion modeling was performed as well as modeling of surface runoff of ash into nearby surface water and sediment. Ash-specific absorption adjustment factors were derived for lead and other metals. A second project considered the proposed use of combustor ash as alternate daily cover at the City's operating municipal solid waste landfill. A third project considered the use of combustor ash as aggregate in road materials.

**City and County of Honolulu, Honolulu, HI (MSW Combustion Ash) –** Prepared a work plan for the environmental testing of a test roadway that would contain municipal solid waste combustion ash as a partial substitute for aggregate in the asphalt preparation. Prepared an operations plan for the manufacture of the ash-amended asphalt and the construction of the test roadway. Prepared a draft and final work plan for the evaluation of the leachate quality from the roadway materials containing ash. Constituents of concern were lead and other heavy metals. Provided oversight of the manufacture of ash-amended asphalt and the construction of the test roadway. Executed the four-year field sampling program for environmental testing of the test and control roadways. Summarized the environmental testing of municipal solid waste ash-amended asphalt. Test results included wash water analyses, analyses of the soil at the location of surface water runoff from the test and control roadways, and analysis of SPLP leachate of test cores of test and control asphalt. Prepared a plan for long-term testing of ash-amended asphalt.

**City and County of Honolulu, Honolulu, HI (MSW Combustion Ash) —** Performed risk assessment, air sampling, and legislative testimony in Senate committee hearing to address emergency concerns by the State, environmental activists, and local citizens concerning some unpermitted waste disposal activities at a former municipal solid waste incinerator. Disposal activities included disposal of solid waste combustion ash on the facility site and disposal on the adjacent ash landfill. Prepared a Human Health Risk Assessment of the City and County of Honolulu's Refuse Division and Department of Parks and Recreation workers who currently work at the closed Waipahu Incinerator complex, children and adults who use the adjacent Waipio Peninsula Soccer Complex, nearby residents, and hypothetical trespassers at the Waipahu Ash Landfill. Constituents of concern were lead, other heavy metals, and dioxins and furans.

**City and County of Honolulu, Honolulu, HI (MSW Combustion Ash) –** Prepared Closure Plan for Subtitle D closure of a unused municipal solid waste incinerator. Performed facility inventory and wipe sampling of internal facility surfaces for lead and other metals present in deposited ash-like material. Responded to State Department of Health (DOH) questions and attended meeting with DOH on client's behalf. Closure Plan includes plans for soil sampling and analysis, equipment cleaning, removal and recycling, building surface wipe sampling and risk assessment, groundwater modeling, ecological reconnaissance, and site wide risk assessment.

**Confidential MSW Ash Landfill (MSW Combustion Ash) –** Provided risk assessment consulting services concerning the permitting requirements for expanding a municipal landfill that accepts municipal solid waste combustor ash, which contains lead, other heavy metals, and

dioxins/furans. The landfill wished to gain state permission to use MSW combustor ash as landfill daily cover.

**Confidential MSW Facility (MSW Combustion Ash) –** Provided litigation support regarding a personal injury case in which plaintiffs alleged that they were harmed by heavy metals, such as lead and cadmium, from a municipal solid waste combustor's stack emissions and/or fugitive dust from the municipal solid waste combustor ash. Evaluated plaintiff's medical data, identified various potential sources of heavy metal exposures, and performed various risk assessment calculations. Assisted in preparing interrogatories and responses to interrogatories.

**City and County of Honolulu, Honolulu, HI –** Prepared a scope of work for a field sampling program to measure dust generation during asphalt roadway demolition using cold planer machines by cold planing. Executed a field sampling program for dust generation monitoring using NIOSH total and respirable dust methods and real-time PM10 monitors during roadway demolition. Constituents of concern included lead and other heavy metals. Concluded that dust generation from asphalt road demolition does not pose a significant risk to people adjacent residents or to workers. Prepared a report entitled "Air Monitoring of Roadway Demolition Activities, Beneficial Use of H-POWER Municipal Solid Waste Ash as an Aggregate for Road Materials.

**Confidential Polymer Processor, CT –** Performed toxicological evaluation of numerous chemicals to determine the cause of alleged health symptoms reported by people living near the facility. Focused on eye and lung irritation and delayed sensitization effects. Derived toxicological benchmarks for use in a human health risk assessment. Interfaced with client lawyers and negotiated with the state toxicologist.

**Confidential Tannery, MN –** Conducted toxicological investigation of products and formulations to determine the cause of alleged respiratory sensitization symptoms in workers in one department. Evaluated ambient air monitoring reports and analytical methodologies. Performed literature searches and critical reviews of scientific papers.

**NiSource, Merrillville, IN –** Provided risk assessment and toxicology consulting to gas utility concerning elemental mercury vapor because of Region V regulatory actions. Predicted indoor air mercury levels at various times assuming various spill scenarios using EPA models. Evaluated levels of mercury vapor commonly detected in dentists' offices and in locations of historical mercury spills. Evaluated health-based criteria for mercury vapor exposure. Evaluated mercury vapor detection instruments.

**Ogden Projects, Inc., Stanislaw, CA –** Performed technical oversight of air dispersion modeling of a hypothetical accidental release of anhydrous ammonia. Conducted toxicological evaluation of acute toxicity data on ammonia. Determined appropriate health-based benchmarks for various exposure times.

### Worker Risk Assessment Projects

**Bank of America, NJ –** Evaluated site data and assisted in work plan development for White Swan Superfund Site downgradient from a former dry cleaning facility. Tetrachloroethylene and other solvents had migrated beneath a large residential neighborhood. Attended meetings with US EPA and participated in scoping of RI/FS process.

**Confidential Client, NJ –** Prepared a toxicological evaluation of tetrachloroethylene in an office building formerly used as a dry-cleaning facility. Evaluated reported health symptoms associated

with PCE exposure and evaluated specific symptoms and health effects reported by building staff. Prepared memorandum summarizing findings and briefed client and client legal staff.

**Confidential Medical Clinic, Nationwide –** Evaluated the toxicological consequences of an event in which a fire extinguisher containing ABC Dry Chemical Fire Extinguishant accidentally discharged in the storage room a medical clinic. The accidental discharge released the contents of the fire extinguisher, resulting in aerial dispersion of the extinguishant to the storage area and to a neighboring room that houses equipment used to prepare materials for on-site patient treatment. Prepared toxicological evaluation of monoammonium phosphate and other ingredient and performed a human health risk evaluation.

**Confidential Medical Clinic, Nationwide –** Evaluated the toxicological consequences of an event in which a pump motor causes a small fire that partially burned plastic piping that carried solutions used in clinical treatment. Client was concerned that the heat may have caused the release of constituents in the plastic piping into the solutions within the pipe. Critically evaluated the situation, assisted in designing a testing program, evaluated the test data and performed a toxicological evaluation.

**Confidential Medical Clinic, Nationwide –** Evaluated the toxicological consequences of an event in which unspecified contaminated water from the town water supply entered the clinic and may have mixed with solutions used for patient treatment. Critically evaluated the situation, assisted in designing a testing program, evaluated the test data and performed a toxicological evaluation.

**Confidential Electric Power Plant, Nationwide -** Evaluated the hazards and risks to workers posed by the release of two fire-resistant hydraulic fluids (Fyrquel EHC & Fyrquel EHC Plus) at an operating power plant. Evaluated the toxicological properties of the constituents, which were mixtures of tri-aryl phosphates. Performed human health risk evaluation and briefed workers at the plant.

**Confidential Electric Power Plant, Nationwide -** Evaluated the hazards and risks to workers posed by the release of ash containing small amounts of respirable crystalline silica from routine operations. Designed sampling and analysis program. Evaluated data and assisted managers in defining exclusion zones. Briefed workers on risks of respirable crystalline silica.

**Confidential Electric Power Plant, Nationwide-** Evaluated the hazards and risks to workers posed by the release of a white powder containing amorphous silica from a siloxane removal system. Workers were concerned that they had been exposed to crystalline silica. Critically evaluated test data and prepared a summary report for workers that explained the risk profiles of crystalline silica versus amorphous silica. Briefed workers and addressed worker concerns. Presented risk evaluation results at meeting of regulatory officials.

**Payette Company, MA –** Performed indoor air quality assessment of an office building in which people were complaining about headaches and subjective symptoms. Evaluated the building, chemicals used, and staff complaints. Prepared memorandum summarizing findings.

**Rite Aid Pharmacy, PA –** Performed a critical evaluation of an Industrial Hygiene report on indoor air quality at an operating pharmacy building in New Jersey that was located adjacent to property that formerly housed a service station and a dry cleaner. Performed risk assessment calculations on chlorinated solvents and petroleum hydrocarbons. Made presentations to Rite Aid workers concerning indoor air quality.

**Rite Aid Pharmacy, NC –** Evaluated indoor air quality data on several warehouse buildings in North Carolina that were situated atop groundwater containing chlorinated solvents, including TCE and PCE, presumably released from former occupants of the buildings and other adjacent buildings. Planned and executed additional air quality sampling in several buildings. Performed risk assessment calculations and prepared a report.

**Confidential Polymer Processor, CT –** Performed toxicological evaluation of numerous chemicals to determine the cause of alleged health symptoms reported by people living near the facility. Focused on eye and lung irritation and delayed sensitization effects. Derived toxicological benchmarks for use in a human health risk assessment. Interfaced with client lawyers and negotiated with the state toxicologist.

**City and County of Honolulu, Honolulu, HI –** Performed indoor surface wipe testing of dust in a former municipal solid waste incinerator that is currently used as a maintenance shop and office space for employees of two City departments. Tested collected dust samples for lead and other heavy metals. Evaluated dust loading standards for the definition of lead-based paint as defined by EPA and HUD in residential buildings. Evaluated OSHA workplace floor dust criteria. Performed risk assessment calculations for workers using standard practices.

**Confidential Client, Nationwide –** Prepared risk-based lead wipe sample criteria for commercial buildings for a company that was vacating buildings and cleaning them for commercial re-use.

**ENSCO, El Dorado, AR –** Evaluated the scientific literature and prepared a toxicological evaluation of 2,4-dichlorophenol, phenol, and other chlorophenols to assist ENSCO in setting waste acceptance criteria that would be protective of worker's health.

**New Brunswick Power, Fredericton, NB –** Performed detailed toxicological evaluation of vanadium and prepared report that was submitted to potential clients of synthetic gypsum (flue gas desulfurization residue) who use it to manufacture wallboard. The report evaluated respiratory toxicological data to determine if vanadium released in the manufacture and use of synthetic gypsum wallboard might have the potential cause certain respiratory effects that are known to be associated with a specific vanadium compound, vanadium pentoxide, which serves as the basis of the US EPA Reference Concentration for vanadium. Designed in vivo inhalation toxicology study to directly determine inhalation toxicity of both natural and synthetic gypsum. Designed in vitro toxicology study to determine the bioavailability of both natural and synthetic gypsum. Designed exposure study to measure the amount of dust released during the cutting of wallboard during use in construction activities.

**3M Company, Minneapolis, MN –** Conducted toxicological investigation of 70 chemicals and chemical mixtures, including solvents, dyes and pigments, and plastic resins and additives. Determined presence of chemicals on various regulatory lists and evaluated primary toxicological information. Chemicals were then prioritized to assist 3M in pollution prevention planning.

**NiSource, Merrillville, IN –** Provided risk assessment and toxicology consulting to gas utility concerning elemental mercury vapor because of Region V regulatory actions. Predicted indoor air mercury levels at various times assuming various spill scenarios using EPA models. Evaluated levels of mercury vapor commonly detected in dentists' offices and in locations of historical mercury spills. Evaluated health based criteria for mercury vapor exposure. Evaluated mercury vapor detection instruments.

**Boston Gas Company, Medford, MA –** Performed risk assessment consulting regarding a building formerly used for chemical manufacturing and formulating that was being considered for redevelopment as an office building. Performed a site inspection, a toxicological investigation of site-related chemicals, and risk assessment calculations.

**Confidential Client, NY –** Evaluated chemical composition data from an off-specification caulk product that was present in an office building. Prepared a toxicological evaluation of the constituents and evaluated potential risk to office workers.

**Confidential Client, NM –** Performed strategic consulting to client on indoor air quality sampling and data evaluation for an office building above a former TCE plume associated with a former Superfund site in Albuquerque, NM.

**Confidential Tannery, MN –** Conducted toxicological investigation of products and formulations to determine the cause of alleged respiratory sensitization symptoms in workers in one department. Evaluated ambient air monitoring reports and analytical methodologies. Performed literature searches and critical reviews of scientific papers.

**Goodwin Proctor, UniFirst Corporation, MA –** Performed risk assessment for one of the largest and most complex chlorinated solvent site in Massachusetts. Tetrachloroethylene was released from the site of a former dry-cleaning warehouse facility and migrated beneath 40-50 homes and businesses in a residential neighborhood in Somerville, MA. Provided technical assessment of a State-proposed Unit Risk Factor (URF) for PCE and succeeded in convincing regulators to allow use of a realistic URF. Participated in Massachusetts Department of Environmental Protection Indoor Air Workgroup, attended meetings, and provided critical comments to draft Indoor Air Guidance documents. Attended public meetings, meetings with regulators, and meetings with staff and teachers at an affected school. Performed risk assessment calculations for PCE, TCE and other solvents and prepared multiple reports.

**Duke Energy, IN –** Evaluated indoor air quality data from an office building adjacent to and on top of a former manufactured gas plant site. Performed Peer Review of risk assessment calculations and report. Advised client of significance of detected constituents.

**Boston Gas Company, Boston, MA –** Performed a Method 3 Phase II Risk Characterization of a former Manufactured Gas Plant site currently used as a private membership yacht club and marina. gas storage and distribution center. Chemicals evaluated included PAHs, TPH, cyanide, and lead. Receptors included on-site workers, construction and utility workers, and club members.

**Consolidated Edison, NY –** Prepared risk communication course for workers at Consolidated Edison's Astoria, Queens facility to discuss the RCRA RFI process in the areas previously used as a Manufactured Gas Plant facility. Discussed toxicological information regarding PAHs, coal tar, complexed cyanides, and other MGP-related chemicals.

**Boston Gas Company, MA –** Prepared toxicological evaluation of ferric ferrocyanide for presentation to workers at a former MGP site. Performed risk characterization of site groundwater to determine if volatile chemicals present in water in building basements could volatilize into the building.

**Confidential Manufacturing Client, US –** For a confidential electronic manufacturing client, provided senior oversight and technical review of a summary of information pertaining to radioactivity from the long -term releases from the malfunctioning Fukushima nuclear reactor

complex located in Fukushima Prefecture, Japan. This summary discussed the potential for adverse worker safety-related impacts to workers at the client's facilities that received electrical components from suppliers located in Japan.

**GEMCORE Site, CA –** For Chevron Environmental Management Company, provided senior oversight and peer review of a risk assessment that evaluated the potential for adverse human health effects from exposure to arsenic, lead, and naturally occurring radioactive material (NORM) in soil at the Former Unocal/GEMCOR Geothermal Facility in Calipatria, California. The risk evaluation considered the hypothetical future exposure of solar power facility maintenance workers. For NORM, human exposures were estimated and radiological doses and cancer risks were calculated using RESRAD, Version 6.5.

**City and County of Honolulu, Honolulu, HI –** Performed indoor surface wipe testing of dust in a former municipal solid waste incinerator that is currently used as a maintenance shop and office space for employees of two City departments. Tested collected dust samples for lead and other heavy metals. Evaluated dust loading standards for the definition of lead-based paint as defined by EPA and HUD in residential buildings. Evaluated OSHA workplace floor dust criteria. Performed risk assessment calculations for workers using standard practices.

### Regulatory Product Toxicology

**Simplot, ID –** Assisted the Far West Agribusiness Association to remove ammonium sulfate from Washington Department of Ecology (DOE)'s list of "toxic air pollutants" under WAC 173-460-150 based on the most recent, best available health effects information. Critically evaluated primary toxicological data, prepared a summary report and testified at a regulatory hearing.

**Confidential Client, US –** Provided product registration services to a client who filed a Premanufacture Notice under the Toxic Substances Control Act (TSCA) with incorrect information about the identify of a reactant, which was supplied as a confidential trade-marked reactant. Prepared amendment to the Premanufacture Notice and investigated the potential legal liability associated with supplying incorrect information to the USEPA.

**Confidential Chemical Company, US** – Provided toxicology support for chemical product registration in US under TSCA for a new chemical entity. Concluded that the new chemical entity has structural features that are classified as low hazard and are similar to the features of chemicals included on the low-hazard monomer and reactant list. The specific monomer unit included in the PMN chemical is derived from a chemical that is different from the one for which EPA reviewers expressed concern. Based on these considerations, concluded that the PMN chemical did not "present unreasonable risk of injury to human health or the environment," that additional toxicity testing is not warranted, and that a use restriction for a specific application requested by EPA was not needed.

**Confidential Electronics Company, US** - Reviewed compliance with TSCA LVE and R&D exemptions and other TSCA-related matters for silane chemicals. Provided guidance on the number of isotopic and deuterated products to determine whether any additional listings are necessary for these products.

**Confidential Specialty Engineered Materials Company, US –** Provided toxicology support for filing of a Premanufacture Notice under the Toxic Substances Control Act for a metallic chemical entity containing four metal elements. The objective of this review was to identify potential concerns that might be reflected on a product Safety Data Sheet for the chemical entity or during

the U.S. Environmental Protection Agency's (US EPA) review of a Premanufacture Notice or exemption request filed under the Toxic Substances Control Act (TSCA).

**Expert Witness Support on Proposition 65 Issue –** Provided Proposition 65 risk assessment support to confidential brass part manufacturer who was being sued for failure to warn of the presence of lead in commercial metal parts. For this project, he critically evaluated the testing and risk assessment of the plaintiff and showed that the No Significant Risk Level was not exceeded, and warning was not necessary.

**Toxicology Excellence in Risk Assessment, Cincinnati, OH –** Served on independent expert panel to review and evaluate a toxicological evaluation of coal tar shampoo that derived a No Significant Risk Level in accordance with California Proposition 65. Risk assessment was performed in support of litigation by coal tar shampoo manufacturers.

**Confidential Pharmaceutical Client, Switzerland –** Provided product registration services to a client who was required to register pharmaceutical intermediates under the EU REACH program. Performed toxicological read-across assessments for 30 intermediates to determine if toxicological data from Active Pharmaceutical Ingredients and/or other chemicals in commerce would be reasonable surrogate data.

**Confidential Pharmaceutical Client, Switzerland –** Provided toxicological assessment services to a client who was required to derive Permitted Daily Exposure levels (PDEs) and Derived No Effect Levels (DNELs) for eight pharmaceutical active ingredients per European Medicines Agency requirements. Reviewed and evaluated toxicological data and derived PDEs and DNELs.

**Confidential Pharmaceutical Client, US –** Provided toxicological assessment services to a client who wished to derive acceptable levels in wastewater from manufacturing facilities for more than 25 pharmaceutical active ingredients. Reviewed and evaluated toxicological data and derived toxicological Acceptable Daily Intakes and microbial resistance Acceptable Daily Intakes for humans and wildlife.

**Farchemia, Milan, Italy –** Derived and documented human health risk-based guidelines for drinking water consumption for two pharmaceuticals that were released to surface water. For carbamazepine and dimetridazole, no Tolerable Daily Intake (TDI) or an Acceptable Daily Intake (ADI) values were available in the published literature. AMEC risk assessors searched the published toxicology literature, summarized the literature on adverse effects and the dose levels at which they occurred, and derived a TDI using the methods and procedures that are in normal use by regulatory agencies. From the TDIs, groundwater remedial goals for the two pharmaceuticals were derived and documented.

**Babst, Calland, Clements, and Zomnir, PA –** Derived and documented an oral health-based toxicological criterion (Reference Dose) for resorcinol based on newly available data from a range finding study of a guideline compliant two-generation reproduction and developmental toxicity study in rats sponsored by the Resorcinol Task Force. Evaluated the published literature. Prepared a comprehensive toxicological evaluation. Presented proposed Reference Dose at expert panel meeting arranged by Toxicology Excellence in Risk Assessment (TERA). Evaluated and responded to panel comments. Presented updated findings to TERA panel. Presented Reference Dose at meeting of Pennsylvania Science Advisory Board.

**Resorcinol Task Force, Gloucestershire, United Kingdom –** Attended various annual meetings, derived a Reference Dose (RfD) for resorcinol, discussed the RfD and approval by a review panel convened by TERA, and participated in discussions about RTF's draft report of the guideline-compliant full two generation reproductive study in rats. Assisted in the evaluation of the WHO CICAD and in the preparation of the recent SIAR as a toxicology reviewer.

**Babst, Calland, Clements, and Zomnir, PA –** Critically evaluated and prepared comments on the EPA's High Production Volume Data Summary and Test Plan for resorcinol.

**Babst, Calland, Clements, and Zomnir, PA –** Critically evaluated and prepared comments on an ATSDR Public Health Assessment on the Bear Creek Waste Disposal Area. Evaluated and prepared comments on the toxicological evaluations of resorcinol, benzene sulfonate, meta benzene disulfonate, and para hydroxyl benzene sulfonate.

**Babst, Calland, Clements, and Zomnir, PA –** Derived and documented oral health-based toxicological criteria (Reference Doses) for benzene sulphonate, meta benzene disulphonate, and para hydroxyl benzene sulphonate from toxicological studies designed, placed, managed, and evaluated for the client. Toxicological studies for the three constituents included: mutagenicity studies in bacteria and mammalian cells, 17-day range finding studies in rats, and 13-week studies in rats.

**Beazer East, Inc., PA –** Designed, placed, managed, evaluated and summarized dermal irritation toxicological studies in rabbits for benzene sulphonate, meta benzene disulphonate, and para hydroxyl benzene sulphonate. Results were published in a peer-reviewed journal.

**Schultheis Tabler and Wallace, Ephrata, WA –** Performed detailed toxicological evaluation of ammonia and prepared expert report for submission to the court. The report evaluated respiratory toxicological data to determine if a single, short-term exposure might have caused chronic respiratory effects as alleged by a railway worker who was working near a site from which ammonia fumes were alleged to have been released into the atmosphere. Attended deposition.

**Osaka Gas Company, Japan –** Evaluated toxicology and risk assessment laws and regulations for UK, US, Canada, Germany, Netherlands, and other European countries, prepared report comparing approaches to waste site management among countries, and made recommendations concerning the best approach for a waste site in Japan.

**Beazer East, Inc., PA –** Designed, placed, managed, evaluated and summarized dermal penetration studies in human skin for benzene sulphonate, meta benzene disulphonate, and para hydroxyl benzene sulphonate. Results were published in a peer-reviewed journal.

**Confidential Tannery, MN –** Conducted toxicological investigation of products and formulations to determine the cause of alleged respiratory sensitization symptoms in workers in one department. Evaluated ambient air monitoring reports and analytical methodologies. Performed literature searches and critical reviews of scientific papers.

**Commonwealth of Pennsylvania, Pittsburgh, PA –** Evaluated toxicological evaluation of TPH from diesel fuel prepared by Conrail in support of a state-wide clean-up standard for TPH. Presented alterative approach that was incorporated into the document.

**U.S. EPA, Washington, DC –** Assessed the suitability of using the EPA RQ scheme for ranking chronic toxic effects for the purpose of Emissions Inventory Reporting. Prepared additional toxicity criteria for implementation of Section 313 of the Superfund Amendments.

**Hawaii Department of Health, Honolulu, HI –** Served as toxicology consultant to HDOH in addressing the concerns of a community group who alleges abnormally high rates of birth defects and learning disabilities in their children due to pesticide residues from former agricultural use of the land upon which their community was built. Performed toxicological evaluation of 50 chemicals of potential concern, which included organic herbicides, chlorinated hydrocarbons, arsenic, chromium and dioxins/furans. Risk assessment calculations demonstrated that the chemicals detected in residential soils could not have been causally related to any effects alleged by community members. Made presentations to members of the public and attended meetings with HDOH.

**Massachusetts Natural Gas Council, MA –** Performed toxicological evaluation of ferric ferrocyanide for submission to the U.S. Environmental Protection Agency to assist them in determining if ferric ferrocyanide should be listed as a CERCLA Hazardous Substance.

**California Dept. of Health Services –** Prepared a comprehensive human health effects assessment of inorganic nickel. Derived health-related limits and goals for use in emergency and remedial actions at California hazardous waste sites. This project required a critical evaluation of scientific reports regarding all aspects of the toxicology of nickel compounds. An important aspect of this assessment was the derivation of toxicokinetic factors from comparisons of the absorption, metabolism, and elimination of the contaminant by humans and the experimental animals that were used in the quantitative toxicity studies.

**American Red Cross, Washington, DC –** Served on expert panel of toxicologists that evaluated the use of bis(2-ethylhexyl)phthalate (BEHP) and a new citrate based plasticizer in blood bags. Because BEHP, which has a history of safe use in blood bags, has been shown to cause tumors in rodents who are fed large doses over their lifetime, alternative plasticizers were developed by blood bag vendors. Upon comparison of the toxicological data from both chemicals, the panel recommended that use of BEHP be continued.

**U.S. EPA, Washington, DC –** Prepared a critical evaluation of the available information on the carcinogenicity, mutagenicity, reproductive effects and developmental effects caused by inorganic fluorides. U.S. EPA used this report in making decisions regarding the merit of a petition to have inorganic fluoride added to the SARA Section 313 list.

**IBM, NY –** Provided peer review of a toxicological analysis of perchloroethylene. Analysis was prepared to apprise IBM corporate staff of current developments in the toxicology and pharmacokinetic modeling of PCE. Topics presented included epidemiology, animal carcinogenicity bioassays, potential mechanisms of carcinogenicity, physiologically-based pharmacokinetic modeling, and relevance to human risk of PCE carcinogenicity in experimental animals.

**Confidential Client, TX –** Provided senior review and oversight of a risk assessment of perchloroethylene in groundwater associated with an industrial laundry. Risk assessment was prepared for litigation support and included a critical evaluation of the EPA's current cancer slope factor. Evaluated current pharmacokinetic modeling studies and presented alternate cancer slope factors based on best available science.

**Boise Cascade Corporation, International Falls, MN –** Prepared a critique of EPA's cancer slope factor for chloroform that was published in the Journal of the Technical Association of the Pulp and Paper Industry. Prepared comprehensive evaluation of the metabolism and bioavailability metabolism of chloroform.

**Boston University School of Medicine –** Served as Adjunct Assistant Professor of Toxicology, 1989-1992. Taught graduate level course in toxicology to medical doctors and graduate students in public health.

**City of Detroit Legal Department –** Provided expert testimony regarding a legal case in which PCBs from a Region V Superfund site were alleged to have caused specific adverse health effects. Prepared a written interrogatory and gave an oral deposition regarding the significance of specific PCB serum levels as an indicator of site-specific exposure versus general background exposure.

**New Brunswick Power, Fredericton, New Brunswick –** Performed toxicological evaluation of respirable particulate matter. Approximately fifty epidemiology studies and government documents allegedly linking quantifiable cases of health effects with respirable particulate matter were evaluated and critiqued. These documents included the Canadian "National Ambient Air Quality Objectives for Particulate Matter," the U.S. "Air Quality Criteria for Particulate Matter," and dozens of scientific papers from the primary literature. In addition, several computer models allegedly estimating quantifiable cases of health effects were evaluated and critiqued. These include the Illness Costs of Air Pollution (ICAP) model developed for the Ontario Medical Association and the Air Quality Valuation Model (AQCM) developed by Health Canada/Environment Canada.

**Beazer East Inc., Pittsburgh, PA –** Critically evaluated acute toxicity data on arsenic and derived acute toxicity benchmark for use at a former wood treatment site. Benchmark was used to determine if one-time exposures to soil hotspots would be protective of acute toxicity endpoints.

**Ogden Projects, Inc., Stanislaw, CA –** Performed technical oversight of air dispersion modeling of a hypothetical accidental release of anhydrous ammonia. Conducted toxicological evaluation of acute toxicity data on ammonia. Determined appropriate health-based benchmarks for various exposure times.

**PACIFIC Division Naval Facilities Engineering Command, CLEAN, HI –** Prepared and submitted comments to the National Toxicology Program regarding their proposal to list naphthalene as "reasonably anticipated to be a human carcinogen" in the Eleventh Edition of *Report on Carcinogens*.

**Confidential Client –** Performed critical review of dioxin toxicology literature. Identified and critically reviewed the key historical and recent papers on the potential toxicity of dioxin and related compounds in support of possible litigation. Human and animal studies investigating reproductive and developmental effects, immunologic effects, carcinogenic effects, and mechanism of action and pharmacokinetics were included in the review.

**Massachusetts Natural Gas Council –** Developed and validated a Physiologically Available Cyanide Method for measuring cyanide in soil samples from hazardous waste sites. The method was developed under strict supervision of the Massachusetts DEP and is used to implement an agency-derived "imminent threat" benchmark concentration.

**Massachusetts Natural Gas Council, MA –** Critically evaluated and prepared formal comments on Massachusetts Department of Environmental Protection proposed policy on risk assessment of PAHs. Demonstrated that experimental data on naphthalene and other PAHs were not sufficient to classify them as potentially carcinogenic PAH. Presented information

showing that literature on PAH interactions does not support a conclusion that PAH given together result in synergistic effects.

**New England Power Company, Westborough, MA –** Evaluated health effects of electromagnetic fields associated with high voltage power lines for an Environmental Impact Statement. Briefed NEP management on state of the science regarding potential health effects.

**Confidential Client, MT –** For this rail yard site, performed a detailed toxicological evaluation of diesel fuel. Evaluated state and federal clean-up level precedents for total petroleum hydrocarbons. Proposed a risk-based sampling plan for site soils. Derived groundwater action levels for three groundwater use scenarios: ingestion, incidental contact, and watering of produce.

**Atochem, Tacoma, WA –** Reviewed and evaluated data showing that EPA's cancer slope factor for arsenic is inappropriate. Current information demonstrates that low doses of ingested arsenic are efficiently metabolized to a nontoxic form in the body. At the high doses at which toxic effects are seen, this process is saturated and is inefficient. Thus, linear low dose extrapolation models are inappropriate. Also, performed laboratory experiment to estimate the site-specific bioavailability of arsenic, which was less than the default value assumed by Washington state regulators.

**ThermalKEM, SC –** Served as ThermalKEM's representative on Advisory Committee for a University of South Carolina epidemiology study around a hazardous waste incinerator.

**American Paper Institute, Washington, DC –** Evaluation of body weight versus surface area dose scaling for dioxin. Critically evaluated the appropriate method for scaling laboratory animal dioxin doses to humans. Documented in a written report that body weight scaling was scientifically appropriate and that EPA's cancer slope factor was an overestimate.

**Georgia-Pacific, NC –** Critically evaluated the North Carolina Department of Health's use of toxicity data to derive a fish advisory for dioxin. Recommended to DOH that pathology data from EPA's animal study using current NTP pathology guidelines be used, as well as body weight dose scaling.

**DuPont, Wilmington, DE –** Critically evaluated the primary toxicity studies from which EPA derived RfC's for CrVI and CrIII. While the value was not unreasonable for CrVI, it was scientifically inappropriate to use the same data from chromate workers to derive a RfC for CrIII. Data were presented to demonstrate that CrIII is much less toxic than CrVI. EPA subsequently removed both values from its IRIS database, but a RfC for total chromium, regardless of speciation, was proposed using the same CrVI data.

**American Ref-Fuel, Houston, TX –** Critically evaluated the state's derivation of a cancer slope factor for chromium that is four times higher than EPA's value. Presented dosimetry arguments to demonstrate that EPA's value adequately health protective.

**American Ref-Fuel, Houston, TX –** Prepared scientific arguments that municipal solid waste combustor emitted CrVI would significantly transform to CrIII before reaching an exposure point and that absorbed CrVI would significantly transform to CrIII in the human body before reaching target tissues. Cited EPA reports that document such processes. Presented arguments to New York and Texas regulators, respectively, that such processes should be quantitatively modeled. Both regulators agreed with the conceptual arguments and agreed to carefully consider quantitative estimates, if presented.

## Solvent Risk Assessment/Indoor Air Risk Assessment

**Confidential Client, Alaska –** Performed risk assessment of petroleum refinery chemical released to groundwater used as drinking water. Derived toxicological reference value for risk assessment from primary toxicological data. Assessed use of groundwater for bathing, washing and vegetable garden watering in addition to drinking. Performed vapor intrusion modeling. Attended agency meetings and derived acceptable levels in water to protect those ingesting the water.

**Owens Corning, Berlin, NJ –** Performed risk assessment of a heat transfer agent containing biphenyl and diphenyl oxide that was released to groundwater used as drinking water. Assessed state and federal toxicological criteria. Assessed use of groundwater for bathing, washing, industrial uses and direct consumption for residents, commercial workers, and school children. Attended agency meetings and participated in 4 public involvement meetings.

**Confidential Client –** Prepared Comments on EPA's *Proposed Classification of Trichloroethylene and Proposed Unit Risk Factor, February 2010*. Prepared 50 page scientific comment document and concluded that EPA's proposals were deficient because the implications of the proposal were not discussed, and no validation exercise was performed to determine if cancer incidence predictions made with the proposed Unit Risk Factor match the known incidence rates of RCC, liver and biliary cancer and NHL in the context of the many well characterized risk factors for these cancers.

**Timex, AK –** Evaluated groundwater and indoor air quality data from office buildings adjacent to and on top of former manufacturing facilities. Constituents of concern included TCE and other chlorinated and non-chlorinated solvents. Performed senior review and oversight of risk assessment calculations and report.

**Goodwin Proctor, UniFirst Corporation, MA –** Performing risk assessment consulting for a UniFirst –owned commercial building, a building containing a day care center, and a residential neighborhood at the Wells G&H Superfund site. Constituents of concern include TCE and PCE. Commented on EPA vapor intrusion criteria, participated in workplan development, reviewed site data, prepared risk assessments, prepared reports, and attended meetings with EPA project managers. Planned and executed indoor air and subslab soil vapor sampling in numerous buildings and prepared sampling and analysis reports and human health risk assessment reports. Attended meetings with USEPA and parents of children at the day care center.

**Confidential Client, NM –** Performed strategic consulting to client on indoor air quality sampling and data evaluation for an office building above a former TCE plume associated with a former Superfund site in Albuquerque, NM.

**Rite Aid Pharmacy, PA –** Performed a critical evaluation of an Industrial Hygiene report on indoor air quality at an operating pharmacy building in New Jersey that was located adjacent to property that formerly housed a service station and a dry cleaner. Performed risk assessment calculations on chlorinated solvents and petroleum hydrocarbons. Made presentations to Rite Aid workers concerning indoor air quality.

**Goodwin Proctor, UniFirst Corporation, VT –** Performed risk assessment for a chlorinated solvent site in Vermont. Tetrachloroethylene was released from the site of a former dry-cleaning operation and migrated beneath residential dwellings. Attended meetings with regulators. Performed risk assessment calculations for PCE, TCE, and other solvents.

**Goodwin Proctor, UniFirst Corporation, NC –** Performed risk assessment for a chlorinated solvent site in North Carolina. Tetrachloroethylene was released from the site of a former dry-cleaning operation and migrated beneath the building which is now used as a warehouse for dry cleaning operations. Attended meetings with regulators. Performed risk assessment calculations for PCE, TCE, and other solvents and prepared multiple memoranda. Evaluated site data and made recommendations regarding site sampling and remedial options. Performed site-specific modeling of indoor air quality.

**Goodwin Proctor, UniFirst Corporation, CA –** Performed risk assessment for a chlorinated solvent site in Stockton, CA. Tetrachloroethylene was released from the site of a former dry-cleaning operation and migrated beneath the building. Evaluated site data and made recommendations regarding site sampling and remedial options. Performed third party review of site-specific modeling of indoor air quality.

**Confidential Client, NY –** Prepared a toxicological evaluation of tetrachloroethylene in an office building adjacent to a former dry-cleaning facility. Evaluated reported health symptoms associated with PCE exposure and evaluated specific symptoms and health effects reported by building staff. Prepared memorandum summarizing findings and briefed client and client legal staff.

**IBM, NY –** Provided peer review of a toxicological analysis of perchloroethylene. Analysis was prepared to apprise IBM corporate staff of current developments in the toxicology and pharmacokinetic modeling of PCE. Topics presented included epidemiology, animal carcinogenicity bioassays, potential mechanisms of carcinogenicity, physiologically-based pharmacokinetic modeling, and relevance to human risk of PCE carcinogenicity in experimental animals.

**Confidential Client, TX –** Provided senior review and oversight of a risk assessment of perchloroethylene in groundwater associated with an industrial laundry. Risk assessment was prepared for litigation support and included a critical evaluation of the EPA's current cancer slope factor. Evaluated current pharmacokinetic modeling studies and presented alternate cancer slope factors based on best available science.

**Boise Cascade Corporation, International Falls, MN –** Prepared a critique of EPA's cancer slope factor for chloroform that was published in the Journal of the Technical Association of the Pulp and Paper Industry. Prepared comprehensive evaluation of the metabolism and bioavailability metabolism of chloroform.

**Hanley & Patch Attorneys, CA –** Provided litigation support for lawsuit in which perchloroethylene was alleged to have been released by the client and to have decreased property values and caused unacceptable risks. Provided expert advice and courtroom testimony on the toxicity of perchloroethylene and the potential risks posed by their presence. Modeled volatilization into ambient and indoor air. Compared estimated exposures to typical

exposures at dry cleaning facilities. Client won lawsuit based in large part on risk assessment testimony.

**Massachusetts Attorney General's Office –** Prepared an affidavit for Federal Court demonstrating that an imminent threat to public health was posed by the presence of chlorinated solvents in a residential area adjacent to a former electronics manufacturing facility. Prepared a supporting appendix, which was a detailed risk assessment. Gave courtroom testimony concerning the risk assessment approach.

**Texas Commission on Environmental Quality, TX –** Performed strategic consulting to TCEQ on indoor air quality sampling and data evaluation for residences and schools above a petroleum plume associated with a historical release in McAllen, TX.

**ThermoRetec, Concord, MA –** Prepared iterative Method 3 risk characterization pursuant to Massachusetts Contingency Plan requirements for a former Manufactured Gas Plant that was planned for redevelopment as mixed land use that included underground parking, office space, a hotel, and residential housing. Performed risk calculations according to several potential development scenarios. Informed developer that certain areas were acceptable for development and others were not. Estimated the risks due to volatilization of site-related constituents into current off-site buildings and into a potential underground parking garage.

**Northern Utilities, NH –** Performed risk assessment of volatiles entering sewer pipes and homes at a former manufactured gas plant site by the use of volatilization modeling approaches. Assisted in drafting scope of work for additional sample collection.

### Science Policy/Science Communication

**Boston University School of Medicine –** Served as Adjunct Assistant Professor of Toxicology, 1989-1992. Taught graduate level course in toxicology to medical doctors and graduate students in public health.

**U.S. EPA, Washington, DC –** Participated in policy development and rulemaking for the Toxic Substance Control Act at the Office of Toxic Substances. Developed technical aspects of rules to monitor significant new uses of chemicals. Prepared strategy documents, program plans, and briefing reports regarding these and other rules. Assisted in managing a technical contract regarding chemical use patterns.

**Environmental Law Institute, Washington, DC –** Served as Staff Scientist. Edited Environmental Law Reporter reports and other Institute documents for scientific accuracy. Prepared and submitted to EPA comments on proposed Resource Conservation and Recovery Act regulations. Gained familiarity with Federal databases concerning air and water quality and chemical exposure assessment methodologies.

**The World Bank, United Nations, Washington, DC –** Prepared reports and memoranda on a variety of topics germane to Third World development, including the effects of U.S. pesticide regulations on marketability of pyrethrum pesticides produced in Tanzania and the role of the World Bank as a technology transfer institution.

**U.S. EPA, Seattle, WA –** Participated in the formulation of a regional water quality strategy as an Environmental Protection Specialist at EPA Region X. Gained familiarity with Federal water pollution laws and regulations and the Environmental Impact Statement review process.

**WGBH, Boston, MA –** Served as a AAAS Mass Media Fellow. Research, directed and produced ten radio reports on scientific and environmental issues. Reports broadcast on "All Things Considered" included a three-part series on the technical and policy issues surrounding the saccharin ban and a report on sickle cell anemia.

**University of Washington –** Served as a Teaching Assistant in the Graduate School of Public Affairs for a course in statistical methods.

**Seattle Community College –** Designed and co-taught a course in environmental issues.

**University of California –** Served as a Lecturer. Managed the undergraduate general chemistry laboratory course, including design of experiments, publication of a revised lab manual, direction and production of a series of six instructional videotapes concerning experimental techniques, and supervision of three graduate teaching assistants.

### Toxicology Research

**Toxicology Program, Massachusetts Institute of Technology –** Performed toxicology research and received training that focused on biochemical toxicology, genetic toxicology, chemical dosimetry, and molecular mechanisms of mutagenesis/carcinogenesis.

**Toxicology Program, Massachusetts Institute of Technology –** Characterized a previously unknown role of human hemoglobin in the metabolic transformation of xenobiotic substances, including numerous environmental contaminants. Determined the effects of point mutations in human hemoglobin on the enzymatic activity.

**Toxicology Program, Massachusetts Institute of Technology –** Developed methods to identify and quantitate foreign compounds and their metabolites in biologic fluids. Gained extensive experience in the techniques of bioanalytical chemistry, including HPLC, GC/MS, FPLC, electrophoresis, ultrafiltration, and others.

## Selected Publications/Presentations

Magee, Brian H. and Norman D. Forsberg. Testing the Validity of a Proposed Dermal Cancer Slope Factor for Benzo[a]pyrene. (manuscript submitted)

Forsberg, Norman D., Joseph T. Haney, Jr. Glenn C. Hoeger, Anita K. Meyer, Brian, H. Magee. 2020. Oral and dermal bioavailability studies of polycyclic aromatic hydrocarbons from weathered soils containing fragments of clay pigeon shooting targets. (in review).

Haney, Joseph, Norman D Forsberg, Glenn Hoeger, Brian Magee, Anita Meyer. 2020. Risk Assessment Implications of Site-Specific Oral Relative Bioavailability Factors and Dermal Absorption Fractions for Polycyclic Aromatic Hydrocarbons in Surface Soils Impacted by Clay Skeet Target Fragments. Regulatory Toxicology and Pharmacology 113:104649.

Forsberg, Norman and Brian Magee. 2019. Read-Across Evaluation for Vinyl Propionate: Filling Data Gaps for Germ Cell Mutagenicity and Carcinogenicity to Support REACH Registration. Society of Toxicology. Baltimore, MA. March 2019.

Forsberg, Norman and Brian Magee. 2019. Development of Inhalation Reference Concentrations for Chlorotrifluoroethylene (CTFE) and 1,2-Dichloro-1,2,2-trifluoroethane (HCFC-123a). Society of Toxicology. Baltimore, MA. March 2019.

Lee, Dan, Brian Magee, and Danielle Pfeiffer. 2018. Recommendations on the Use of Existing Toxicological Data/Information for Evaluating Noncancer Hazards of Uranium at Mining Sites. SETAC. Sacramento, CA. November, 2018.

Forsberg, Norman, Erin Osborn, Brian Magee, Paul Anderson, Neil J. Parke. 2018. Effect of differing regulatory guidance on acceptable environmental levels of active pharmaceutical ingredients in industrial wastewater discharges. SETAC. Sacramento, CA. November, 2018.

Pfeiffer, Danielle, Dan Lee, Brian Magee, Michael Hay. 2018. Development of an area-specific bioavailability factor for assessing human exposure-risk to arsenic in soils in Southeastern Idaho. SETAC. Sacramento, CA. November, 2018.

Forsberg, Norman D., Brian H. Magee, Shawn L. Sager. 2018. Deriving no effect levels using probabilistic approaches: application to TCE and potential impacts to risk-based exposure concentrations. SETAC EU. Rome, Italy. May, 2018.

Magee, B.H.; N.D. Forsberg; A.K. Meyer. 2018. Methods for deriving site-specific relative bioavailability factors from animal bioavailability data. SETAC EU. Rome, Italy. May, 2018.

Forsberg, Norman D.; Brian H. Magee; Anita K. Meyer; Glenn C. Hoeger; Carlos M. Duarte. 2018. Using A Risk-Based Approach to Guide Remedial Goals: Oral Relative Bioavailability of PAHs at Formerly Used Defense Sites. Eleventh international conference on remediation of chlorinated and recalcitrant compounds. Palm Springs, CA. June, 2018.

Forsberg, Norman D., Brian H. Magee, Shawn L. Sager. 2018. A probabilistic approach for determining risk-based exposure concentrations for trichloroethylene (TCE). 28th Annual International Conference on Soil, Water, Energy, and Air. Amherst, MA. October 2018.

Magee, Brian and Norm Forsberg. 2017. U.S. EPA's Expanded-List PAHs in Environmental Media. SETAC EU. Nantes, France.

Magee, Brian and Norm Forsberg. 2017. U.S. EPA's Expanded-List PAHs in Environmental Media. SETAC EU. Nantes, France.

Magee, Brian, Norm Forsberg, and Meredith Frenchmeyer. 2017. Major Changes in USEPA's Risk Assessment of PAHs. Railroad Environmental Conference. Urbana-Champaign, IL.

Magee, Brian, Norm Forsberg, and Meredith Frenchmeyer. 2017. States' Approaches to Assessing PAH Risks. SETAC NA. Minneapolis, MN.

Magee, Brian. 2017. Impact of New USEPA Policies on Risk-Based Remedial Decisions. Luncheon Presentation. MGP Symposium. New Orleans, LA.

Magee, Brian, Norm Forsberg, and Glenn C. Hoeger. 2016. Design and Implementation of In vitro Dermal Absorption Studies of PAHs from Impacted Soils for Application in Human Health Risk Assessment. SETAC. Orlando, FL.

Million B. Woudneh, Jonathan P. Benskin, Richard Grace, M. C. Hamilton, Brian H. Magee, Glenn C. Hoeger, Norman D. Forsberg, John R. Cosgrove. 2016. Challenges in Analysis of Hydroxy PAHs in Urine. SETAC. Orlando, FL.

Magee, Brian and Anne LeHuray. 2016. PAHs in the Real World: Sources, Sinks, Bioavailability, and Toxicity. SETAC. Orlando, FL.

Magee, Brian, Norm Forsberg, and Glenn C. Hoeger. 2016. Bioavailability Studies of PAHs in Soil. Railroad Environmental Conference. Champaign Urbana, IL.

Magee, Brian, Norm Forsberg, and Glenn C. Hoeger. 2016. Oral Bioavailability Study of PAHs in Coal Tar/Coal Tar Pitch Clay Pigeon Target Fragments from Range Sites. SETAC EU. Nantes, France.

Magee, Brian, Norm Forsberg, and Glenn C. Hoeger. 2016. Dermal Absorption Study of PAHs in Coal Tar/Coal Tar Pitch Clay Pigeon Target Fragments from Range Sites. SETAC EU. Nantes, France.

Magee, Brian and Norman Forsberg. 2016. Implications of EPA's Proposed Dermal Slope Factor on Risks Posed by Dermal Contact with Grilled Meats. Society of Toxicology Annual Meeting.

Magee, Brian and Norman Forsberg. 2016. Implications of EPA's Proposed Dermal Slope Factor on Risks Posed by Dermal Contact with Grilled Meats. AEHS National Meeting, Amherst, MA.

Magee, Brian, Norm Forsberg, and Glenn C. Hoeger. 2016. Dermal Absorption Study of PAHs from Coal Tar/Coal Tar Pitch in Clay Pigeon Target Fragments from Range Sites. AEHS National Meeting, Amherst, MA.

Magee, Brian, Norman Forsberg and Claire Hamadji. 2015. Utility of Short Term Assays for Assessing Carcinogenicity of PAHs. 54th Society of Toxicology Annual Meeting, San Diego, CA.

Magee, Brian and Norman Forsberg. 2015. Testing the Validity of EPA's Proposed Dermal Slope Factor for Benzo[a]pyrene: Genetic Alteration Signatures in Common Skin Cancers. 54th Society of Toxicology Annual Meeting, San Diego, CA.

Magee, Brian, Norm Forsberg, and Katy Baker. 2015. USEPA's Dermal Slope Factor for Benzo(a)pyrene Predicts That Skin Cancer in London is Caused by PAHs in Soil. Society of Environmental Toxicology and Chemistry Annual Meeting, Barcelona, Spain.

Magee, Brian, Norm Forsberg, and Glenn C. Hoeger. 2015. PAH Composition of Clay Pigeon Target Fragments at Two Military Range Sites. Society of Environmental Toxicology and Chemistry Annual Meeting, Barcelona, Spain.

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# CHESTER COUNTY DEPARTMENT OF EMERGENCY SERVICES

# PIPELINE EMERGENCY PREPAREDNESS & TRAINING TABLETOP EXERCISE

## After Action Report
## December 13, 2018


DEVELOPED FOR CHESTER COUNTY DES
BY
GGN TECHNICAL RESOURCES, LLC
"EMERGENCY PLANNING AND CRISIS MANAGEMENT CONSULTANTS"
LANCASTER, PA


CHESTER COUNTY CROSS EX. 5

## GOAL

Using a tabletop exercise environment, provide an opportunity for the Chester County emergency preparedness community and its related stakeholders to assess its capability to effectively plan for, respond to, and manage the initial operational period of a transmission pipeline incident.

This exercise was sponsored through a Technical Assistance Grant provided through the U.S. Department of Transportation – Pipeline and Hazardous Materials Safety Administration (PHMSA)

## OBJECTIVES

The purpose of the tabletop exercise was to evaluate the ability of Chester County emergency responders to respond to a transmission pipeline incident. Using a discussion-focused tabletop exercise format, the objectives of the exercise were:

1. Address issues identified as part of the After-Action Report (AAR) from the May 18, 2018 Tabletop Exercise and Chester County pipeline planning activities.

2. Identify "best practices" that can be used by Chester County healthcare and school facilities to improve their emergency preparedness to "all hazard" incident scenarios, with a focus upon pipeline-related scenarios.

3. Outline the critical tasks to be performed by emergency response personnel upon their initial arrival at a pipeline emergency.

4. Outline the processes for managing and coordinating emergency response operations at a pipeline emergency.

## EXERCISE LOCATION AND POINTS OF CONTACT

All exercise activities were conducted at the Chester County Public Safety Training Campus, 137 Modena Road, Coatesville, PA 19320.

The point of contact for the exercise was Chief Frank Sullivan, Chief – Chester County HMRT. Phone: (610) 344-5086 (office). E-mail: FSullivan@chesco.org

The Exercise Facilitator was Gregory Noll, GGN Technical Resources, LLC. Phone: (717) 575-0514. Email: ggnoll@me.com

## EXERCISE PLANNING ASSUMPTIONS

- There are numerous liquid and gas pipeline corridors throughout Chester County. These pipeline right-of-ways are located in urban, suburban and rural environments. The probability of a pipeline release scenario having community impacts is high.
- This is the second tabletop exercise to be conducted during CY2018. This session is designed to provide additional focus on a number of the issues identified by participants at the May 18, 2018 exercise, including the following:
    - Provide the opportunity for additional interaction with other stakeholder disciplines, especially healthcare facilities and schools.
    - Review the tools and capabilities that are available within Chester County for community alerting and notification.
    - Provide additional information on the establishment and growth of the Incident Command System (ICS) organization for a pipeline emergency. This included helping non-responders understand the application and use of ICS by emergency responders.
    - Provide additional opportunities for the attendees to participate in decision-making ref: pipeline emergency scenario.
    - Provide additional information on public protective actions (i.e., evacuation, shelter-in-place), and how it would take place with children and special need groups.
- Any pipeline emergency with a 911 notification will automatically result in a public safety response, with the AHJ's (authority having jurisdiction) Senior Fire Department Officer functioning as the Incident Commander.
- Upon arrival on-scene, pipeline personnel will report to the Incident Command Post (ICP). The initial pipeline representative will likely serve as the initial pipeline liaison to the Incident Commander until the arrival of a supervisor. The Chester County HMRT Officer will report to the Incident Commander and manage hazmat related tasks and activities.
- Initial public safety tasks responsibilities will include:
    - Assume command and establish an initial Incident Command Post (ICP).
    - Establish an initial isolation perimeter and hazard control zones.
    - Identify and verify the product(s) being transported by the pipeline
    - Ensure safe isolation and shutdown of the pipeline.
    - Initiate initial public protection actions to protect the public and community.
    - Initiate air monitoring and detection tasks to characterize site hazards.
- As the incident timeline progresses, a unified command organization will be established.
- Emergency responders will employ a risk-based management process to determine incident strategies and tactics, based upon incident facts, science and incident circumstances.

## AGENDA AND SCHEDULE

1. *Introduction, Objectives and Agenda*. The Introduction covered the following topics:
    - Introduction of all participants
    - Exercise goals, objectives and planning assumptions
    - Exercise agenda and schedule. Each breakout session will be presented and will last approximately 45 - 60 minutes.
    - Exercise format and evaluation
    - Exercise ground rules

2. *#1 - Overview of Chester County Department of Emergency Services (DES)*. Overview of planning and operational capabilities currently available to the community, DES points-of-

contact, and how these capabilities can be applied during both pipeline emergency and "all hazard" scenarios. Capabilities include planning processes, community alerting and notification, incident management and information management.

Speakers were as follows:

- Opening Remarks - Frank Sullivan, Chief, Chester County HazMat Emergency Response
- Chester County DES and Communications - William H. Turner, Deputy Director for Emergency Management, Chester County Dept. of Emergency Services
- Craig Thomas, Field Engineering and Operations Manager, Chester County Water Resources Authority

3. *#2 – Best Practices Breakout Session*. Attendees were divided into three groups based upon their background and affiliation. The three groups were (1) emergency planning and response; (2) healthcare facilities; and (3) schools and educational facilities. Each session had a facilitator (see below), and discussions focused upon "best practices" that are being utilized and could be applied in both "all hazard" and pipeline emergency scenarios. At the end of the breakout session, all attendees returned to the Main Room and provided a report to the full group.

   Breakout Facilitators were as follows:

   - Emergency Planning and Response
     - Gregory G. Noll, GGN Technical Resources, LLC
     - Keith Simpkins, Platoon Leader, Chester County DES 911 Center
   - Healthcare Facilities
     - Brian Barth, RN, PHRN, Regional Manager, The Hospital and Healthsystem Association of Pennsylvania
     - John Felicetti, CHEP, CHSO, Director: Safety, Security and Emergency Management, Chester County Hospital – Penn Medicine
     - Bruce Hartshorne, Executive Vice President of Operations, Tel Hai Retirement Community
     - Harry Moore, Deputy Director for Field Services / EMS, Chester County Dept. of Emergency Services
   - Schools and Educational Facilities
     - Kevin Campbell, Director of Facilities, West Chester Area School District
     - Chrissy DePaolantonio, Safe Schools Planning Coordinator, Chester County Dept. of Emergency Services
     - Tim Hubbard, Chief Security Officer, Downingtown Area School District
     - Don Herb, Deputy Chief, Chester County HMRT

4. *#3 – Exercise Scenario Discussion.* Due to limited available time, a scenario was presented to the group at-large rather than a breakout session as originally planned. The scenario involved a pipeline leak at a valve station located at 501 Dorlan Mill Road, Uwchlan Township. The Facilitator presented questions to the primary responders who would respond to an incident at this location. Emphasis was placed upon the following key points:

   - Establishment of command and initiation of the ICS organization by the AHJ (authority having jurisdiction).
   - Interaction between the pipeline operator and the Incident Commander.

- Initial public safety tasks and responsibilities including:
  - Establish an initial isolation perimeter and hazard control zones.
  - Identify and verify the product(s) being transported by the pipeline
  - Ensure safe isolation and shutdown of the pipeline.
  - Initiate initial public protection actions to protect the public and community.
  - Initiate air monitoring and detection tasks to characterize site hazards.
- Public protective actions that would be taken by the adjoining school building.
- Transition from single command to unified command, as appropriate.

5. *#4 - Hot Wash and Exercise Evaluation*. At the conclusion of the exercise, each individual was asked to complete a two-page Exercise Evaluation Questionnaire. These were then collected and summarized into the AAR (see Attachment A).

## EXERCISE GROUND RULES

- Emergency preparedness is a collaborative process – "One Team…One Fight."
- Discussion inputs and related information were provided by the respective Breakout Facilitator. Emphasis was on learning and discussion.
- Treat each other with respect.
- There is not always a "right way" or a "wrong way." There may be a lot of different ways to address an issue based upon the situation and capabilities.
- Persuade your peers.
- Seek agreement on foundational issues.

## EXERCISE OBSERVATIONS AND RECOMMENDATIONS

Exercise Feedback Reports are included as Attachment A. The following observations and recommendations are based upon inputs from both the exercise participants and the Exercise Facilitator.

### Observations

1. North America is in the midst of an energy renaissance that is having a significant impact upon the emergency planning and response communities. Although southeastern PA has had a long-time historical relationship with the refining and energy transportation sectors, this renaissance has presented a number of new challenges for the emergency preparedness communities. These challenges include "new products" such as natural gas liquids (NGL), liquefied natural gas (LNG) and compressed natural gas (CNG), the construction of new pipelines, pipeline reversals, flammable liquid unit trains (High Hazard Flammable Trains – HHFT), CNG transportation and use, and new gas storage facilities.

2. There are currently ten (10) pipeline operators who operate eleven (11) transmission pipelines within Chester County and impact urban, suburban and rural communities. This includes 355 miles of liquid transmission pipelines and 228 miles of liquid transmission pipelines based upon data provided through the National Pipeline Mapping System (NPMS). Specific pipeline right-of-way information can be referenced from the Chester County Pipeline Information Center Mapping Application (https://chesco.maps.arcgis.com/apps) and the NPMS website (www.npms.phmsa.dot.gov),

3. Chester County has an active Local Emergency Planning Committee (LEPC) that has been engaged with its stakeholders and communities on transmission pipeline issues. Through Chester County DES and LEPC efforts and coordination, a number of pipeline training activities have been made available to the emergency response community. The effectiveness of this process was illustrated by the diversity of attendees at the tabletop exercise, including emergency responders, local and county government officials, pipeline operators, community members, and representatives from sensitive receptors (e.g., schools, senior centers, healthcare facilities). Despite the diversity however, there is a significant target audience that is requesting additional training and educational opportunities.

4. Chester County has numerous resources that are available to support both planning and response efforts to transmission pipeline incidents. While most of these are well known to responders, they are not well-recognized by non-responder stakeholders. These resources include the Chester County HazMat Response Team, Fire Department Foam Units, County DES Incident Support Team, and other public and private resources that can be accessed through mutual aid. In addition there are community alerting and notification resources available through County DES, such as the EverBridge Mass Communication System. In addition, pipeline operators have agreements with environmental contractors and Oil Spill Response Organizations (OSRO), as well as industrial mutual aid organizations such as the Delaware Bay and River Cooperative (DBRC).

5. The make-up of this session was different than that of the May 18, 2018 exercise, with a substantial number of attendees having limited familiarity and exposure with the broad concept of emergency preparedness for a pipeline emergency, the specific tactical challenges, and the capabilities of the Chester County emergency services community, including fire, hazmat, law enforcement, and emergency medical services. Looking forward, there will continue to be a high demand for meetings, information, training and exercises on this topic.

## Recommendations

1. There is a significant demand for both additional and continuous information, training and exercises, as noted by a number of stakeholders. These stakeholders include the emergency services community and the range of communities and facilities that could potentially be impacted by a pipeline emergency, including schools, healthcare facilities, and special needs occupancies. DES may consider exploring options to facilitate the delivery of additional tabletop exercises that can be delivered for individual jurisdictions and areas.

2. Chester County is fortunate that its County Leaders have supported the efforts of the LEPC. The “all hazards” focus of the Chester County LEPC has allowed it to serve as a coordination point for issues that go beyond the scope of the original SARA Title III legislation. Chester County DES should continue to ensure there is LEPC representation from many of the groups represented at both exercises, and should strongly support the use of the LEPC as a foundation for assessing and developing collaborative solutions to future pipeline and other “all hazard” challenges and risks to the community.

3. Due to a range of operational and safety regulations and initiatives targeted towards reducing operational risks, pipeline emergencies are few in number and scope. Given the lack of actual response experience to “working” pipeline emergencies, the need for an

ongoing training and exercise program that reflects a range of response scenarios is critical. While transmission pipeline scenarios are just one of a range of "all hazard" scenarios, given local and county risks it should be integrated into the multi-year local and county exercise program.

## ATTACHMENT A
## PARTICIPANT FEEDBACK AND RECOMMENDATIONS

The comments presented below were compiled from 35 participants who completed the feedback form. Comments were transcribed verbatim with minor editing; comments may have also been edited as needed to maintain anonymity of the respondents.

### Part I – Recommendations and Proposed Action

1. **List three strengths that you observed in today's exercise.**
   - Had the right people in the room – good mixture of participants (17)
   - Knowledge and expertise of facilitators and presenters (12)
   - Local / County assets that are available and their level of coordination ref: emergency planning and response (11)
   - Willingness of organizations to work together (8)
   - Breakout discussions (4)
   - Good information distributed in a useful manner (3)
   - How informed and prepared emergency service assets are (2)
   - Networking opportunities (2)
   - Knowledge base of DES, local emergency responders and Facilitator (2)
   - Hearing from diverse industries (2)
   - Understanding the process – seeing how much work goes on "behind the scenes" (2)
   - Exercise scenario (2)
   - Opportunity to communicate with our school districts, healthcare facilities and hear about incident complexity from emergency responders (2)
   - Good venue / facility for the exercise (2)
   - Dose of realism that was quite useful
   - Attendance from "higher risk" groups
   - Attendance and participation from pipeline operators
   - Hearing about the preparedness and awareness of the responders
   - Met expectations of training
   - Messaging to put out to the public
   - Good program – first time at an event like this
   - Awareness of emergency response priorities and concerns
   - Open discussions and respectfully kept on track
   - Demonstration of mutual cooperation (unified command) by emergency responders
   - Strong communications in group sessions

2. **List three areas for improvement based on what you observed in today's exercise.**
   - Possibly longer period of time (7)
   - More pipeline operator information and involvement (7)
   - Provide more local / different incident scenarios (3)

- Communications among all groups (residents, pipeline operators, emergency services) (3)
- Being able to hear all presenters (2)
- Hard to keep the groups on time limits, but the group conversations were valuable (2)
- Reduce introduction – not good use of time (2)
- Develop transportation asset listings
- Improve communications with organizations on pipeline hazards and available resources
- Improve facility readiness for evacuation
- Thought it was excellent and would do it again because participant concerns vary
- Additional time to allow for multiple tabletop scenarios
- Need enough time to fully conduct the hot wash
- Start of the exercise quicker
- Need to prioritize communication and contact to public utilities
- Better evaluation of healthcare provider / agencies Emergency Response Plans
- Control of affected populations
- Sign-up info sent me to the wrong address
- PowerPoint handout of slides being available
- Consider making into a webinar format
- Starting on-time – add arrival time to prevent lateness
- Add contact information to handouts
- More opportunities for participant input
- Engage the Emergency Management Coordinators (EMCs) more
- Less direct impact of one pipeline

3. **Based on what you learned today, what recommendations do you have to improve your organization's ability to plan / react / respond to a transmission pipeline incident.**
   - Learn about the products being transported and how they affect the environment
   - Increase level of facility preparedness (8)
   - We should participate in a practice drill (2)
   - Better public awareness
   - Increase detail of facility evacuation plans
   - Increase detail of transportation assets for region
   - Increase detail of individual facility evacuation points and alternate care sites
   - Attending the program increases my knowledge to effectively serve the community
   - Use of scribes for records / KC HIMS / patient tracking
   - Track ambulatory status of residents
   - More working together (planning, training) with the pipeline operators (4)
   - Need to speak with Building Superintendent for HVAC and other potential areas to be monitored / shutdown
   - Updating and maintaining accurate client / patient information systems
   - Meet with out-patient care facilities to see if they need help with emergency plans

- Further interactions with high risk groups
- Share information with my quality and safety director
- Assist in formulation and execution of pipeline scenario for healthcare facility
- Getting more involved from my organization
- Pipeline operators provide school / health facility POC whether the facility is within the designated minimum impact area
- Ensure an "all hazards" approach in planning
- Need for earlier communications from pipeline operators or 911 to affected schools
- Gain knowledge on our facilities situation and take steps for prepare
- Better able to explain the overall response process better
- We are totally behind the eight ball
- Do more tabletops with wider player participation
- Broaden the Emergency Operations Plan (EOP)
- Include the map of pipelines in our Emergency Operations Plan (EOP)
- Need to "stay up" on pipeline education and training
- Work on public communications / alerting

4. **List one major lesson learned from today that helped you improve professionally.**
   - Contacts and resources – everyone is willing to work with each other (3)
   - Incident-based response – adjust the actions to the reality of the incident and not the prescribed response (2)
   - Improved / better communications (2)
   - Communication plan is critical in a successful response (2)
   - Hear concerns from various participants; make sure you listen to all participants (2)
   - The importance of clearly describing a risk-based response approach to the public (2)
   - Improved understanding of response procedures (2)
   - Extent of pipelines within the County
   - Increased level of preparedness based upon risk levels
   - Confirms my faith in all of our emergency responders
   - The County and School Districts have a unique opportunity to share information and hopefully utilize technologies
   - Secret is preparation and the need to secure as much knowledge as possible relative to emergency planning
   - Adult care / resident facilities need to create emergency plans
   - Current level of school preparedness
   - Overview of the different Chester County emergency service capabilities
   - Hospitals / Nursing Homes – unlikely they could / should be evacuated, as incident would be over before they could be evacuated
   - All emergencies and responses are different
   - Planning the scenario was helpful in understanding the process
   - We all share responsibility for the response to the incident

- Add schools to the EverBridge System
- The need to gain support for more training for both myself and our organization
- Lack of private sector awareness of emergency services capabilities
- As an organization we have some areas of opportunity

## Part II – Exercise Design and Conduct

1. **What is your assessment of how the Tabletop Exercise was designed and conducted?**

   **Rating (1 = strongly disagree; 5 = strongly agree; n = 35)**

   **4.5** The exercise was well structured and organized.
   **4.7** The exercise scenario was plausible and realistic.
   **3.8** The time allowed to run the exercise was sufficient.
   **4.3** Participation in the exercise was appropriate for someone in my position.
   **4.7** The exercise included the right mix of people and disciplines to accomplish the stated objectives.

2. **Please provide any recommendations on how future Emergency Planning and Preparedness training and exercises could be improved or enhanced.**
   - Provide more time or make groups smaller to allow for extensive collaboration in the time allotted (5)
   - Continue sessions with mixture of municipalities, schools, business, healthcare and emergency responders (2)
   - Presentation by pipeline company representatives on their emergency response systems; more pipeline operator involvement (2)
   - Continue to provide exercises and scenario-based training (2)
   - Right people were here
   - Use the same set-up for the breakouts
   - Include pipeline people to participate
   - Define types and responses
   - Develop a way for non-responders to participate
   - Provide more variables
   - Q & A is as important as the exercise
   - Very helpful to hear how first responders will act and their expectations
   - Provide a "baseline information" packet (3-4 pages) with common terms and basic information on pipelines, common products, likely impacts, etc.

3. **Additional comments or suggestions that you may have.**
   - Good class. Excellent program - very interesting and applicable. Good instructors (7)
   - Offer regular training on pipelines
   - Would have liked more involvement at the personal and professional level, and sharing processes

- Coordinate with neighboring counties. For example, Twin Valley School District spans both Berks and Chester Counties
- It was interesting learning the EMS planning process
- Appreciate DES pulling these sessions together
- Looking forward to getting the DES slides
- Excellent facility
- Thank you DES and PHMSA

# FDA Warns Consumers Not to Use "Best Bentonite Clay"

Laboratory tests indicate elevated levels of lead

[3/23/16] The U.S. Food and Drug Administration is warning consumers not to use "Best Bentonite Clay," a product of Best Bentonite, located in Guthrie, Oklahoma. FDA has determined that the product contains elevated lead levels and may pose a lead poisoning risk.

"Best Bentonite Clay" is sold as a fine powder on Amazon.com and on the Best Bentonite website (www.bestbentonite.com (http://www.bestbentonite.com/) (http://www.fda.gov/about-fda/website-policies/website-disclaimer)disclaimer icon (http://www.fda.gov/AboutFDA/AboutThisWebsite/WebsitePolicies/Disclaimers/default.htm)). According to the Best Bentonite website, customers mix the product with water and ingest it or apply it to their skin.

FDA laboratories have found elevated levels of lead in "Best Bentonite Clay." Exposure to lead can cause serious damage to the central nervous system, kidneys, and immune system. In children, chronic exposure to lead, even at low levels, is associated with cognitive impairment, reduced IQ, behavioral difficulties, and other problems.

Consumers should not purchase or use "Best Bentonite Clay." Anyone who has used this product or given it to a child should consult a health care professional immediately. FDA has previously warned consumers about the risk of lead poisoning associated with the use of a bentonite clay product (see http://www.fda.gov/Drugs/DrugSafety/ucm483838.htm (/drugs/drug-safety-and-availability/fda-warns-consumers-about-health-risks-alikay-naturals-bentonite-me-baby-bentonite-clay)).

FDA has not confirmed any cases of lead poisoning associated with "Best Bentonite Clay."

Health care professionals and consumers are encouraged to report any adverse events potentially related to the use of any bentonite product to FDA's MedWatch (/medwatch-fda-safety-information-and-adverse-event-reporting-program) Adverse Event Reporting program. To file a report, use the MedWatch Online Voluntary Reporting Form (https://www.accessdata.fda.gov/scripts/medwatch/index.cfm?action=reporting.home). The completed form can be submitted online or via fax to 1-800-FDA-0178.

VK Cr.-Ex. 1
C-2018-3006116, et al.
10-7-20
Harrisburg JS

# SAFETY DATA SHEET

VK Gr-Ex. 2
C-2018-3006116, et al.
10-7-20
Harrisburg JS

## 1. Identification

**Product identifier** SUPER GEL-X®

**Other means of identification** None.

**Recommended use** Not available.

**Recommended restrictions** Workers (and your customers or users in the case of resale) should be informed of the potential presence of respirable dust and respirable crystalline silica as well as their potential hazards. Appropriate training in the proper use and handling of this material should be provided as required under applicable regulations.

**Manufacturer/Importer/Supplier/Distributor information**

**Manufacturer**

**Company name** CETCO, an MTI Company

**Address** 2870 Forbs Avenue
Hoffman Estates, IL 60192
United States

**Telephone** General Information 800 527-9948

**Website** http://www.cetco.com/

**E-mail** safetydata@amcol.com

**Emergency phone number** .

**Americas** 1.866.519.4752 (US, Canada, Mexico) 1 760 476 3962 Access Code 333562

## 2. Hazard(s) identification

**Physical hazards** Not classified.

**Health hazards** Not classified.

**Environmental hazards** Not classified.

**OSHA defined hazards** Not classified.

**Label elements**

**Hazard symbol** None.

**Signal word** None.

**Hazard statement** Not applicable.

**Precautionary statement**

**Prevention** Observe good industrial hygiene practices.

**Response** Wash hands after handling.

**Storage** Store away from incompatible materials.

**Disposal** Dispose of waste and residues in accordance with local authority requirements.

**Hazard(s) not otherwise classified (HNOC)** None known.

**Supplemental information** Not applicable.

## 3. Composition/information on ingredients

**Mixtures**

| Chemical name | Common name and synonyms | CAS number | % |
|---|---|---|---|
| TRADE SECRET* | | Proprietary* | < 0.1 |
| Other components below reportable levels | | | 90 - 100 |

**Constituents**

| Chemical name | CAS number | % |
|---|---|---|
| CALCIUM CARBONATE | 471-34-1 | |
| SMECTITE GROUP MINERALS | 1318-93-0 | |

**Constituents**

| Chemical name | CAS number | % |
|---|---|---|
| QUARTZ | 14808-60-7 | <= 8 |
| CRISTOBALITE | 14464-46-1 | <= 2 |

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret. Bentonite is a UVCB substance sub-type 4. The purity of the product is 100 % w/w. Bentonite is composed mainly of smectite group minerals but the composition is varied, as expected for a UVCB substance, and other mineral constituents will be present in small and varying amounts. These minor constituents are not relevant for classification and labelling.

**Composition comments** Occupational Exposure Limits for constituents are listed in Section 8. The purity of the product is 100% w/w. Impurities are not applicable for a UVCB substance.

## 4. First-aid measures

**Inhalation** If dust from the material is inhaled, remove the affected person immediately to fresh air. Call a physician if symptoms develop or persist. No specific first aid measures noted.

**Skin contact** No specific first aid measures noted. Get medical attention if irritation develops and persists. Wash skin with soap and water.

**Eye contact** No specific first aid measures noted.

**Ingestion** No specific first aid measures noted. Rinse mouth thoroughly. Get medical attention if any discomfort occurs.

**Most important symptoms/effects, acute and delayed** Dust in the eyes will cause irritation.

**Indication of immediate medical attention and special treatment needed** Provide general supportive measures and treat symptomatically.

**General information** No hazards which require special first aid measures. Provide general supportive measures and treat symptomatically.

## 5. Fire-fighting measures

**Suitable extinguishing media** Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2). Use any media suitable for the surrounding fires.

**Unsuitable extinguishing media** Not applicable, non-combustible.

**Specific hazards arising from the chemical** None known. The product itself does not burn.

**Special protective equipment and precautions for firefighters** Material can be slippery when wet.

**Fire fighting equipment/instructions** In the event of fire, cool tanks with water spray. Material can be slippery when wet.

**Specific methods** Cool containers exposed to flames with water until well after the fire is out.

**General fire hazards** No unusual fire or explosion hazards noted. This material will not burn.

## 6. Accidental release measures

**Personal precautions, protective equipment and emergency procedures** Keep unnecessary personnel away. Material can be slippery when wet. Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits. Avoid inhalation of dust from the spilled material. For personal protection, see section 8 of the SDS. No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.

**Methods and materials for containment and cleaning up** If sweeping of a contaminated area is necessary use a dust suppressant agent which does not react with the product. Sweep up or vacuum up spillage and collect in suitable container for disposal. Collect dust using a vacuum cleaner equipped with HEPA filter. Minimize dust generation and accumulation. Avoid the generation of dusts during clean-up. Following product recovery, flush area with water. For waste disposal, see section 13 of the SDS. Collect powder using special dust vacuum cleaner with particle filter or carefully sweep into closed container.

**Environmental precautions** Prevent further leakage or spillage if safe to do so. No special environmental precautions required.

## 7. Handling and storage

**Precautions for safe handling** Minimize dust generation and accumulation. Provide appropriate exhaust ventilation at places where dust is formed. Avoid breathing dust. Avoid contact with skin and eyes. In case of insufficient ventilation, wear suitable respiratory equipment. Practice good housekeeping.

**Conditions for safe storage, including any incompatibilities**

No special restrictions on storage with other products. Store in a dry area. Store in original tightly closed container. Keep the container dry. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS). Guard against dust accumulation of this material.

## 8. Exposure controls/personal protection

**Occupational exposure limits**

**US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)**

| Constituents | Type | Value | Form |
|---|---|---|---|
| INERT OR NUISANCE DUSTS | PEL | 5 mg/m3 | Respirable fraction. |
| | | 15 mg/m3 | Total dust. |

**US. OSHA Table Z-3 (29 CFR 1910.1000)**

| Constituents | Type | Value | Form |
|---|---|---|---|
| INERT OR NUISANCE DUSTS | TWA | 5 mg/m3 | Respirable fraction. |
| | | 15 mg/m3 | Total dust. |
| | | 50 mppcf | Total dust. |
| | | 15 mppcf | Respirable fraction. |

**US. ACGIH Threshold Limit Values**

| Components | Type | Value |
|---|---|---|
| TRADE SECRET | TWA | 2 ppm |

**US. NIOSH: Pocket Guide to Chemical Hazards**

| Components | Type | Value |
|---|---|---|
| TRADE SECRET | TWA | 6 mg/m3<br>2 ppm |

**Biological limit values**

No biological exposure limits noted for the ingredient(s).

**Exposure guidelines**

**US - California OELs: Skin designation**

TRADE SECRET (CAS Proprietary) Can be absorbed through the skin.

**US - Tennessee OELs: Skin designation**

TRADE SECRET (CAS Proprietary) Can be absorbed through the skin.

**US ACGIH Threshold Limit Values: Skin designation**

TRADE SECRET (CAS Proprietary) Can be absorbed through the skin.

**US NIOSH Pocket Guide to Chemical Hazards: Skin designation**

TRADE SECRET (CAS Proprietary) Can be absorbed through the skin.

**Appropriate engineering controls**

Ventilation should be sufficient to effectively remove and prevent buildup of any dusts or fumes that may be generated during handling or thermal processing. If engineering measures are not sufficient to maintain concentrations of dust particulates below the OEL, suitable respiratory protection must be worn.

**Individual protection measures, such as personal protective equipment**

**Eye/face protection**

Use tight fitting goggles if dust is generated. Wear dust-resistant safety goggles where there is danger of eye contact.

**Skin protection**

**Hand protection**

No protection is ordinarily required under normal conditions of use.

**Other**

Normal work clothing (long sleeved shirts and long pants) is recommended.

**Respiratory protection**

Use a NIOSH/MSHA approved respirator if there is a risk of exposure to dust/fume at levels exceeding the exposure limits.

**Thermal hazards**

Not applicable.

**General hygiene considerations**

Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Use good industrial hygiene practices in handling this material.

## 9. Physical and chemical properties

**Appearance**

Lump, granular or fine powder.

**Physical state**

Solid.

| | |
|---|---|
| **Form** | Powder. Various. |
| **Color** | Various. |
| **Odor** | None. |
| **Odor threshold** | Not applicable. |
| **pH** | 8.5 - 11 |
| **Melting point/freezing point** | > 842 °F (> 450 °C) / Not applicable. |
| **Initial boiling point and boiling range** | Not applicable. |
| **Flash point** | Not applicable. |
| **Evaporation rate** | Not available. |
| **Flammability (solid, gas)** | This product is not flammable. |
| **Upper/lower flammability or explosive limits** | |
| **Flammability limit - lower (%)** | Not applicable. |
| **Flammability limit - upper (%)** | Not applicable. |
| **Explosive limit - lower (%)** | Not available. |
| **Explosive limit - upper (%)** | Not available. |
| **Vapor pressure** | Not applicable. |
| **Vapor density** | Not applicable. |
| **Relative density** | 2.6 g/cm³ |
| **Solubility(ies)** | |
| **Solubility (water)** | < 0.9 mg/l |
| **Partition coefficient (n-octanol/water)** | Not applicable.<br>Not applicable. |
| **Auto-ignition temperature** | Not applicable. |
| **Decomposition temperature** | > 932 °F (> 500 °C) |
| **Viscosity** | Not applicable. |
| **Viscosity temperature** | Not applicable. |
| **Other information** | |
| **Bulk density** | 0.9 - 1.4 g/cm³ |
| **Explosive limit** | Not applicable. |
| **Explosive properties** | Not explosive |
| **Explosivity** | Not applicable. |
| **Flame extension** | Not applicable. |
| **Flammability** | Not applicable. |
| **Flammability (flash back)** | Not applicable. |
| **Flammability (Heat of combustion)** | Not applicable. |
| **Flammability (Train fire)** | Not applicable. |
| **Flammability class** | Not applicable. |
| **Flash point class** | Not flammable |
| **Molecular formula** | UVCB Substance |
| **Molecular weight** | Not applicable. |
| **Oxidizing properties** | None. |
| **Percent volatile** | 0 % |
| **pH in aqueous solution** | 8.5 - 11 |
| **Specific gravity** | Not applicable. |
| **VOC (Weight %)** | CARB<br>0 % |

## 10. Stability and reactivity

| | |
|---|---|
| **Reactivity** | The product is stable and non-reactive under normal conditions of use, storage and transport. |
| **Chemical stability** | Stable at normal conditions. |
| **Possibility of hazardous reactions** | Will not occur. |
| **Conditions to avoid** | Moisture. Avoid temperatures exceeding the decomposition temperature. Contact with incompatible materials. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). |
| **Incompatible materials** | None known. |
| **Hazardous decomposition products** | None. |

## 11. Toxicological information

**Information on likely routes of exposure**

| | |
|---|---|
| **Inhalation** | Inhalation of dusts may cause respiratory irritation. |
| **Skin contact** | Not classified. |
| **Eye contact** | Dust in the eyes will cause irritation. |
| **Ingestion** | Not classified. |
| **Symptoms related to the physical, chemical and toxicological characteristics** | None known. |

**Information on toxicological effects**

| Product | Species | Test Results |
|---|---|---|
| Bentonite | | |
| **Acute** | | |
| **Inhalation** | | |
| *Dust* | | |
| LC50 | Rat | > 5.27 mg/l, 4 hr OECD 436 |
| **Oral** | | |
| *Dust* | | |
| LD50 | Rat | > 2000 mg/kg OECD 425 |

| Components | Species | Test Results |
|---|---|---|
| TRADE SECRET | | |
| **Acute** | | |
| **Inhalation** | | |
| LC50 | Rat | 10600 mg/l/4h |
| | | 1200 mg/l, 4 Hours |
| **Oral** | | |
| LD50 | Mouse | 2400 mg/kg |
| | Rat | 33.5 mg/kg |

* Estimates for product may be based on additional component data not shown.

| | |
|---|---|
| **Skin corrosion/irritation** | Not classified. |
| **Serious eye damage/eye irritation** | Dust in the eyes will cause irritation. Mild irritant to eyes (according to the modified Kay & Calandra criteria) |
| **Respiratory or skin sensitization** | |
| **Respiratory sensitization** | Not classified. |
| **Skin sensitization** | Not classified. |
| **Germ cell mutagenicity** | Not classified. |

**Carcinogenicity** In June 2003, SCOEL (the EU Scientific Committee on Occupational Exposure Limits) concluded that the main effect in humans of the inhalation of respirable crystalline silica dust is silicosis. "There is sufficient information to conclude that the relative risk of lung cancer is increased in persons with silicosis (and, apparently, not in employees without silicosis exposed to silica dust in quarries and in the ceramic industry). Therefore, preventing the onset of silicosis will also reduce the cancer risk..." (SCOEL SUM Doc 94-final, June 2003) According to the current state of the art, worker protection against silicosis can be consistently assured by respecting the existing regulatory occupational exposure limits. Occupational exposure to respirable dust and respirable crystalline silica should be monitored and controlled. No carcinogenicity data available for this product. Sepiolite was evaluated by IARC as class 3 ("Cannot be classified as to carcinogenicity to humans"). Based on read-across with sepiolite, bentonite was assessed as non-carcinogenic. Therefore classification of bentonite for carcinogenicity is not warranted.

**IARC Monographs. Overall Evaluation of Carcinogenicity**

| | |
|---|---|
| TRADE SECRET (CAS Proprietary) | 3 Not classifiable as to carcinogenicity to humans. |

**Reproductive toxicity** Not classified.

**Specific target organ toxicity - single exposure** Not classified.

**Specific target organ toxicity - repeated exposure** Not classified.

**Aspiration hazard** Not available.

## 12. Ecological information

**Ecotoxicity** The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

| Product | | Species | Test Results |
|---|---|---|---|
| Bentonite | | | |
| **Aquatic** | | | |
| Algae | EC50 | Freshwater algae | > 100 mg/l, 72 hours |
| Crustacea | EC50 | Coon stripe shrimp (Pandalus danae) | 24.8 mg/l, 96 hours |
| | | Daphnia | > 100 mg/l, 48 hours |
| | | Dungeness or edible crab (Cancer magister) | 81.6 mg/l, 96 hours |
| Fish | LC50 | Freshwater fish | 16000 mg/l, 96 hours |
| | | Marine water fish | 2800 - 3200 mg/l, 24 hours |

| Components | | Species | Test Results |
|---|---|---|---|
| TRADE SECRET | | | |
| **Aquatic** | | | |
| Crustacea | EC50 | Daphnia | 47 mg/L, 48 Hours |
| Fish | LC50 | Fish | 222 mg/L, 96 Hours |

* Estimates for product may be based on additional component data not shown.

**Persistence and degradability** Not relevant for inorganic substances

**Bioaccumulative potential** Will not bio-accumulate.

**Partition coefficient n-octanol / water (log Kow)**

| | |
|---|---|
| TRADE SECRET | 0.35 |

**Mobility in soil** Bentonite is almost insoluble and thus presents a low mobility in most soils.

**Mobility in general** The product has poor water-solubility.

**Other adverse effects** No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

## 13. Disposal considerations

**Disposal instructions** Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose in accordance with all applicable regulations.

**Local disposal regulations** Dispose in accordance with all applicable regulations.

**Hazardous waste code** The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

| | |
|---|---|
| **Waste from residues / unused products** | Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions). |
| **Contaminated packaging** | Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied. Store containers and offer for recycling of material when in accordance with the local regulations. |

## 14. Transport information

**DOT**

Not regulated as dangerous goods.

**IATA**

Not regulated as dangerous goods.

**IMDG**

Not regulated as dangerous goods.

| | |
|---|---|
| **Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** | Not applicable. |

## 15. Regulatory information

**US federal regulations**

**CERCLA Hazardous Substance List (40 CFR 302.4)**

| | |
|---|---|
| TRADE SECRET (CAS Proprietary) | Listed. |

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

| | |
|---|---|
| **Hazard categories** | Immediate Hazard - No<br>Delayed Hazard - No<br>Fire Hazard - No<br>Pressure Hazard - No<br>Reactivity Hazard - No |

**SARA 302 Extremely hazardous substance**

Not listed.

| | |
|---|---|
| **SARA 311/312 Hazardous chemical** | No |

**SARA 313 (TRI reporting)**

Not regulated.

**Other federal regulations**

**Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List**

TRADE SECRET (CAS Proprietary)

**Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)**

Not regulated.

| | |
|---|---|
| **Safe Drinking Water Act (SDWA)** | Not regulated. |
| **Food and Drug Administration (FDA)** | Total food additive<br>Direct food additive<br>GRAS food additive |

**US state regulations**

**US - New Jersey RTK - Substances: Listed substance**

TRADE SECRET (CAS Proprietary)

**US - Pennsylvania RTK - Hazardous Substances: Listed substance**

TRADE SECRET (CAS Proprietary)

**US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)**

Not listed.

**US. California. Candidate Chemicals List. Safer Consumer Products Regulations (Cal. Code Regs, tit. 22, 69502.3, subd. (a))**

TRADE SECRET (CAS Proprietary)

**US. Massachusetts RTK - Substance List**

TRADE SECRET (CAS Proprietary)

**US. New Jersey Worker and Community Right-to-Know Act**

TRADE SECRET (CAS Proprietary)

**US. Pennsylvania Worker and Community Right-to-Know Law**

TRADE SECRET (CAS Proprietary)

**US. Rhode Island RTK**

TRADE SECRET (CAS Proprietary)

**US. California Proposition 65**

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

**International Inventories**

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|---|---|---|
| Australia | Australian Inventory of Chemical Substances (AICS) | Yes |
| Canada | Domestic Substances List (DSL) | Yes |
| Canada | Non-Domestic Substances List (NDSL) | No |
| China | Inventory of Existing Chemical Substances in China (IECSC) | Yes |
| Europe | European Inventory of Existing Commercial Chemical Substances (EINECS) | No |
| Europe | European List of Notified Chemical Substances (ELINCS) | No |
| Japan | Inventory of Existing and New Chemical Substances (ENCS) | No |
| Korea | Existing Chemicals List (ECL) | Yes |
| New Zealand | New Zealand Inventory | Yes |
| Philippines | Philippine Inventory of Chemicals and Chemical Substances (PICCS) | Yes |
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

## 16. Other information, including date of preparation or last revision

**Issue date** 10-October-2013

**Revision date** 24-July-2015

**Version #** 20

**Further information** This safety datasheet only contains information relating to safety and does not replace any product information or product specification.
UVCB = a substance of Unknown or Variable composition, Complex reaction products or Biological materials
SWERF = Size Weighted Respirable Fraction methodology is a scientific method developed to quantify the content of respirable particles within a bulk product. All details about the SWERF method are available at www.crystallinesilica.eu.
HMIS® is a registered trade and service mark of the NPCA.

**HMIS® ratings**
Health: 1
Flammability: 0
Physical hazard: 0

**NFPA ratings**
Health: 1
Flammability: 0
Instability: 0

**List of abbreviations**

SWERF = Size-Weighted Relevant Fine Fraction methodology is a scientific method developed to quantify the content of respirable particles within a bulk product. All details about the SWERF method are available at www.crystallinesilica.eu.

UVCB = a substance of Unknown or Variable composition, Complex reaction products or Biological materials

**References** For any information on literature references or toxicity/ecotoxicity studies, please contact the supplier.

**Disclaimer**

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The manufacturer expressly does not make any representations, warranties, or guarantees as to its accuracy, reliability or completeness nor assumes any liability, for its use. It is the user's responsibility to verify the suitability and completeness of such information for each particular use. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. The information in the sheet was written based on the best knowledge and experience currently available.

**Revision Information**

This document has undergone significant changes and should be reviewed in its entirety.