Citizens' Risk Assessment

Public Input for Determining Risk Assessment Needs

A comprehensive list of public input and discussions from various community meetings

Citizens' Risk Assessment Initiative

March 2018

ISSUED BY

Citizens' Risk Assessment Committee

Contact: riskassessmentcommittee@gmail.com

REPRESENTATIVE

Seth Kovnat, Project Engineer

Tom Casey, Risk Assessment Chair

Introduction

Del-Chesco United for Pipeline Safety is a nonpartisan, fact-based, grassroots coalition of locally-based safety and advocacy groups *(like Protect Penn Delco, Middletown Coalition for Community Safety, Goshen United for Public Safety, West Whiteland Residents for Safety, Uwchlan Safety Coalition, Upper Uwchlan Residents for Safety. Wallace Safety Coalition and East Goshen Safety and Environmental Advocates)*, are made up of concerned residents from across Pennsylvania. Del-Chesco United's mission is to unite people through education and to encourage our elected officials to make informed policy decisions for the safety and well-being of our communities.

The Risk Assessment Initiative will use the data from the Quantitative Risk Assessment (QRA) in an attempt to answer all known questions and concerns that the public has inquired about over the past 4 years. The research will undoubtedly produce new questions once the modeling data and reports are revealed. This is an ongoing assessment process and some uncertainties will remain once the data is collected, but this QRA is the critical first step.

Funding Support

We need your help. Please make a contribution to this effort by choosing a direct payment at our **GO FUND ME** account,
https://www.gofundme.com/citizens039-risk-assessment-of-me2

Or you can contribute to this effort by making a donation to **CLEAN AIR COUNCIL** and designate your contribution to the "Citizens' Risk Assessment: Mariner East". By making your contribution through Clean Air Council, your donation will be tax deductible and you will receive an annual membership to CAC as thanks for being a part of this Citizens' project. Your contribution will go 100% in full to the study.
http://cleanair.org/donate/

Public Input

Our process is to review all the factors that RISKS from pipelines bring to all communities. Especially when we are dealing with a company that has a less than stellar performance that could pose higher risks to Health, Safety, & Welfare.

Three Main Risk Categories:

LIFE

1. Loss of Life
    a. Risk from explosions
        i. Measure from varying levels underground
        ii. Public infrastructure issues, ie. sewer systems
    b. Risk from leaks
        i. Both pipeline and above ground facilities
    c. Risk from Horizontal Directional Drilling
        i. HDD to this extent has never been done
        ii. Potential impacts on communities
2. Health Concerns
    a. Air
        i. Flares, leaks, fire
    b. Water
        i. Wells, aquifers, public water
    c. Ground
        i. Farms, soil, erosion
    d. Personal
        i. Psychological impacts to community
            1. Stress
            2. PTSD type symptoms
            3. Feelings of fear/hopelessness
        ii. Noise issues & their effects on health
            1. Lead to high blood pressure & heart attacks
            2. Developmental issues in children

3. Injury
    a. Fire
    b. Flying debris from over pressurization or explosion
    c. Self-evacuation concerns

PROPERTY

1. QRA output will provide risk of damage as a function of distance from the pipeline
    a. Have actuary in the real estate field take the risk data and quantify property damage risk in dollars for specific predetermined locations
        i. Huggins Actuarial located in Media (One example) http://hugginsactuarial.com/
    b. Consideration of an economics report on the negative impacts from the pipeline to compare to the Sunoco commissioned "all positive" economics report.
        i. Would need input data from Sunoco's source material to compare
    c. Insurability of property
2. Home values vs. Negative Stigmas
    a. Get a nationally recognized Appraiser to report on issues surrounding pipeline development and operations
        i. speak with John Hosey from Shelterfield (has access to national numbers) http://www.shelterfield.com/
            1. John evaluated the ME1 flaring tower and gathered credible nationally collected data
            2. Use the Actuary report to get appraisal issues from national sources
            3. Assess negative stigma associated with catastrophic events around the country.
3. Insurance concerns
    a. Homeowners policy renewals
    b. Homeowner Association issues (HOAs)
        i. What happens to premiums
        ii. Need to get information from Andover insurer
4. Zoning issues
    a. How does a pipeline alter zoning districts?

b. What is the impact to Municipal & County Comprehensive Planning

5. Quantify loss of different types of property
    a. Value of lost homes and buildings
        i. Quantify based on site specific impact radius (examples)
            1. CC Library Exton / Exton Mall
            2. Wellington and/or church zone
            3. Rt. 202 & Boot rd. (impact to loss of business)
            4. Marchwood neighborhoods
            5. Rt. 1 crossing/Granite Farms
            6. Glenwood/Riddlewood neighborhoods
            7. Aston/Judy Way area
            8. Marcus Hook
            9. Glenwood Elementary
            10. Boot Road Intersection near Wellington & Church/school
    b. Value of lost business revenues
        i. Rt. 202 & Boot road corridor (UPS, QVC, bus. parks)
        ii. Eagleview area
        iii. Exton mall and businesses on Rte. 100
        iv. Goshen Corporate Centers
        v. Aston (esp. ME1)
    c. Value of lost schools
        i. Chester Cty, get specific examples
        ii. Delco, get specific examples

ENVIRONMENT

1. Impacts from HDD to wells, aquifers, lakes, streams
    a. Get depths of public and private aquifers in the region
    b. Value of lost well water
    c. Value of contaminated or drained aquifers
2. Loss of wetlands; increased flooding
3. Loss of tree cover and habitat due to right-of-way clearing
4. What are the concerns regarding air issues
    a. Consult with Clean Air Council
5. Various geologic issues for Mariner East path

a. Karst topography concerns from drilling
b. Sinkholes & subsidence (gradual sinking of an area of land)
c. Regional geologic information

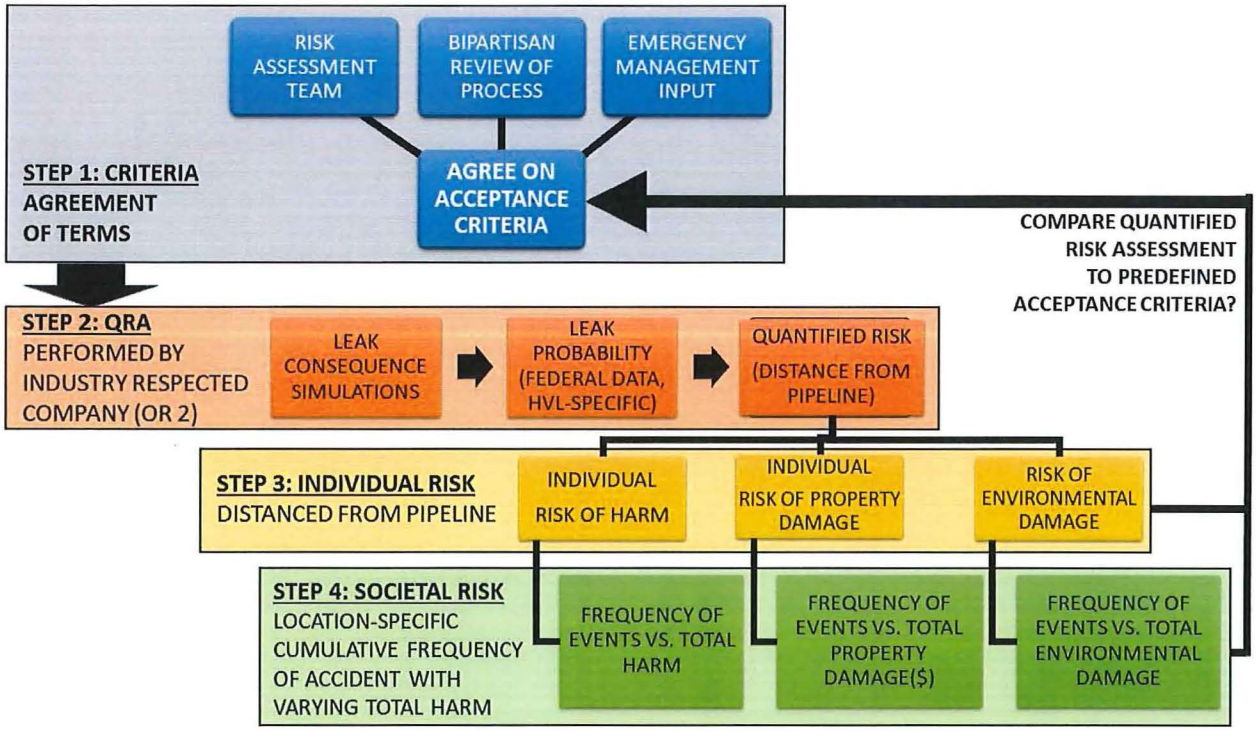
Risk/Benefit Analysis

- What benefits are claimed by industry/Sunoco?
- What assurances does industry/Sunoco give about the risks?
- What are the actual benefits when correlated to the QRA?
- What are the actual risks per QRA?
- Better understanding for community.
- Better understanding for municipalities.
- Factual data for individuals to assess personal risk.
- A more informed community overall.

Conclusion

The community has engaged in the process of trying to understand the risks we are all facing with regards to pipeline development in our communities. They have spoken up at countless township meetings, public events sponsored by the industry, public & private events sponsored by community groups, and even traveled to the state capital to engage with the governor of Pennsylvania and other state representatives. But the questions still remain. What are the risks? What should I do in the event of a gas release? What is the impact to our community? What will happen afterwards? How will these projects impact my home value? These questions, and many more, demand answers. The Citizens' Risk Assessment will attempt to answer them, so that the public & municipalities understand the risks we are being forced to live, work, shop, travel, and play in & around.

Process Flowchart



Appendix

Links for comparison assessments

Explanation of F-N plot (Societal Risk)
http://onlinelibrary.wiley.com/doi/10.1002/9780470552940.app1/pdf

http://proceedings.esri.com/library/userconf/petrol16/papers/petrol_22.pdf

http://www.cheminst.ca/sites/default/files/pdfs/Connect/PMS/Pipeline%20QRA.pdf

http://www.pipelinerisk.com/pdf/Enhanced_PL_Risk_Assess_Part_2%20rev3.3.pdf

http://www.windot.com/docs/federal/ntsb/PHMSA_research/pdf/DTPH5615T00003L_-_Criticatl_Review_of_Candidate_Pipeline_Risk_Models_-_Final_Report.pdf

http://www.dec.ny.gov/docs/legal_protection_pdf/20120216questqra.pdf

http://www.penspen.com/wp-content/uploads/2014/09/risk-assessment-new-guidelines.pdf

http://www.middletowncoalition.org/copy-of-sen-killion-rep-quinn-lette

Citizens' Risk Assessment

Quantitative Risk Assessment

Request For Proposal: Scope of Work

Citizens' Risk Assessment Initiative

March 2018

ISSUED BY

Citizens' Risk Assessment Committee

Contact: riskassessmentcommittee@gmail.com

REPRESENTATIVE

Seth Kovnat, Project Engineer

Tom Casey, Risk Assessment Chair

Introduction & Background

The Citizens' Risk Assessment Initiative is accepting proposals in response to this Request for Proposal (this "RFP," or this "Request for Proposal") in order to find qualified firms to quantify the risk associated with operation of artificially liquefied Ethane, Propane, and Butane pipelines in densely populated areas. This data-driven Quantitative Risk Assessment (QRA) will use simulations and statistical likelihood to quantify and assess risk, comparing the results to risk acceptance criteria. The goal of this QRA is to evaluate the risk of highly volatile liquids (HVL) transmission pipelines routed through densely populated areas.

A proposed pipeline project seeks to operate and install 3 co-located HVL transmission pipelines through densely populated suburban Philadelphia. The unique risks to public safety that come with running artificially liquefied, highly combustible gas transmission pipelines through high consequence areas have yet to be adequately assessed. The route was chosen in order to reuse or parallel existing Rights of Way (ROW), but with no federal route oversight (due to classification as an intrastate hazardous liquids pipeline) and no state route oversight (due to Pennsylvania not having a regulatory body responsible for pipeline routing).

The objective of this Request for Proposal is to identify a source that will provide the best overall result to the Citizens' Risk Assessment Initiative. While price is a significant factor, other criteria will form the basis of our award decision, as more fully described in the Evaluation Factors section of this Request for Proposal.

The main goals of this assessment project are:

1. To address the risks & impacts of pipeline development on the identified three main risk categories -- **LIFE, PROPERTY,** and **ENVIRONMENT**.
2. To help to define unknown risk factor data, then compare/contrast to already established industry risk data.
3. To understand the level of risks posed on each of the three risk categories, and compare it to already established acceptable levels of risk.
4. To provide a risk assessment that is readily available to the general public.

Project Scope

The scope of the project entails Quantitative Risk Assessment for Natural Gas Liquids pipelines. The Mariner East Project pipeline route will be used to **quantify leak consequences, statistical probability, individual human/property risk, and total human/property loss frequency for a multitude of variables**.

The goal of this assessment is to provide a risk assessment tool not only for evaluating Mariner East pipelines, but any and all existing or future NGL pipelines. In order to do this efficiently, the Mariner East 2 pipeline route will be used as a baseline route to provide flow characteristics for variable pipeline characteristics (i.e. flow materials, pipe characteristics, diameter, pump station discharge pressure, pump station spacing, etc.).

Variables Shall Envelope Pipeline Operation Details

Any and all information that is typically provided by the pipeline operator (i.e. specific NGL mixtures, discharge pressure, flow characteristics, etc.) shall be used as variables and varied to envelope all plausible scenarios to encompass Mariner East project and any other potential NGL project possibilities.

NGL flow shall be simulated appropriately to reflect phase change physical chemistry. Flow simulations can be generic. However, local pressures, temperatures, and density for the flowing product is requested as output at critical features (i.e. valves, pre/post-pumps, end-of-line).

To envelope flow and leak characteristics, analysis is requested for:

a) Pipe diameter sensitivities:
    i) 4in, 8in (ME1), 12in, 16in (ME2X), 20in (ME2), 24in, 30in, 36in.
b) Pumping station sensitivities:
    i) Pumps assumed to be located 85 miles apart.
    ii) Intermediate pumping stations added at 43 mile spacing as permitted in approved DEP applications.

iii) Variable pumping station discharge pressures: 1500psi (MAOP), 1200psi, 1,000psi, 800psi
iv) Request recommendations based on safe local operating pressures for different NGL mixtures, specifically pure ethane that has highest critical pressure.
v) Determine local operating pressure lower threshold where risk significantly increases due to volatility within normal operation

c) Flow material mixtures:
   i) 100% Ethane
   ii) 100% Propane
   iii) 100% Butane
   iv) Y-Grade NGL
   v) Other common NGL mixtures
   vi) Methane Natural Gas

Plausible Leak Scenarios

Plausible leak scenarios shall be simulated using industry approved software. Independent of actual features along the Mariner East route, hazards shall be simulated with a variety of risk factors. These risk factors include, but are not limited to terrain, topography, geology, presence of buildings/trees, proximity to sewers/karst, proximity to ignition sources, etc. Standard leak analysis shall be simulated. However, consideration of critical leak hole size must be either discussed qualitatively or derived analytically (preferred). There may be a

These variables shall envelope all plausible pipeline uses and characteristics, providing sensitivity analysis that shows how risk varies with each different parameter.

d) Pinhole leak hole sizes (1/8", 1/4", 1/2" and 3/4" holes, rupture)
   i) Determine if ALL leaks greater than the "CRITICAL LEAK HOLE SIZE" for each pipe diameter and product (defined below) must be combined and treated with full rupture consequences.
e) Phase change volatility at cryogenic temperature shall be calculated for each assessed product to determine "CRITICAL LEAK HOLE SIZE":

1) Determine mixtures/pipe diameter/leak hole size combinations that have adiabatic expansion gas temperatures below API 5L Carbon Steel embrittlement temperature
    (a) Discuss whether it is plausible for small leaks of gas below API 5L Carbon Steel embrittlement temperature can propagate a leak hole into full rupture
2) Determine mixtures/hole size combinations that have adiabatic expansion gas temperatures below Viton embrittlement temperature. (Viton is used at valve/pump/inspection access above ground features for O-Rings and Seals)
    (a) Discuss Viton seal performance when subjected to released gas below its embrittlement limit.

Failure Mode Considerations

f) Undocumented Digging in someone's yard/land/farm
g) Trenching failure/error during commercial/institutional/industrial construction
h) Corrosion (i.e., seam failure, air to ground interface failure, etc.)
i) Weld failure
j) Field Bend Failure
k) Valve Breaking
l) Valve gasket failure
m) Equipment port failure
n) Ground shifting (Karst, heavy rain, etc.)
o) Shutdown/deinventory issues during emergencies or sudden events elsewhere online

Other Relevant Pipeline Sensitivities

p) Use of outdated welding methods (ME1)
q) Variable age (new, 20 years, 80+ years old)
r) Large diameter seam-welded (ME2, ME2X)
s) Straight pipe vs. pipe with excessive field bends as it navigates around residences, roads, etc.
t) Different Pipeline features

i) Valve Stations
ii) Pump Stations
iii) Variable Depth 3ft, 6ft, 12ft buried pipe, 50ft HDD, 100ft. HDD
    1) Consideration in the event that drilling fluid dries out and leaves full/partial open-air annulus surrounding HDD-installed pipe

Probability

u) Assess leak rates for both **industry average AND worst** Hazardous Liquids transmission pipeline operator to show sensitivity
v) Leak data sources:
    i) Federal leak data (self-reported)
    ii) Enforcement Actions (Unreported but verified)
    iii) Other publicly available source with references required
w) Account for risk factors specific to densely populated areas (Rural vs. Suburban)
    i) Delayed ignition likelihood in areas with many ignition sources
    ii) 3rd party damage (accidental or malice) with pipeline located on private property.
x) Factor in likelihood of HVL pipeline leaks compared to traditional Liquid pipelines
y) Account for multiple pipelines in shared ROW
z) Account for crossing other pipelines at specific locations
aa) Account for different materials (ethane) and thermal risks to pipeline (especially for two-phase flow)
bb) Consideration of pipeline run through unstable terrain (i.e. karst) that can fail from ground shifting/sinking.
cc) Consideration of HDD pipe that is in constant bending preload.
dd) Consideration of large diameter pipe that has be cold-formed in the field.

Risk Mitigation Discussion

ee) Comment on use of deinventory tanks at valve sites
    i) Procedures to deinventory lines at each valve site
    ii) Procedures to reverse flow to deinventory line(s) to place material at safe locations

iii) Procedures to allow/manage portable/temporary combustion units at valve sites to deinventory line(s)

iv) Permits that may be required in advance to allow for reasonably anticipated shutdown procedures?

ff) Comment on use of Automatic Valves

i) Explore difference between best-case Automatic Shutdown and Delayed Shutdown

ii) Estimate of minimum time to invoke Emergency Shut-Down (ESD)

iii) Estimate of minimum pressure loss to invoke ESD

iv) Estimate of expected material loss before control room identifies minimum pressure loss to invoke ESD

First Response Comments and Discussion Requested

gg) Safe-Distance setbacks for First Responders in different plausible leak scenarios: Prior to Ignition, During Post-Ignition Jet Fire, etc.

i) Note time durations for each scenario (i.e. how long until 5 mile isolated segment deinventories via jet fire)

hh) Amount of space required to accommodate first responders and support equipment in event of valve site failure

ii) Amount of space required to accommodate first responders and support equipment in event of line failure

jj) Valve site detectors to evaluate early warnings of potential leaks, networking of these detectors to first responders, and community warning

kk) Community notification in densely populated residential and institutional settings?

ll) Utility protection in emergencies?

mm) First responder access protocols, incident command hierarchy?

nn) How to perform a pig dig in HDD segments >>20' below grade?

oo) What anomalies are smart pigs missing and how to manage pipes the operator cannot visually inspect?

pp) Leak Response Infrastructure:

i) Water supply requirements and protection in emergencies

ii) What infrastructure required to extinguish jet fire?

iii) What infrastructure required to promote gas concentration dissipation below combustion levels?

iv) Effectiveness of on-site gas leak detectors at valve/pump stations

v) Can above ground features be enclosed in ballistics bunker?

Acceptance of the work is contingent on the following acceptance criteria:

1. Final report providing results with all inputs and assumptions stated clearly, as well as references. The report must include the following:
    a. Summary of results with discussion of their meaning and description of how the data can be used with stated limitations.
    b. Hazards zones (i.e. blast radius) identified around pipeline route and features.
    c. Individual Risk to humans and property quantified around pipeline route and features provided for the different variables identified herein.
    d. Risk of Total Human (lives) and Property Loss (USD) based on public data from census and tax records or other referenced public sources.
    e. Individual and Total Loss Risk shall be provided in a way that allows interactive calculation of risk that can be applied to NGL or Natural Gas pipelines in the event of risk factor changes
        i. Ability to update risk based on presence of different risk factors
        ii. Ability to transpose risk onto a different route that has same variables and risk factor combinations

RFP & Project Timelines

The Request for Proposal timeline is as follows:

Request for Proposal Issuance	2/12/2018
Start of Negotiation	2/24/2018
Contract Award / Upon agreement with committee	3/5/2018

The need-date for project completion is 4-6 weeks from time of bid acceptance. Bidders may propose a date earlier or later, and will be evaluated accordingly.

Budget

The Citizens' Risk Assessment Initiative budget for the project will be determined based on scope of work performed, private fundraising efforts, and municipal partner contributions. Estimates will be directly impacted by the amount of viable options made available to the Risk Assessment. Initially the estimate for completion is **$50,000 (USD).**

Costs will be itemized out after preliminary consultation with the chosen vendor. The Citizens' Risk Assessment Initiative will determine the best way to proceed with available funds raised. Scope of work will be a Time & Materials approach. Updates are to be provided from vendor via email or status report on a bi-weekly basis. Invoices are expected every month. The Time & Materials approach will be restricted by a Not to Exceed dollar value based on available funds.

Citizens' Risk Assessment

QRA Vendor Search & Selection Parameters

Vetting outline for selection of a quality company to assess levels of risk for pipeline development Citizens' Risk Assessment Initiative

January 2018

ISSUED BY

Citizens' Risk Assessment Committee

Contact: riskassessmentcommittee@gmail.com

REPRESENTATIVE

Seth Kovnat, Project Engineer

Tom Casey, Risk Assessment Chair

Summary

The Citizens' Risk Assessment Initiative engaged in a comprehensive search to find qualified firms that have the right combination of capability, credentials, integrity, and interest required to properly assess risk from Natural Gas Liquids pipelines across the Commonwealth of Pennsylvania.

There are a multitude of risk factors associated with the operation of artificially liquefied Ethane, Propane, and Butane pipelines in densely populated areas. The importance of finding a qualified company to assess the risks was paramount for the Citizens Risk Assessment Team.

The primary objective of this risk assessment is to quantify risk along the Mariner East pipeline route for any and all reasonable operational and environmental variations. The assessment results will provide any member of the public the ability to determine their own personal life/property risk while also providing government and emergency services the ability to determine the potential risk magnitude to populations and property.

Performing the assessment using a multivariate approach will efficiently provide a very powerful results package for a number of reasons:

1) Sensitivity analysis of different operational data ensures that the assessment will cover any and all operational variations throughout the life of the pipeline. This includes material mixtures, pipe diameters, pump station spacing, pump discharge pressure, etc. This analysis can be expanded to include Methane Natural Gas and other materials being shipped via transmission pipelines in our area.
2) Sensitivity analysis of different environmental risk factors will allow the results to be used to determine risk in the event risk factors change along the current route. More importantly, this sensitivity allows the results of this risk assessment to be applied to ANY existing or potential new Right of Ways given they have the risk factors covered in this analysis. The ability to determine risk for any existing or future planned NGL pipeline infrastructure is a very power tool that can ensure future planning is data driven.
3) Sensitivity analysis will objectively show how potential installation issues (as documented from DEP Notices of Violations) affect risk.
4) Sensitivity analysis will objectively show how potential mitigation attempts affect risk.

Under normal circumstances, land-use is regulated at the local level by municipalities many of whom have a comprehensive safety ordinances for zoning. For this pipeline application, most municipalities that have such ordinances have been hesitant to apply them given the project's eminent domain authority that has been applied to Mariner East by the PA PUC. The few municipalities that have tried to enforce their safety-related pipeline zoning ordinances, have not been armed with quantifiable risk data to support safety related municipal concerns. Instead, municipalities have relied on high level federal government regulations, echoed at the state level, that fail to address local risks to communities.

Having quantifiable risk data empowers communities, local municipalities, emergency personnel, schools, and private citizens alike. With quantifiable data:

1) Private citizens can decide how much risk they can tolerate.
2) Municipalities can see where risks are heightened and decide what measures can be taken to mitigate risks.
3) Emergency personnel can see what magnitude of emergency is possible and decide what infrastructure they require to proactively minimize carnage while planning realistic evacuation procedures and routes.
4) All of us can use this data to make reasonable requests to the pipeline operator or higher levels of government in the name of risk mitigation.

Overall, we can qualitatively state that the consequences of a Mariner East pipeline leak have the potential to be catastrophic. Many perceive that the probability of a catastrophic leak is low. We must move past qualitative statements and obtain real quantitative data. Data is a very effective tool to mitigate risks, protect property interests, and give landowners the ability to assess levels of risk and how they may impact their health, safety, and welfare. For these reasons it was crucial for our search parameters to find a qualified risk assessment firm that can provide all of the necessary answers in a way that maintains the highest level of integrity.

Search Parameters

The first level of search parameters focused on what is most important to engaging with a qualified risk assessment firm.

Required:

1) Vendor must regularly work in oil and gas industry.
2) Vendor must use simulation to determine flow characteristics and leak consequences.
3) Vendor must use well-respected risk assessment process.
4) Vendor must have high standards for integrity and unbiased quantifiable risk assessment.
5) Vendor must have history of working with industry, government, and emergency services.
6) Vendor must be held in high regard with PHMSA and DOT.
7) Vendor must recognize and be capable of efficiently assessing any and all potential risk factors that can affect an NGL pipeline in a densely populated area.
8) Vendor must be capable of simulating phase change and two phase flow associated with HVLs.
9) Vendor must have streamlined process for assessing multiple variables that fully envelope all potential risk factors and operational scenarios.
10) Vendor must have strong interest in generating new risk data in an area lacking data driven regulation.

The second level of search parameters were critical for any firm that would be chosen. These parameters would help to ensure the quality of the work being produced. Also, they would allow for limited dispute of findings.

Preferred:

1) Vendor should be considered a preferred vendor with PHMSA or other regulating agencies.
2) Vendor should have no current relationship with Sunoco Logistics, Energy Transfer Partners, or any subsidiaries of these companies.
3) Vendor should be an industry leader in risk assessment and consequence modeling.
4) Vendor should have history of educating the industry and/or government and/or emergency services.
5) Vendor should have option to teach public or other entities.

Selected QRA Vendor Qualifications

1. Vendor has advised and provided for US Department of Transportation (DOT)-sponsored study of pipeline risk management.

2. Provided training for DOT federal and state pipeline pipeline risk management auditors.
3. Consulting projects for numerous pipeline operators in the U.S. and in over ten foreign countries.
4. Provided expert witness testimony and report preparations for court proceedings involving previous work.
5. Has helped numerous local and federal government agencies regarding possible impacts arising from pipeline projects.

The company was has been in operation for over 25 years, with experts that have a combined 65 years experience in operations, construction, design, and maintenance. The founder is a noted lecturer, software designer, and author. They have a wide range of clients from a variety of sectors including academia, legal firms, engineering companies, insurers, and industry professionals. They specialize in risk assessments and integrity management plans for pipeline development with an emphasis on providing educational workshops that give their clients the power to use the results in the way that best suits the customer needs.

The company's engineering experts have helped to provide consulting services such as:

1. Compliance Assessments – based on current government regulations and industry practices;
2. Risk Management – based on risk reduction versus resource allocation analysis methods; cost/benefit analyses;
3. Risk Assessments – based on new and improved quantitative methods and proven consequence analysis methods;
4. Custom Software Development – risk assessment and management, database management and engineering application program development.
5. Risk Management Workshops – risk management presentations and workshops;
6. Ownership Transfer Due Diligence – compliance and risk assessment approaches;
7. Procedure Development – operations, maintenance, emergency & management procedures;
8. Personnel Training – on site refresher & custom training programs;

The company operates under some guiding principles. First, the are committed to technical excellence. They will continue to develop and efficiently apply the optimal risk management tools in order to best meet the needs of their clients. They strive to consistently provided the most cost effective solutions for their clients. They vow to never advise a client to spend resources in an inefficient manner. Reliability in services provided

helps meet or exceed established client expectations; the result is a long-term client relationship and a reputation for delivering sound solutions under high public and government scrutiny. And finally, they prides themself in providing objective and unbiased information to clients ensuring an unquestionable level of integrity and professionalism.

Conclusion

The Citizens' Risk Assessment utilized input from years worth of input from the countless public meetings being held across the state. The need for a quality report grows with each new pipeline project being considered in the state of Pennsylvania. The rush to get these projects completed without knowing the true impacts would be a mistake. The industry only tells communities what they want them to know. The community has determined that it wants to know more, to have true understanding of the risks involved.