# Office of Pipeline Safety (OPS)
## Pipeline and Hazardous Materials Safety Administration (PHMSA)
## Accident Investigation Division (AID)

**September 7-8, 2022**
**PA Safety Seminar**



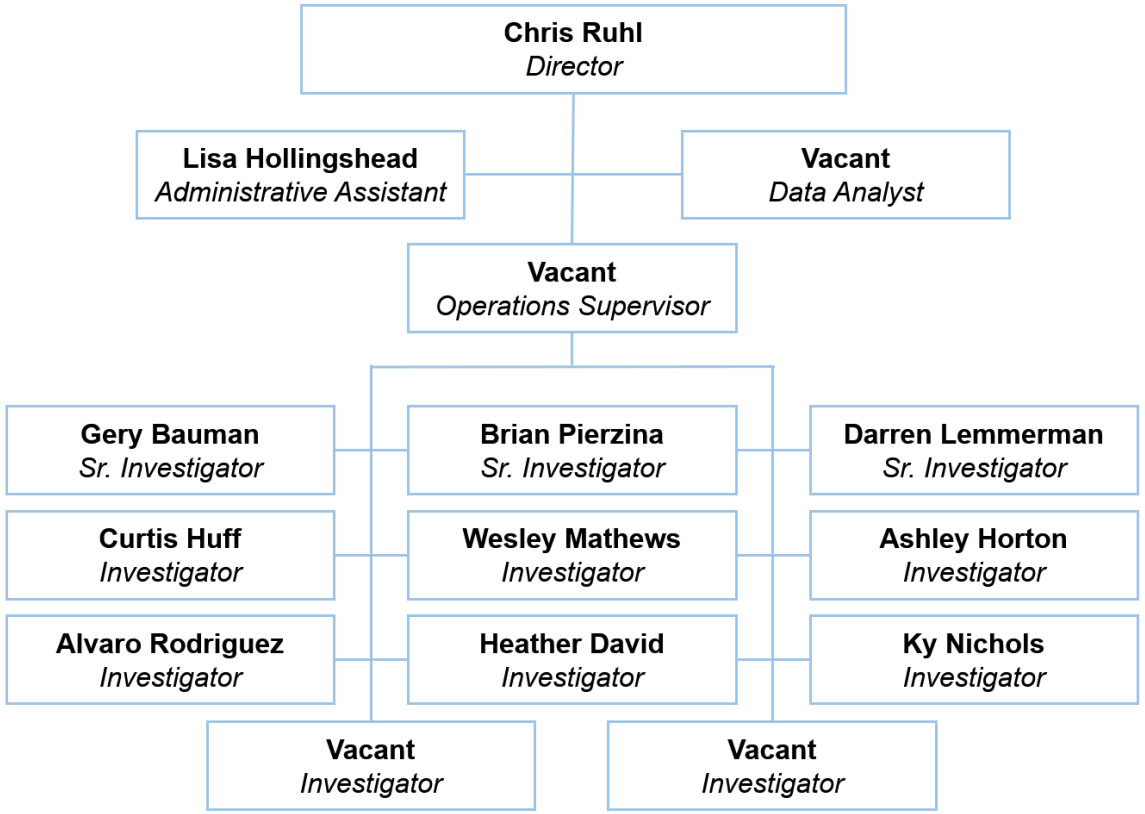
# Discussion Outline

- Pennsylvania Trends
- AID Roles
- Case Study Examples
- AID Considerations
- Additional Resources



# Accident Investigation Division

- Director, Chris Ruhl
- Operations Supervisor, Vacant
- Investigators, 2 Vacant
  - Brian Pierzina (MN)
  - Darren Lemmerman (MN)
  - Gery Bauman (OH)
  - Curtis Huff (OK)
  - Ashley Horton (OK)
  - Wesley Mathews (OK)
  - Alvaro Rodriguez (CO)
  - Heather David (MI)
  - Ky Nichols (OK)
- Data Analyst, Vacant
- Administrative Assistant
  - Lisa Hollingshead






# Meet AID

# What We Do

- AID was established on April 1, 2017
- Review, evaluate, and circulate NRC notifications
- Conduct on-site investigations
- Review operator 30-day reports
  - PHMSA's best failure data
  - Scrutinize to ensure information is current, accurate, and consistent
- Analyze and disseminate accident trend data to identify emerging trends and improve pipeline safety
- Capture and share lessons learned



# When does AID deploy?

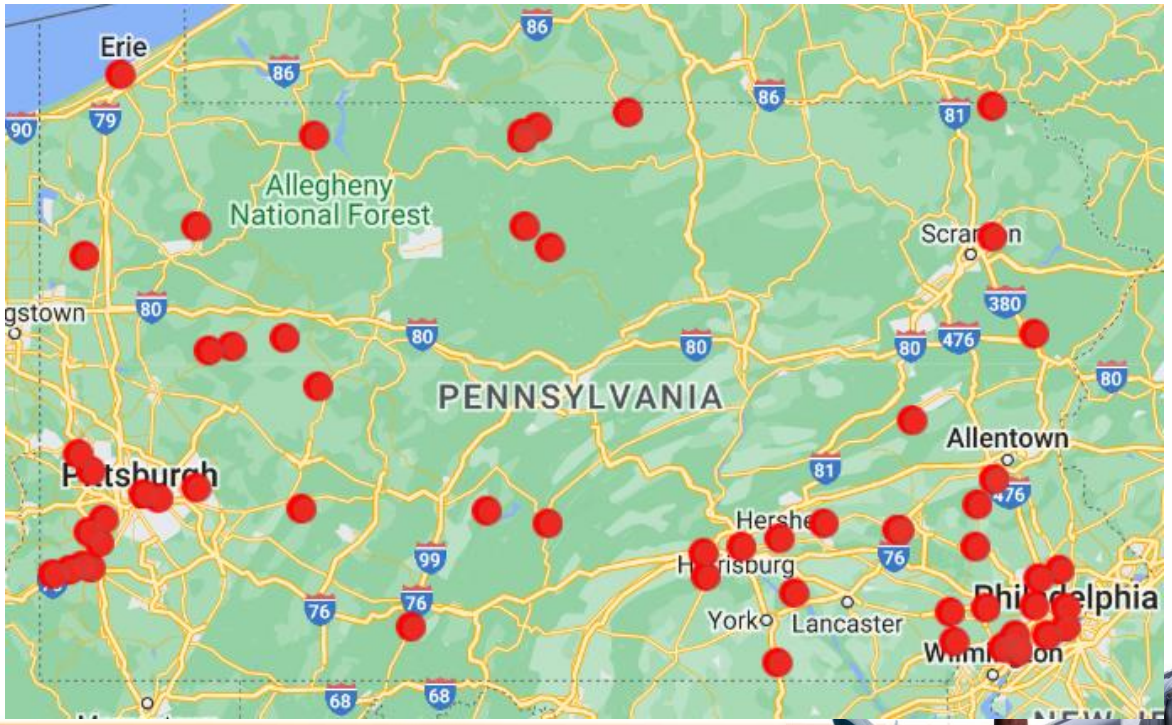
- A release of product and one or more of the following:
  - Fatality
  - Injury
  - Hazardous liquid spill > 500 barrels or spill reaches water
  - Major transportation impact - highway, airport, rail
  - Major supply impact
  - Pipeline system/operator of interest
  - Toxic release – ammonia, $CO_2$
  - NTSB deploys
  - Politically sensitive/high media interest
  - State request



# Recent PHMSA Pennsylvania Reports

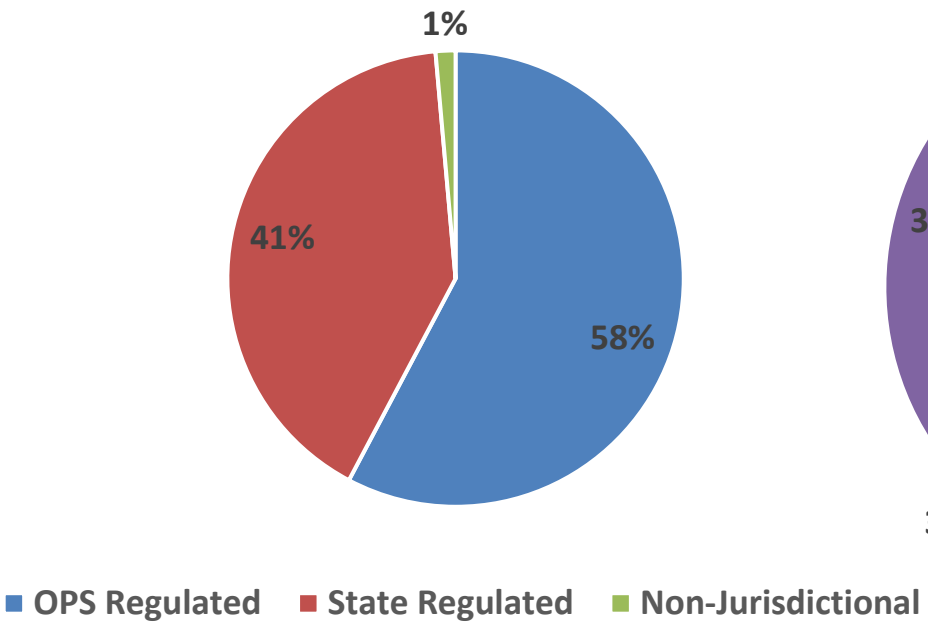
- January 2018 through July 2022

- 71 events requiring 30-Day Reports
  - Gas Transmission
  - Gas Distribution
  - Hazardous Liquid

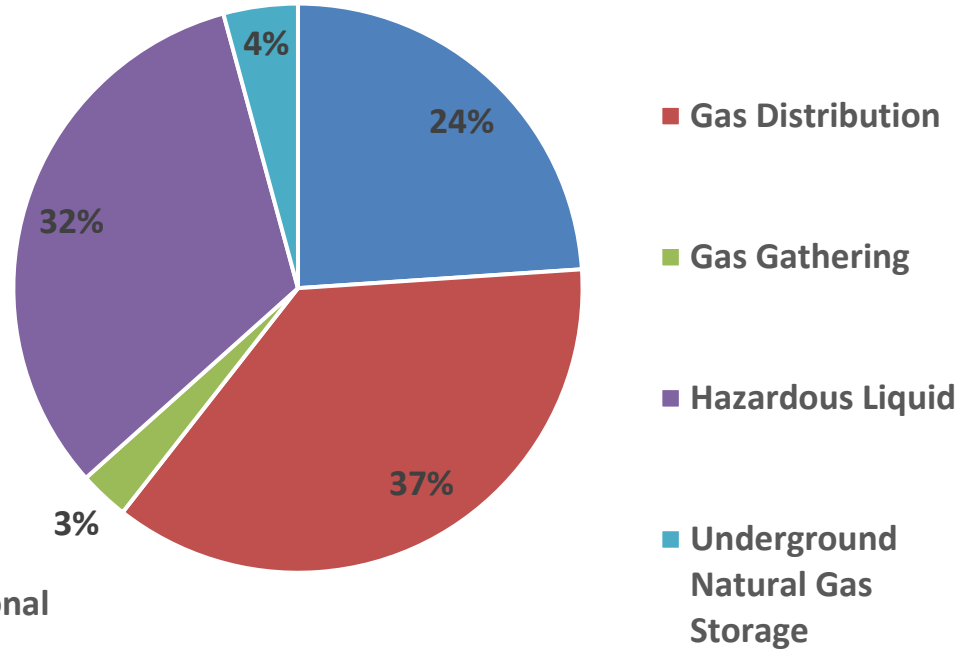


# Pennsylvania Reportable Events

## Incident/Accident Jurisdication




## Incidents/Accidents By System Type



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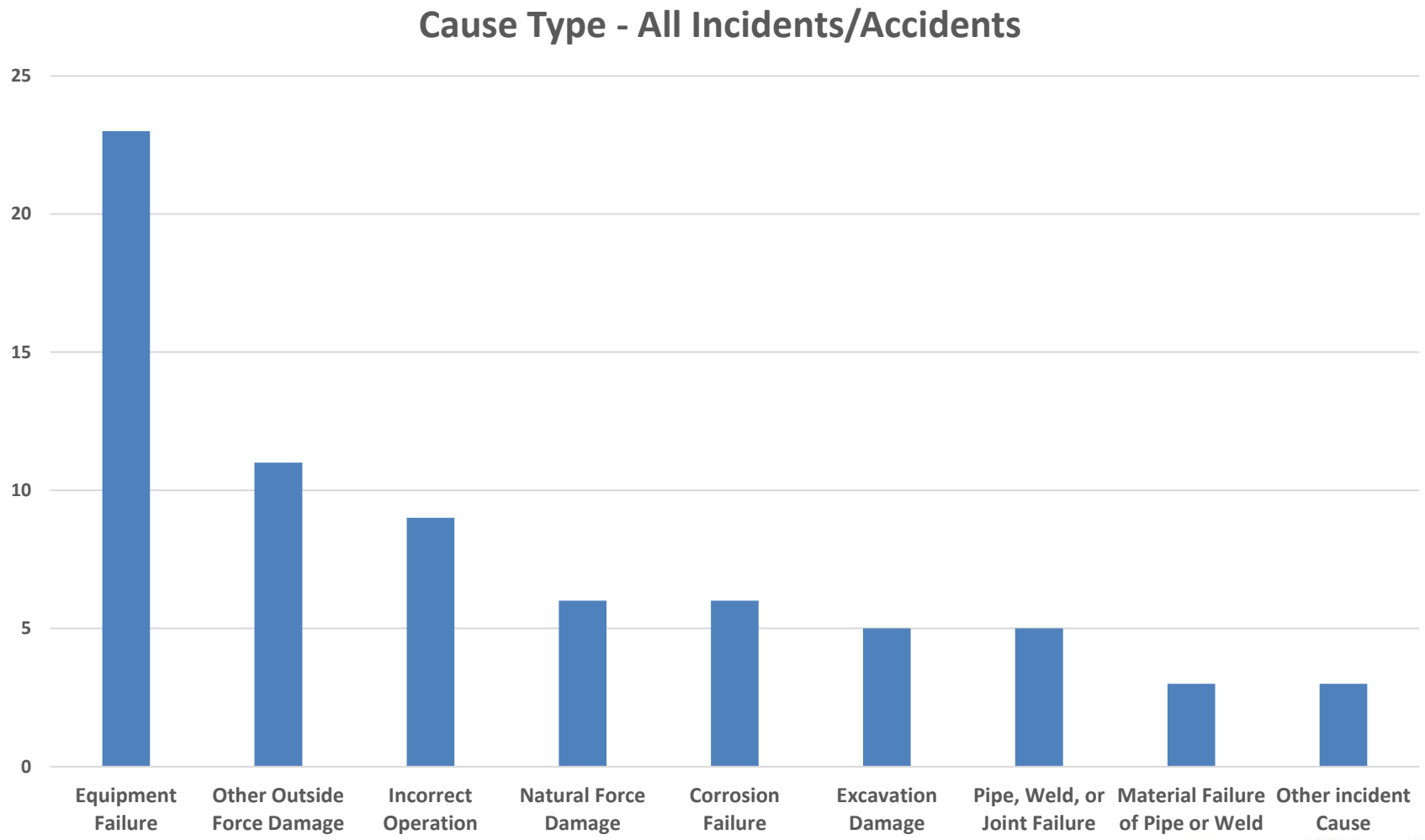

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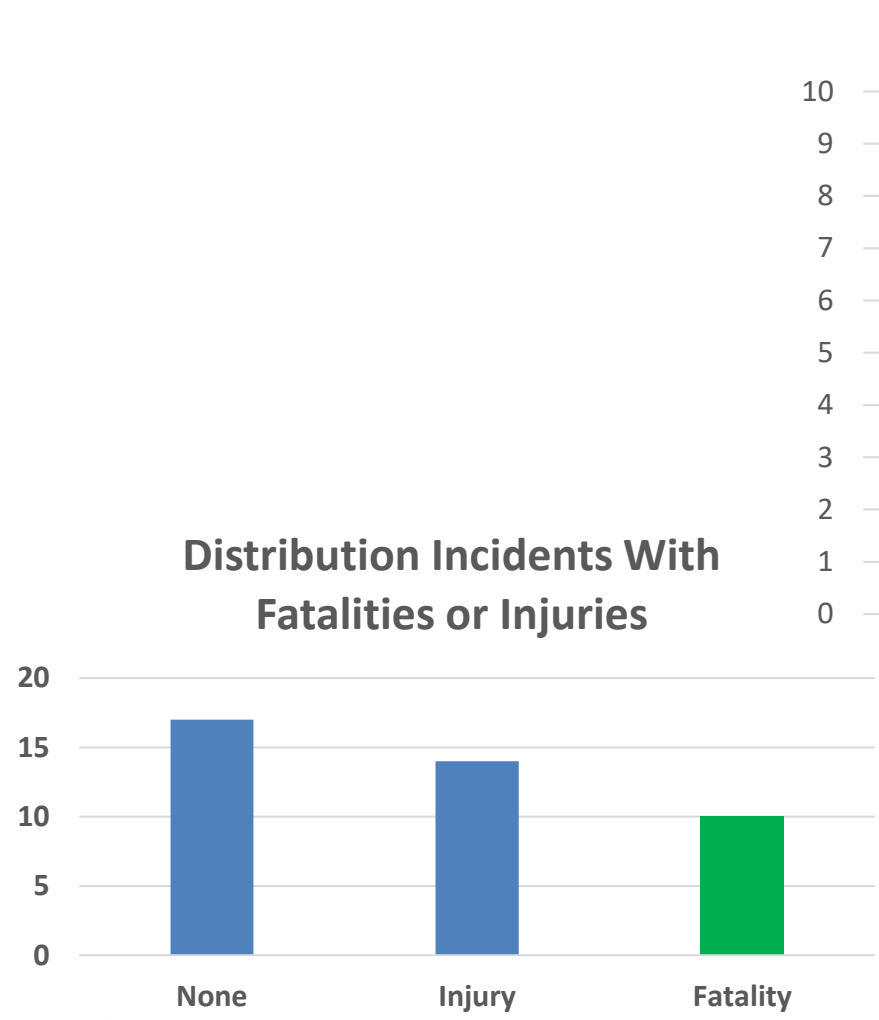


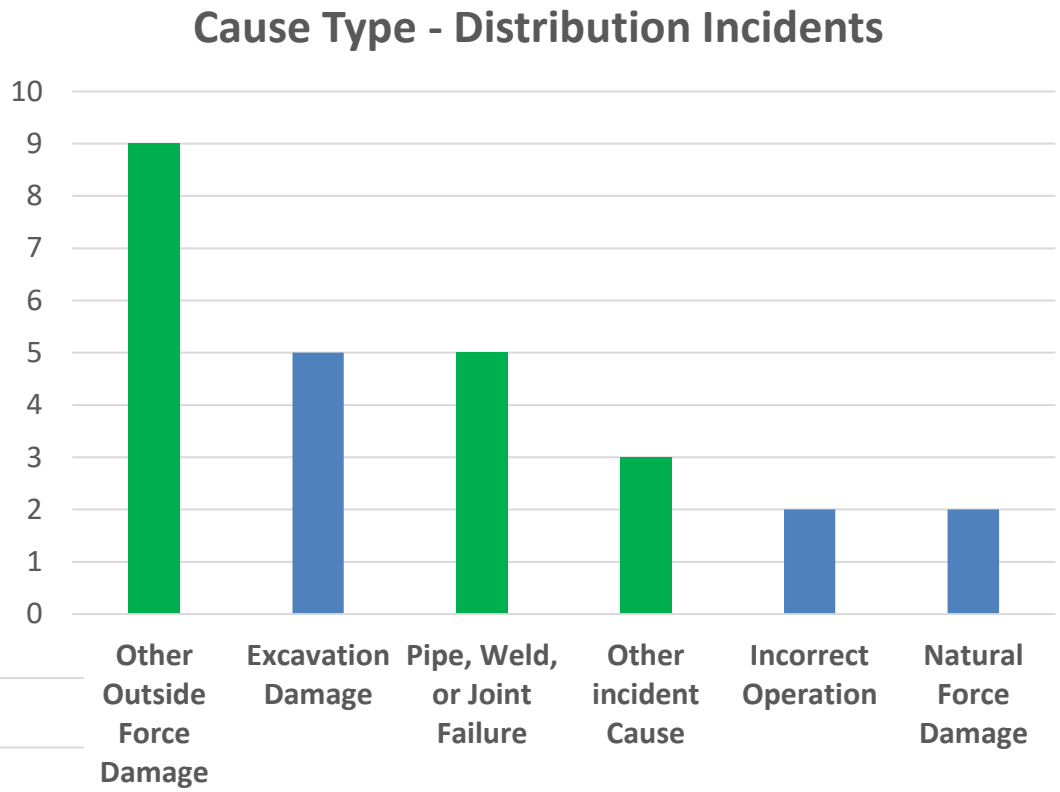

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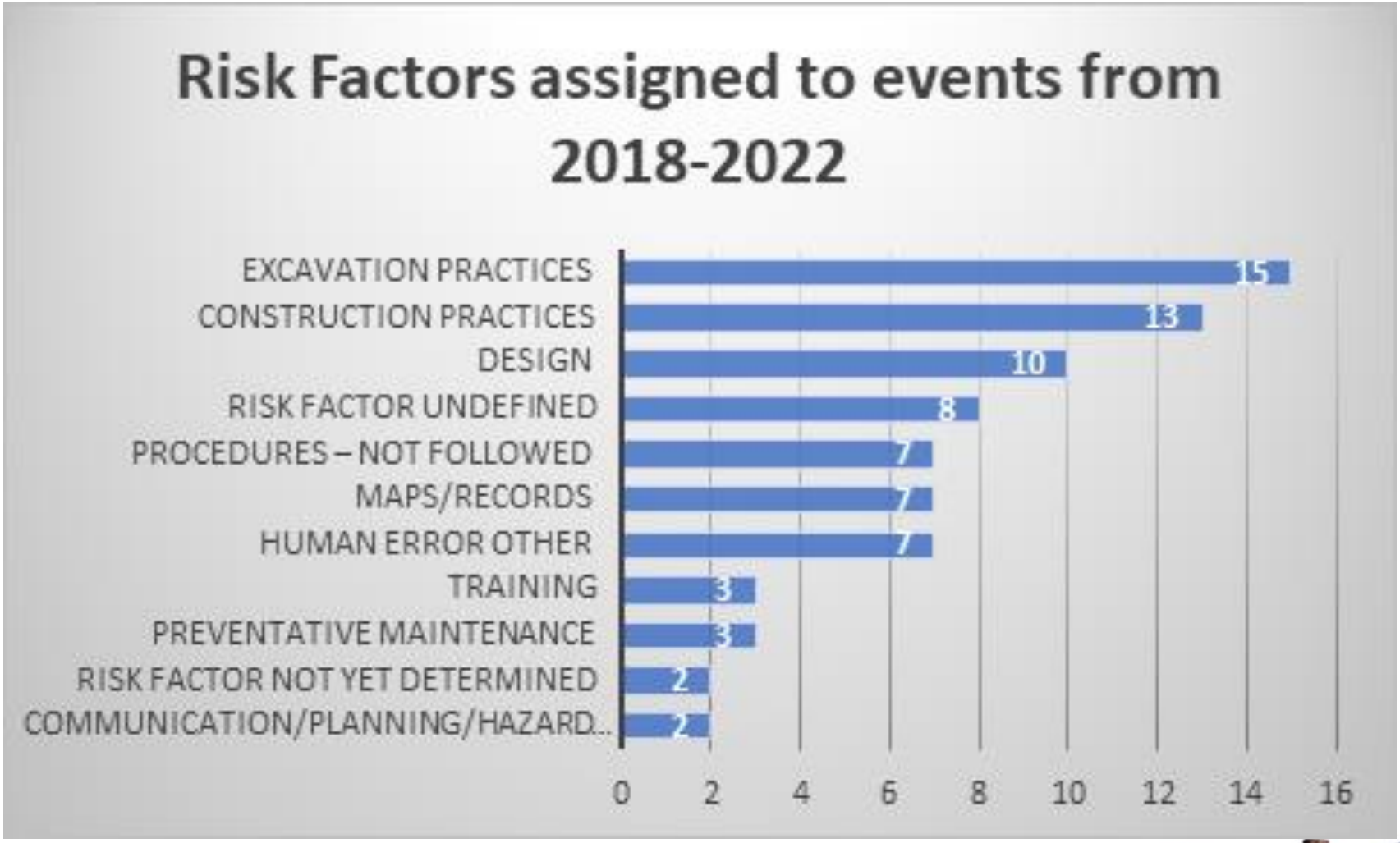


# Case Studies

- Events where the consequences escalated
  - Fatalities or injuries occurred
- Pipeline types include
  - Natural gas distribution
  - Natural gas transmission

- Incidents investigated by PHMSA AID, State Programs, and the National Transportation Safety Board (NTSB)
  - The NTSB monitors all pipeline related incidents and deploys to investigate at their discretion



# Case History #1 – Injury Incident

- Excavation damage – 1st party – Auburn Hills, MI
  - Crew was working to lower a 2” PE main
  - Operator struck a shallow tee causing a release of gas
- Escalation of the consequences
  - Procedures called for excavation to cease and for the emergency response plan to be implemented
  - Crew continued to excavate in order to isolate the release
  - The excavator hit an electric line that was parallel to the main
  - The electrical line arced and ignited the natural gas

# Case History #1 – Injury Incident

- Operator personnel did not follow established procedures
  - Immediate ceasing of excavation once a release occurs
- Consequences:
  - Employee hospitalized with burns.
  - Complete loss of excavation equipment

# Case History #2 – Fatality & Injury Incident

- Outside Force Damage – Midland, TX
  - A non-regulated 6” natural gas gathering pipeline (Operator #1) ruptured and the releasing natural gas ignited
  - A PHMSA regulated 12” natural gas transmission pipeline (Operator #2) was located above the 6” pipeline.
  - The rupture and blowing gas uncovered the 12” transmission pipeline
  - The resulting fire was impinging on the 12” pipeline
  - The natural gas fire also started a grass fire in the area
  - Operator #1, Operator #2, and firefighters were at the site



# Case History #2 – Fatality & Injury Incident

- Continuation of events
  - The 6” pipeline was isolated, and the fire was significantly reduced
  - The 12” pipeline was isolated and holding 765-psig
  - Operator #2 field personnel submitted a request to blow down the isolated section of the 12” pipeline at 12:29 p.m.
  - Firefighters and operator personnel were gathered around the crater within 30 to 80-feet to discuss what had occurred



# Case History #2 – Fatality & Injury Incident

- Escalation of the consequences
  - At 12:33 p.m. the 12” pipeline, impinged by the fire, ruptured

# Case History #2 – Fatality & Injury Incident

- Consequences
  - Personnel were too close to a fire compromised pipeline
  - Five operator employees were injured
  - Two firefighters were injured
  - One operator employee later died from their injuries

# Case History #3 – Fatality & Injury Incident

- Excavation damage – 3rd party – Murrieta, CA
  - At a house, a solar panel installation crew drove a ground rod into a ½” PE gas service line
  - No One-Call was made
  - The house was evacuated but a secured perimeter was not setup
  - An occupant of the house was allowed to return
  - Gas company employee removed the grounding rod prior to shutting off the

# Case History #3 – Fatality & Injury Incident

- Escalation of the consequences
  - Emergency response procedures were not followed
  - Gas company crew did not evacuate or mark off the area
  - Area was not made safe
  - Flow of gas was not stopped
  - No checks for gas migration
  - Explosion occurred while two gas company employees were excavating near the ground rod to expose the service line.

# Case History #3 – Fatality & Injury Incident

- Consequences
  - One fatality – gas company employee
  - Eight injuries
    - One resident
    - Three firefighters
    - Two gas company employees
    - Two solar panel contractors
  - Four homes red tagged, no re-entry
  - Thirteen homes yellow tagged, limited access

# Case History #4 – Fatality & Injury Incident

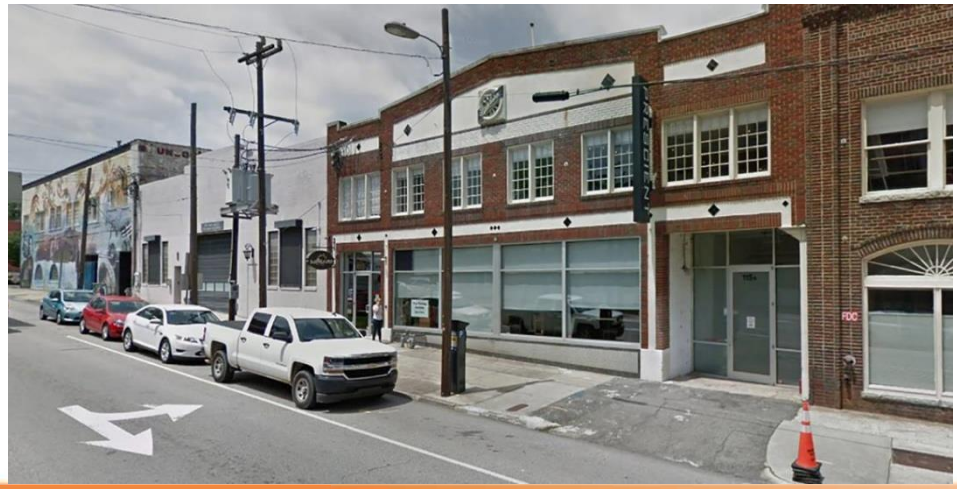
- Excavation damage – 3rd party – Durham, NC
  - HDD* crew installing a fiber optic cable hit a ¾” PE service line
  - A One-Call was made, and marks were visible
  - No pot-holing was performed to verify line location
  - Timeline of the event
    - 9:11 a.m. - A call reporting a strong smell of gas had been placed to 911
    - 9:13 a.m. - Local responders investigated, but detected no odor of gas
    - 9:28 a.m. – HDD operator called 811 to report damage
    - 9:37 a.m. – HDD operator called 911, reporting a gas line had been hit, resulting in the same fire department unit being dispatched to the scene
    - 10:07 a.m. – Explosion occurs at business address. Evacuations and isolation of the escaping gas were in process at the time of the explosion

*Horizontal Directional Drilling



# Case History #4 – Fatality & Injury Incident

- Escalation of the consequences
  - Initial response to 911 call did not detect gas odor
  - Gas line strike was not immediately reported to 911
  - Operating personnel and public not evacuated far enough away
  - Business owner refused operator's and firefighter's evacuation orders



# Case History #4 – Fatality & Injury Incident

- Consequences
  - Two fatalities – 1 gas company employee and 1 business owner
  - 25 injuries
    - 5 requiring overnight hospitalization
    - 20 transported to hospitals

  - Two buildings condemned and subsequently demolished
  - 21 total buildings damaged by the explosion
  - Costs exceeded $35 million

# Case History #5 – Fatality & Injury Incident

- Excavation damage – 3rd party – Aurora, CO
  - HDD crew was working to install fiber optic cables
  - 1.25” PE main was hit causing a release of natural gas
  - No One-Call was made
  - Media reports this was the 5th gas line hit within a month by cable company crews and the 2nd within 72 hours at the site
- Escalation of the consequences
  - Gas migrated to a residence which subsequently exploded
  - Residence exploded over one hour after the first notice
  - Evacuation area was insufficient



# Case History #5 – Fatality & Injury Incident

- Consequences
  - One fatality – an 80-year-old resident
  - Two injuries – first responder and member of the public
  - Three duplex residences damaged, six units
  - Thirty elderly residents were evacuated to a Red Cross center

Credit: SKY 9

# Case History #6 – Fatality & Injury Incident

- Excavation damage – 3rd party – Canton, IL
  - HDD crew was working to install fiber optic cables
  - 1” PE main was hit causing a release of natural gas
  - A One-Call was made, and marks were visible
  - No pot-holing was performed to verify line location
  - Timeline of the event
    - 3:58 p.m. – HDD contractor called 811 to report a damaged pipeline
    - 4:06 p.m. – HDD contractor called the gas operator, who dispatched techs
    - 4:13 p.m. – Operator tech arrived, shortly thereafter confirmed the release
    - 4:48 p.m. – Nearby customers reported gas odor inside & outside building
    - 5:37 p.m. – Pipeline isolated and release secured
    - 5:43 p.m. – The nearby building exploded



# Case History #6 – Fatality & Injury Incident

- Escalation of the consequences
  - HDD contractor called 811 but did not call 911
  - Gas migrated to a nearby building which later exploded
  - No gas reading were taken inside the building after gas odors were reported inside
  - Evacuation area was insufficient

# Case History #6 – Fatality & Injury Incident

- Consequences
  - One fatality – gas company employee
  - Eleven injuries – two operators and members of the public
  - Commercial building destroyed

# AID Considerations


- Trenchless Technology
- Leak Investigation
- Emergency Response

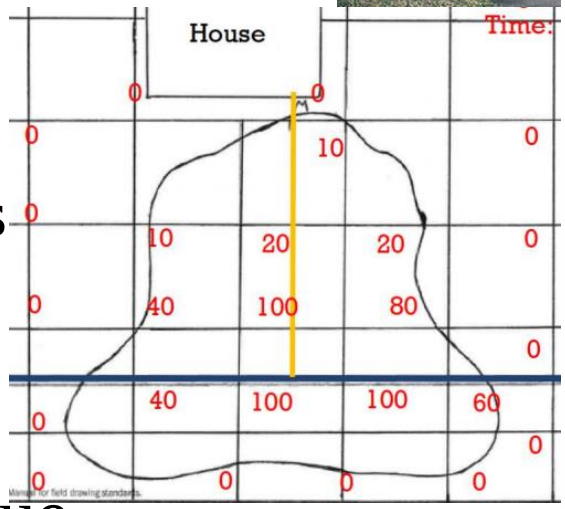


# Trenchless Technology

- Directional drilling is on the increase due to 5G cellular service build out.
- Unique characteristics of HDD increase the potential consequences of damage
  - Potentially in congested areas under pavement
  - Gas migration vs. venting to atmosphere
  - Location of damage may be unknown
  - Potential for multiple migration paths
  - Release isolation complexity increases
  - Are emergency procedures adequate?
  - Are training practices adequate?

# Leak Investigation

- Determine leak location using Flame Ionization (FI) Unit
- Pinpoint leak: determine leak spread by bar holing until 0% gas obtained in all directions
- Check several nearby houses
  - If no one is home, check doors and windows
  - If a positive reading is obtained, evacuate
- Check nearby manholes
- If you find any positive gas reads, continue your investigation.



# Response Plans

- Do your procedures cover multiple scenarios?
  - Scenarios provide a framework for discussion of safety issues
  - Discussion of tactical options for handling various emergencies
  - Set objectives for discussing each scenario type
  - Follow training with discussion of leak and fire control methods
  - Timely evacuation and have an adequate perimeter



# Response Plans

- Do your procedures cover potential gas migration?
  - Gas migration paths
  - Procedures on gas inside of buildings
  - Evacuation area
    - Timing of evacuation
    - Size
    - Timing of evacuees returning

# Regulatory Requirements

- Emergency Response Preparedness for Operators
  - Procedural manual for emergencies - Part 192.605 and 195.402
  - Written Emergency Plan - Part 192.615 and 195.402(e)
  - Written Public Awareness Program - Part 192.616 and 195.440
  - Investigate Incidents/Accidents – Part 192.617 and 195.402(c)(5)

NATIONAL ARCHIVES

Code of Federal Regulations

A point in time eCFR system

Title 49



# Investigation of failures 192.617, 195.402(c)

Significant changes effective 10/5/22

Each operator shall establish procedures for analyzing accidents and failures, including the selection of samples of the failed facility or equipment for laboratory examination, where appropriate, for the purpose of determining the causes of the failure and minimizing the possibility of a recurrence.

Before

Investigation of failures and incidents.

(a) *Post-failure and incident procedures.* Each operator must establish and follow procedures for investigating and analyzing failures and incidents as defined in § 191.3, including sending the failed pipe, component, or equipment for laboratory testing or examination, where appropriate, for the purpose of determining the causes and contributing factor(s) of the failure or incident and minimizing the possibility of a recurrence.

(b) *Post-failure and incident lessons learned.* Each operator must develop, implement, and incorporate lessons learned from a post-failure or incident review into its written procedures, including personnel training and qualification programs, and design, construction, testing, maintenance, operations, and emergency procedure manuals and specifications.

(c) *Analysis of rupture and valve shut-offs.* If an incident on an onshore gas transmission pipeline or a Type A gathering pipeline involves the closure of a rupture-mitigation valve (RMV), as defined in § 192.3, or the closure of alternative equivalent technology, the operator of the pipeline must also conduct a post-incident analysis of all of the factors that may have impacted the release volume and the consequences of the incident and identify and implement operations and maintenance measures to prevent or minimize the consequences of a future incident. The requirements of this paragraph (c) are not applicable to distribution pipelines or Types B and C gas gathering pipelines. The analysis must include all relevant factors impacting the release volume and consequences, including, but not limited to, the following:

(1) Detection, identification, operational response, system shut-off, and emergency response communications, based on the type and volume of the incident;

(2) Appropriateness and effectiveness of procedures and pipeline systems, including supervisory control and data acquisition (SCADA), communications, valve shut-off, and operator personnel;

(3) Actual response time from identifying a rupture following a notification of potential rupture, as defined at § 192.3, to initiation of mitigative actions and isolation of the pipeline segment, and the appropriateness and effectiveness of the mitigative actions taken;

(4) Location and timeliness of actuation of RMVs or alternative equivalent technologies; and

(5) All other factors the operator deems appropriate.

(d) *Rupture post-failure and incident summary.* If a failure or incident on an onshore gas transmission pipeline or a Type A gathering pipeline involves the identification of a rupture following a notification of potential rupture, or the closure of an RMV (as those terms are defined in § 192.3), or the closure of an alternative equivalent technology, the operator of the pipeline must complete a summary of the post-failure or incident review required by paragraph (c) of this section within 90 days of the incident, and while the investigation is pending, conduct quarterly status reviews until the investigation is complete and a final post-incident summary is prepared. The final post-failure or incident summary, and all other reviews and analyses produced under the requirements of this section, must be reviewed, dated, and signed by the operator's appropriate senior executive officer. The final post-failure or incident summary, all investigation and analysis documents used to prepare it, and records of lessons learned must be kept for the useful life of the pipeline. The requirements of this paragraph (d) are not applicable to distribution pipelines or Types B and C gas gathering pipelines.

After



# Closer look at 192.617

- Post-failure and incident procedures
  - Must establish and follow procedures for investigating failures and incidents
    - Includes sending failed specimen to lab to determine cause and contributing factors
- Post-failure and incident lesson learned
  - Must develop, implement and incorporate lessons learned
- Analysis of rupture and valve shutoffs
  - When incidents cause the closure of RMV, operator must conduct a post incident analysis
- Rupture post-failure and incident summary
  - Required within 90 days of incident with quarterly status reviews until complete


# Additional Resources

- National Incident Management System (NIMS)
  - No cost online training on ICS
  - https://www.fema.gov/nims-training
- National Association of State Fire Marshals
  - No cost online training on Pipeline Emergencies
  - https://nasfm-training.org



# Additional Resources

- Pipeline Emergency Response Guidelines
  - Pipeline Association for Public Awareness
  - https://pipelineawareness.org

Pipeline Association for Public Awareness

- Federal Emergency Management Agency (FEMA)
  - September is National Preparedness Month each year
  - https://www.ready.gov/september

Ready



# Additional Resources

- National Pipeline Incident Coordinator (NPIC)
  - NPIC is an AID rotational duty
  - Monitors/Evaluates/Coordinates all ongoing incidents
  - 24/7/365


- NPIC Hotline: Single Point for Operators, State Partners, and Agencies

**NPIC Hotline (888) 719-9033**

**PHMSAAID@dot.gov**



# Fatalities and Injuries During Emergency Response

- Any Questions On?
  - Background
  - Case Study Examples
  - AID Considerations
  - Additional Resources



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