Unit 11: Hazardous Materials Incident Safety, Planning and Operations

1

Unit 11 Objectives

The responder shall be able to:

- Apply the DECIDE Process to decision making at a hazardous material incident.
- Identify response objectives and operations-level tactical options to be able to safely and effectively protect exposures and limit harm.
- Collect and use assembled data on chemical and incident hazards to develop a hazardous material tactical and safety plan.

2

Safe Practices

Federal regulations (OSHA 1910.120(q) require and Emergency Response plan and procedures that regulate responder actions that must be coordinated and completed prior to entry into a hazardous environment. This includes the establishment of incident specific *incident command system* and development an communication of an incident *site safety plan.*

3

D.E.C.I.D.E Process
Framework for Decision Making

- DETECT the presence of a hazardous material
- ESTIMATE the likely harm without intervention
- CHOOSE incident response objectives
- IDENTIFY action options
- DO the best option
- EVALUATE progress

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Levels of Hazardous Material Incidents

Response Level	Description	Resources	Example
1 Potential Emergency	Incident or threat of a release that can be controlled by the first responder. Confined to limited area. No immediate life risk	Local level response Notification to state and federal agencies	Home heating oil tank leak Mixing of pool chemicals
2 Limited Emergency	Incident involves a large area and poses a life risk. May require Public Protection actions.	HAZMAT response team Public Utilities Emergency Management	Tanker roll over Chemical leak at a water treatment facility
3 Full Emergency	Incident involve a severe hazard, large area, extreme life risk. May require large scale Public Protection action.	Local, state and Federal resources. HAZMAT Team(s). EPA, USCG, FEMA, FBI, NTSB	Train derailment Massive explosion Terrorist incident Chemical facility

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HazMat Tactical and Safety Plan

- **Communicates**
  - Physical and chemical hazards
  - Safety precautions
  - Tactical objectives
  - Assignment of duties
  - Communication pathways
  - Incident command organization

- **Common Safety Practices**
  - Appoint a Safety Officer
  - Minimize responders in hazard area
  - Use Buddy System with Back up team
  - Evacuation routes
  - Command and tactical assignments
  - Establish communications
  - Decontamination

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Tactical and Safety Plan Components

- Site Map
- Hazard Analysis
- Safety and Health Considerations
- Tactical Objectives
- Scene Control Zones

- Tactical Command Structure
- Communications
- Hazard Monitoring
- Personal Protection
- Decontamination

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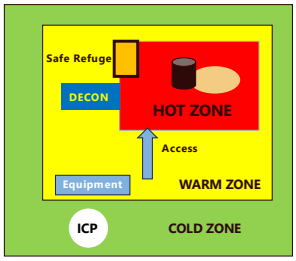
Site Map
Graphic Representation of Incident Site

- Control Zones
- Work Areas
- Decon Areas
- Access Points
- Safe Refuge
- Hazard areas
- Topography
- Facilities



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Hazard Analysis
Identify and evaluate hazards of the incident.

CHEMICAL
- Physical Properties
- Energy Release
- Reactive/Unstable
- Health
- Fire

PHYSICAL
- Energy Sources
- Mechanical
- Weather
- Terrain

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Safety and Health Considerations

- Signs and symptoms of exposure
- Emergency medical treatment.
- On Site medical personnel and equipment.

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Tactical Objectives

- Identify what needs to be accomplished to control the hazard.
- Identify tactical operations to meet the control objectives.

11

Scene Control Zones

- Based on the type and degree of hazard, identifies the criteria and location of control zones; Hot, Warm, and Cold.
- Identifies access and exits points.
- Establish control zones.

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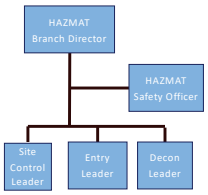
Tactical Command Structure

ICS organization of the HM Branch

Identifies HM Branch functions, personnel and resources assigned.



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Site Communications

- Designated Radio Communication
- Personnel in Hot Zone Should Have Constant Communications
- Emergency Communications

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Hazard Monitoring

- Monitoring Equipment
- Monitoring Hazards
- Evaluation of instrument readings
- Criteria for Action Levels

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Personal Protective Equipment

- Identify the level, ensemble, and type of materials for the hazards identified.
- Reference chemical compatibility.
- Identifies who needs what type and level of PPE.

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Decontamination

- Identifies appropriate level and methods of decontamination.
- All Exposed Personnel and Equipment
- Identify Locations and Stages

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Hazardous Material Branch/Group in the Incident Command System

- HazMat Branch Director or Group Supervisor is responsible for all tactical operations to control hazardous materials.
- HazMat Safety Officer (Assistant Safety Officer) is responsible for the safety and health of responders working in the HM Branch

- HAZMAT Branch:
  - Site control
  - Research
  - Entry Tactical Operations
  - Decontamination

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HAZMAT Branch Director/Group Supervisor

- **Responsible for:**
  - Coordinates **All** HazMat Tactical Operations
  - Establish Control Zones
  - Public Protection Actions
  - Develop Site Safety Plan
  - Determine Tactical Objectives
  - Approve Chemical Protective Equipment
  - Decontamination
  - Leak and Spill Control Operations

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HAZMAT Safety Officer

- **Responsible for:**
  - Advise HAZMAT Branch Director on safety issues
  - Participation in preparation of Tactical and Safety Plan
  - Alter, Suspend or terminate unsafe operations
  - Protection of HAZMAT Personnel from Chemical and Physical Harm
  - EMS Coordination

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Site Control Leader:

- **Responsible for:**
  - Control Access to the Hazard Site
  - Establish Hot and Warm Zone
  - Direct Actions to Prevent Spread of Contamination
  - Ensure exposed or injured are decontaminated
  - Track Movement of personnel in Hot and Warm Zone
  - Observe and report condition changes
  - Coordinate with Medical Branch/Group
  - Communicate and Coordinate with Decon and Entry Leaders

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Research Leader

- **Responsible for:**
  - Coordination with Planning Section Chief
  - Provide and interpret detection and monitoring information
  - Provide analysis of Hazardous Materials
  - Determine appropriate PPE and Decon.
  - Communicate and Coordinate with Entry and Decon Leaders
  - Provide coordination of technical information with outside agencies

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Entry Leader

- **Responsible for:**
  - Supervision of Entry Operations
  - Recommend Tactical actions for Mitigation
  - Carry Out Tactical Assignments
  - Maintain Control of Personnel in Hot Zone
  - Communicate with other Leaders

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Decontamination Leader

- **Responsible for:**
  - Establishment of Contamination Reduction Corridors
  - Supervise Decon Operations
  - Identify Contaminated People and Equipment
  - Maintain Control of personnel in Decon Corridor
  - Communicate and Coordinate with Entry, Site Control and Research Team Leaders
  - Coordinate with Medical Group for Transfer of patients
  - Coordinate Demobilization of Corridor

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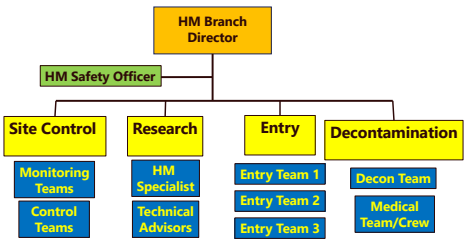
Hazardous Materials Branch



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Incident Review

Train Derailment and Release of Vinyl Chloride
Paulsboro, New Jersey

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Incident Review

Train Derailment Vinyl Chloride Release
Paulsboro, New Jersey
November 30, 2012

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National Transportation Safety Board. 2014.

Conrail Freight Train Derailment with Vinyl Chloride Release,

Paulsboro, New Jersey, November 30, 2012.

Publication Type NTSB/RAR-14/01. Washington, DC.

Consolidated Rail Corporation (Conrail) train derailed in Paulsboro, New Jersey.

Three tank cars containing vinyl chloride came to rest in Mantua Creek, of which one was breached and released about 20,000 gallons of vinyl chloride.

28 residents sought medical attention for possible exposure, and the train crew and many emergency responders were also exposed. Damage estimates $30 million for emergency response and remediation.

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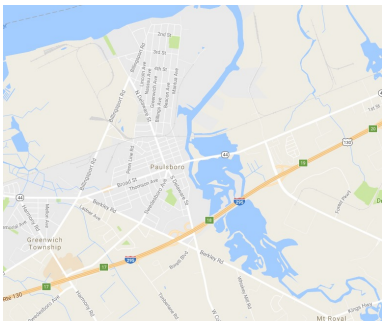

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Train Derailment and Notification
0701-0710 Hours

- Call to County Emergency Response Center (ERC) from Deputy Fire Chief: reports , train derailed on bridge, "spewing out all kind of gas".
- Police Officer (PO) on scene reports, "heavy cloud hovering over Mantua Creek".

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Train Derailment and Notification
0701-0710 Hours

- DFC establishes ICP at his residence (50 yards away from tank car).
- DFC reports, " four tank cars in water leaking, three box cars, bridge collapsed, tank cars have been pierced and have leaked out all of their contents, The creek is full of vapors".

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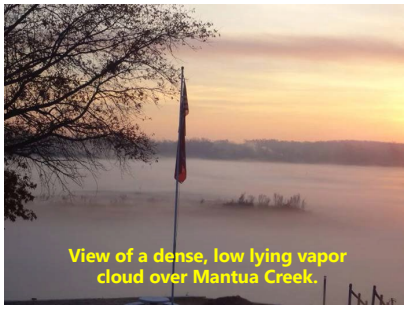

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Train Derailment and Notification
0701-0710 hours

- PO meets train conductor at E. Commerce St. and RR crossing. Conductor advises PO, "situation if life threatening… people are going to die". Conductor told PO of train consist.

- PO reports, It's a major emergency, potentially life threatening, the odor is hazardous. Train contained 1987 – ethanol and 1086 – vinyl chloride.

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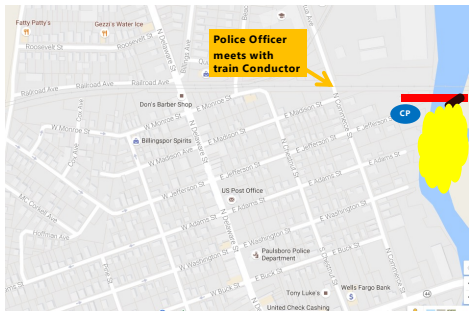

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Verbal Information from Train Conductor to Police Officer

Consist Order	Reporting Mark	Car Number	Type of Car	Contents
6	ECUX	881493	C-Hopper	Polyethylene
7	SGLR	6298	Center beam	Lumber
8	UTLX	207938	DOT-111 tank car	Ethanol
9	OCPX	80323	DOT-105 tank car	Vinyl Chloride
10a	OCPX	80234	DOT-105 tank car	Vinyl Chloride
11	UTLX	98097	DOT-105 tank car	Vinyl Chloride
12	UTLX	98041	DOT-105 tank car	Vinyl Chloride

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Train Derailment and Notification
0701-0710 Hours

- DFC reports, he read placard number 1086. ERC replies that 1086 is 'stabilized vinyl chloride'.
- Fire Chief (FC) is responding requests County HazMat team (HMT) and Paulsboro Refining HazMat team (HMT).

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Discussion

1. **Initial Response**
   - What is known?
   - What is unknown?
   - What are the major concerns?
   - What initial actions should be taken?

38

Train Derailment Initial Operations
0711-0730 Hours
First 30 Minutes

- PO 206 reports, there is a lot of thick smoke coming from the creek.
- PO 218 reports, placards 1987 – ethanol and 1086 – vinyl chloride.

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Train Derailment Initial Operations
0711-0730 Hours

- 0714 Schools are closed.
- Command Post at 230 E. Jefferson St. , open field 50 yards from tank car, apparatus to come down Jefferson St.
- Fire Chief request Coast Guard to be notified, "we are getting some information …that a couple of these tanks have bad stuff….we can't get the placards."

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Figure 11. Emergency responders and a resident in the vapor cloud near the breached tank car. The breached tank car is circled. (Photograph provided by a private citizen)

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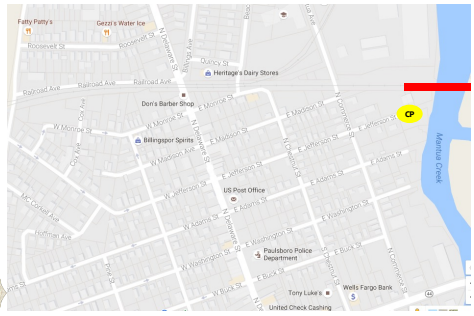

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Train Derailment Initial Operations
0711-0730 Hours

- 0726 – ECC asks PO 206 if evacuation is mandatory, PO replies, "mandatory for 3 blocks"
  - Paulsboro High Scholl notified
  - Housing people at Paulsboro Fire Hall
- 0728 – Refining Company HMT on scene
- 0729 –PO 205 reports, "it's not that toxic… stay in house with the windows closed"

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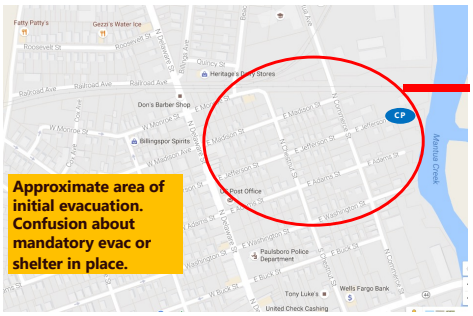

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Train Derailment Initial Operations
0711-0730 Hours

- 0729 – FC reports to ECC, "we have the conductor… looks like we have five cars of vinyl chloride. Can you give me a quick synopsis on the hazards I have with vinyl chloride?"
- PO 205 reports, "it's not that toxic… stay in house with the windows closed".
- ECC reports to FC the health, fire and reactivity hazards of vinyl chloride.

45

Discussion

1. **Incident Analysis**
   - What is known?
   - What has changed?
   - What is the analysis of the incident?
   - What are the basic strategies?

46

Train Derailment Operations
0731-0900 Hours
2 Hours into Incident

- PO206 to ECC, the vapor is nontoxic and people should shelter in place.
- ECC reports to FC the water reactivity information.
- Two railroad workers on the bridge at this time confirming what's in the other cars.

The RR workers are not wearing any PPE

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The breached tank car leaning off the bridge and the vinyl chloride vapor cloud.

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Train Derailment Operations
0731-0900 Hours

- 18 patients at Paulsboro Marine Terminal
  - EMS asks if it is safe to go in?
  - Fire Chief reply, "negative, get them out of there".
- Fire Chief request Conrail to provide the consist and have representative come to CP.

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Train Derailment Operations
0731-0900 Hours

- Police Officer reports, "cloud is coming toward us.. do we need to be concerned?"
- Reply to police officer, "stay in your cars, you'll be fine. It will irritate your eyes and noses. Stay with the windows closed, you should be ok."

50

Train Derailment Operations
0731-0900 Hours

- Refinery Haz Mat Team at Jefferson and Commerce St. informs IC the VOC readings are 631 ppm to 760 ppm.
- Refinery HMT reports 193 ppm at Delaware St. and Billings Rd.
- "County EMS is refusing to go into the hot zone to treat the patients until they have been deconed."

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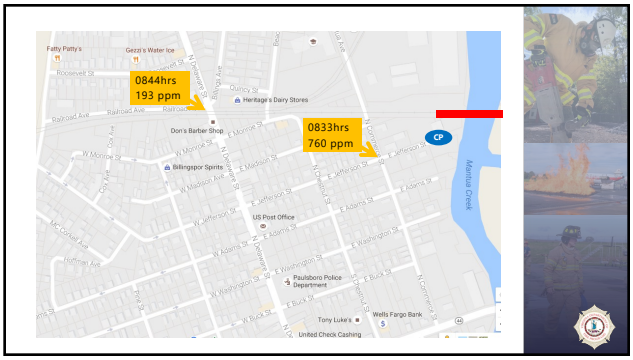

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Train Derailment Operations
0900-1400 Hours

- USCG and NJDEP on scene.
- Police Captain advises residents they can return to their homes but shelter in place. If they don't feel comfortable they can go to fire hall.
- CP remains at Commerce and Jefferson St.
- Refinery HMT reports 10 ppm at incident site.

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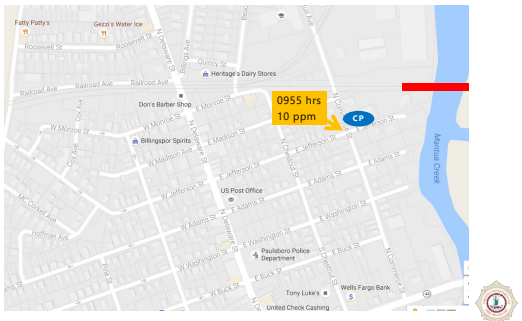

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Train Derailment Operations
0900-1400 Hours

- Message from NJ DEP
  - One car fully in river, car leaked but chemical has dissipated.
  - There are minimal health and environmental impacts at this time.
  - 22 people taken to hospital with respiratory problems.
  - Air monitoring is set up – air levels appear to be safe.

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Train Derailment Operations
0900-1400 Hours

- 1048 – Operations and CP are moving to Borough Hall on Delaware St. due to hazardous conditions.

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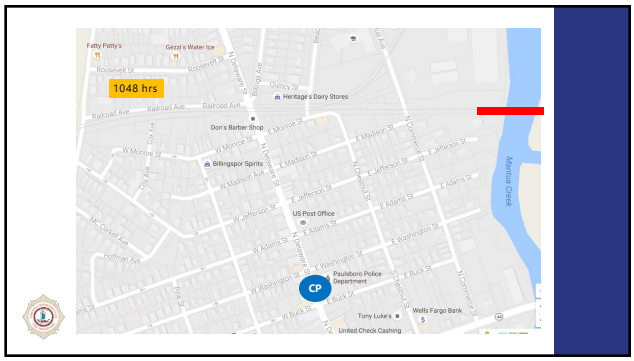
1048 hrs
CP

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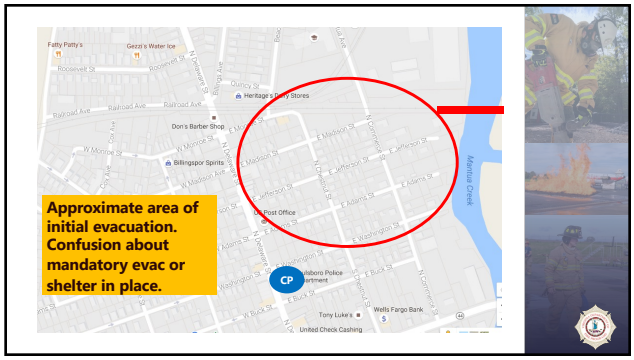
Approximate area of initial evacuation. Confusion about mandatory evac or shelter in place.
CP

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Approximate ½ mile from release
CP

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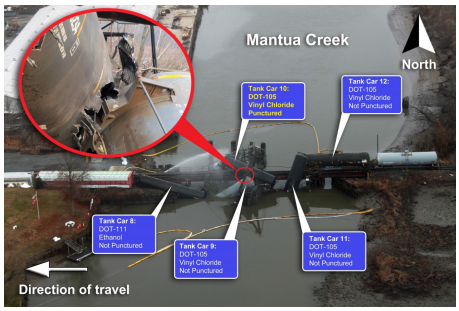

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Train Derailment Operations
0900-1400 Hours

- 1252 – NJ Regional Operations Intelligence Center (ROIC) Update report:
  - Residence within ½ mile advised to shelter in place.
  - 18 people from marine terminal reported symptoms and transported to hospital.
  - 20 others transported to hospital.
  - Respiratory problems reported in nearby communities.
  - Plans for wider evacuation are unclear.

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Train Derailment Operations
1400-2400 Hours

- CG Captain of the Port is the IC, CP moved to County Fire Training Academy.
- Reading for Vinyl Chloride above 1ppm at incident.
  - Paulsboro OEM declares local emergency, orders evacuation for 40-45 residence and 8pm curfew for residents.
- HM Team monitoring, reports 17 ppm.

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Train Derailment Operations
1400-2400 Hours

- 1800 – Unified Command, based on air monitoring, decides to expand evacuation to a 12 block area. This is about 500 residences.
- Mandatory evacuation from Commerce to Delaware St. from RR tracks to Broad St.

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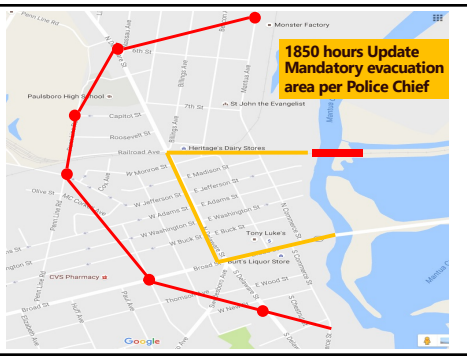

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Train Derailment Operations
1400-2400 Hours

- 1910 – Air monitoring indicates increased reading of Vinyl Chloride, this is due to sunset and atmospheric conditions holding vapors in low lying areas and penetrating structures.
  - Increase evacuation area downwind
  - Involves 400 people

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Train Derailment Operations
1400-2400 Hours

- 2328 – Approximately 400 – 500 people evacuated, 40 families in local hotels.

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NTSB Report

NTSB/RAR-14/01 page 37

"Within minutes of the accident, emergency responders reported a visible vapor cloud indicating that a potentially hazardous chemical release was occurring (see figure 11).

Six minutes after the initial report, the Gloucester County Communications Center told the fire chief that "four tank cars [were] in the water leaking."

The deputy fire chief also reported seeing placard number 1086, which corresponds to vinyl chloride.

Therefore, the incident commander had compelling information that a vinyl chloride release had occurred and that all personnel should have retreated to a safe location, isolated the area in accordance with the ERG, and should have required the use of appropriate PPE, including respiratory protection."

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NTSB Report

NTSB/RAR-14/01 page 40

Although the fire chief testified in the NTSB investigative hearing (NTSB 2013) that he did not ask Conrail employees to examine the wreckage, the HAZWOPER standard found under 29 CFR 1910.120(q)(3) requires the incident commander to delineate and control access to the site.

Assisting agencies, such as the CBRNE team, the NJSP-OEM, and the NJDEP also failed to fully implement their emergency response operations in accordance with HAZWOPER regulations. Their personnel were exposed to vinyl chloride. The NTSB concludes that personnel exposure to vinyl chloride would have been minimized had the incident commander followed guidance contained in the ERG, accepted the advice from hazardous materials emergency responders, and conducted the emergency operations in accordance with HAZWOPER standards under 29 CFR 1910.120.

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Student Activity
Tactical and Safety Plan Worksheet

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Thank You!

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