UTC
Washington Utilities
and Transportation
Commission

621 Woodland Square Loop SE
Lacey, WA 98503
PO Box 47250
Olympia, WA 98504-7250
(360) 664-1119 or (360) 664-1262

Web: www.utc.wa.gov

GRADE CROSSING PROTECTIVE FUND
2021 – 2023 GRANT APPLICATION
OPEN CALL FOR PROJECTS

The Washington Utilities and Transportation Commission (UTC), through the Grade Crossing Protective Fund (GCPF), provides grants for projects that eliminate or reduce public safety hazards at railroad crossings and along railroad rights-of-way in Washington State. Any public, private or non-profit entity may submit an application for a GCPF grant.

To apply for a grant to eliminate or reduce a public safety hazard at a railroad crossing or along a railroad right-of-way, complete the following information and submit it and any attachments to the UTC. If you are proposing a change to the warning devices at a public railroad crossing, you must use the Petition to Modify Warning Devices – GCPF, and not this form.

Please be sure to complete the entire form. Incomplete or missing information will delay the grant review process.

Applicant Information

Applicant Name:	Michael R. Lawson
Signature:	
Organization:	South King Fire & Rescue
Address:	Headquarters – 31617 1st Ave. S. Federal Way, WA
Phone:	HQ: 253-839-6234 Michael R. Lawson: 253-632-4246
Email:	mike.rlawson@southkingfire.org

Project Information

Attach additional sheets as necessary that provide the following:

1. A detailed summary of the **hazard** being addressed. Include any information about accidents or incidents at the site and photographs, drawings or other materials that support the application.

See Overview document answer 1.

2. A detailed **summary of the proposed project and how it will eliminate or mitigate the hazard.** Include any drawings or construction plans for the proposed project.

See Overview document answer 2.

3. A list of all other companies, organizations, state agencies or local governments that may be involved in implementing this proposal, and the contact name, address, email, and phone number for each (if known).

See Overview document answer 3.

4. A cost estimate, including:

a. An itemized list of the total costs of the project.
b. Names of parties contributing to the project, including the applicant and the amount each is contributing.

See Overview document answer 4.

5. The name of the party responsible for long-term maintenance, such as repair of fencing.

See Overview document answer 5.

6. An estimated timeline of the project.

See Overview document answer 6.

7. A description of how the project's success would be measured.

See Overview document answer 7.

8. A description of the applicant's experience in grant management or successfully completing grant projects of this nature, including years of experience, types of projects completed and project cost/scope.

See Overview document answer 8.

9. Any other information the applicant believes would be useful to the UTC in evaluating the project.

See Overview document answer 9.

Railroad Consent

If the applicant is not the railroad owning the crossing or the tracks, the applicant must submit the attached Railroad Consent form completed and signed by the railroad owning the crossing or tracks.

Submitting the Application

After completing the application, please send the original to:

Washington Utilities and Transportation Commission
Attention: Grade Crossing Protective Fund
621 Woodland Square Loop SE
Lacey, WA 98503
PO Box 47250
Olympia, WA 98504-7250

A signed application may be filed electronically at records@utc.wa.gov. When filing electronically, please specify "Grade Crossing Protective Fund" in the subject line.

Assistance

For questions or assistance, please contact:

- Mike Turcott at (360) 664-1119 or mike.turcott@utc.wa.gov
- Betty Young at (360) 292-5470 or betty.young@utc.wa.gov

Railroad Consent

The undersigned represents the Railroad Company in the accompanying GCPF application.

We have reviewed the application and are satisfied that the conditions are the same as described by the applicant in this matter. We agree to allow construction, modification or demolition on a railroad right-of-way as described in the application.

_____

Printed name of Railroad Representative

_____

Signature of Railroad Representative

_____

Title

_____

Name of Railroad

_____

Mailing Address of Railroad

_____

Telephone Number

_____

Email

Date: _____

Overview

On behalf of the South King Fire & Rescue Hazmat Team, I'm submitting a proposal for a portable weather station. Hazmat 361 (addendum A) is a special operations team that responds out of Station 61 located at 3203 S 360th Auburn, WA 98001. The team consists of 12 firefighters that are certified Hazmat Technicians with the ability to respond, assess, and mitigate any hazardous materials incidents within the King County Zone 3 area. Hazmat 361 is the first responding hazmat unit for any railroad or rail crossing incident that involves hazardous material spills. Hazmat 361 is also a part of the Zone 3 Hazmat providers group that includes Renton Fire, Port of Seattle Fire, and Puget Sound Regional Fire Authority. Zone 3 Hazmat providers respond to all major hazmat incidents in South King County.

I am applying for the UTC grade crossings grant to increase the response capabilities of our hazmat team. This proposal will increase the ability to quickly assess and mitigate the hazards associated with the railroad crossings in the Auburn valley area. No hazmat team in Zone 3 currently has this capability.

This grant proposal is for a portable weather station.

1. The hazards being address with this grant request would be all the hazardous materials that are carried by rail through the Auburn valley. Between BNSF and UP, there are more than 75,000 loads of hazardous materials that are transported through the Auburn valley on a yearly basis. Accidents at grade crossings with private or commercial vehicles have a potential for a rail car derailment that could result in a large scale hazmat incident. I have included a map and list of up to 20 grade crossings in the Auburn valley area (addendum B). I have also included a list of WA Rail Crash Stats (addendum C) that show the potential for future incidents.

2. A portable weather station will allow Hazmat 361 to create plume models using live on scene weather data to provide accurate maps of the current and predicted impacts of a hazardous materials spill. This is currently a capability that no hazmat team within the Zone 3 hazmat providers group has. Back in 2005, South King Fire was awarded a grant for this same project. With that grant, we purchased a Colombia portable weather station. That weather station served the hazmat team well for 15+ years, but reached its end life and is no longer supported for repairs. The purchase of a new weather station will restore the important capability of providing accurate plume modeling for incident command decision making. This will have a direct impact on the ability to mitigate the hazards of accidents from grade crossings. I have included several documents that show the importance of plume modeling and the use of weather stations (addendum D, E, F).

3. The implementation of the proposal will be solely conducted by South King Fire & Rescue. The portable weather station will be stored in a protective box on Hazmat 361. The weather station will be able to be mounted on top of Hazmat 361 or setup in an appropriate remote location. Training on the equipment will be conducted by senior members of the hazmat team that have had experience with previous weather stations. As Captain of the hazmat team, I will lead the implementation and be the point of contact for the project.

Michael R. Lawson
mike.rlawson@southkingfire.org
253-632-4246
South King Fire Station 61
3203 S 360th St. Auburn, WA 98001

Colombia Weather Systems
5285 NE Elam Young Pkwy, Suite C100
Hillsboro, OR 97124
503-629-0887

4. The total cost of this proposal is $7,377.10. A quote from Colombia Weather Systems has been included (addendum G)

5. South King Fire & Rescue will assume responsibility for long-term maintenance and repairs.

6. Implementation of this project would be less than 1 month. This includes installation of the equipment and training of personnel.

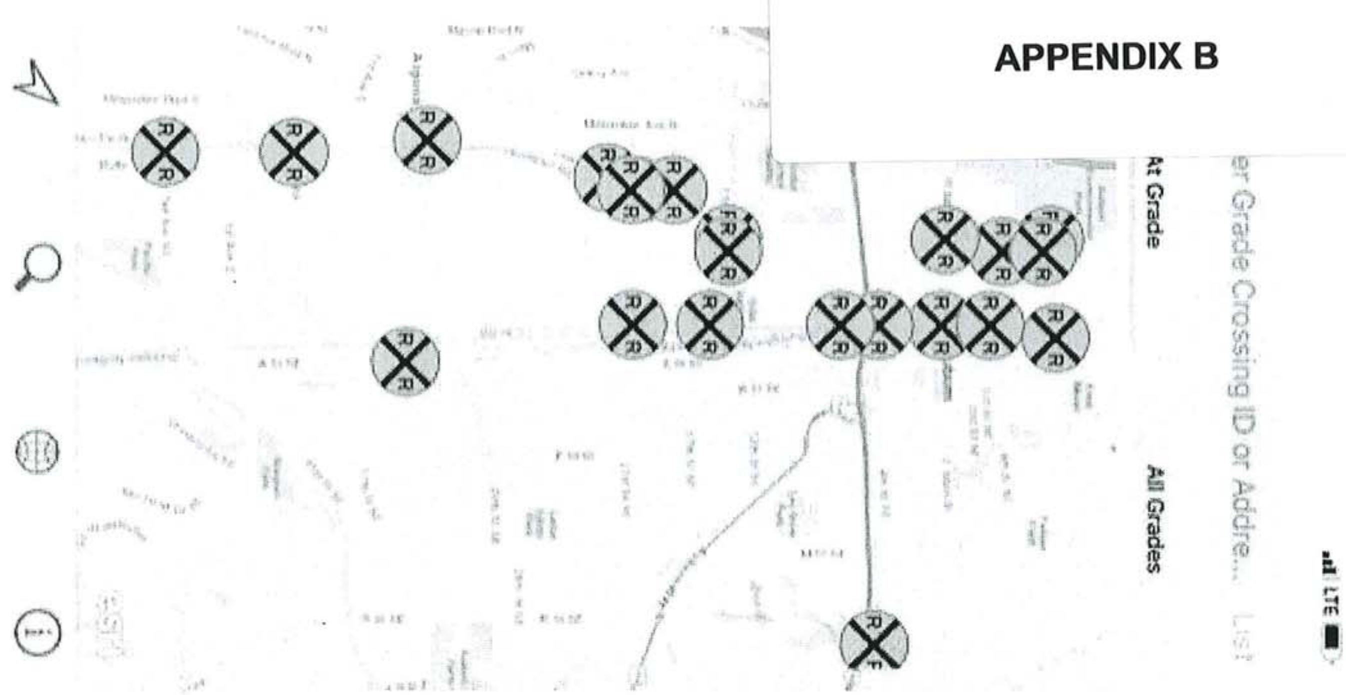
7. Success of this project will be demonstrated by producing real time plume modeling using live weather data. Hazmat 361 participates in Zone 3 hazmat drills on a weekly basis as well as mission specific quarterly drills such as the most recent drill at the Auburn railyard with BNSF (addendum H). This drill is a great example of when we would have created a real time plume model if we had the capability.

8. Hazmat 361 was awarded a grant back in 2005 for the same equipment that we are proposing now. The original equipment served the community well for 15+ years and now needs to be replaced. We anticipate the new weather station to have a similar life expectancy. South King Fire & Rescue has applied for and been awarded numerous grants over the years. Hazmat 361 was recently awarded $22,000 from the Washington Department of Ecology for the replacement of our 4-Gas meters.

9. The implementation of this proposal will have an immediate impact on the ability of the South King Fire & Rescue Hazmat Team to mitigate hazardous situations that pose a threat to the life and safety of the surrounding community. With the number of grade crossings in our area and the likelihood of a grade crossing being a contributing factor in potential incidents, it is important to have the unique capability.

APPENDIX A

APPENDIX B



Federal Railroad Administration
Office of Safety Analysis

8.01 - Query by Location

Total Records: 18

Report Type: (•) Inventory ( ) Accident

Inventory: (•) Current ( ) History

Generate Report | Show All | Reset

Note: Selecting multiple crossings will increase the time required to generate a report. It is recommended that one record be generated at a time.

Number of Results per Page: 20 1 Results: **1** - **18** of 18

	Crossing#	State	Rr	Type	Position	Status	Milepost	County	City	Division	SubDivision	Branch	Street
☐	**085157R**	WA	BNSF	Public	At Grade	Open	0101.95	KING	AUBURN	NORTHWEST	STAMPEDE	ELNSBURG-AUBURN	M ST
☐	**085158X**	WA	BNSF	Public	At Grade	Open	0101.595	KING	AUBURN	NORTHWEST	STAMPEDE	ELNSBURG-AUBURN	AUBURN BLK DIAMON
☐	**085233G**	WA	BNSF	Public	At Grade	Open	0091.530	KING	AUBURN	NORTHWEST	STAMPEDE	ELNSBURG-AUBURN	216TH AVE SE
☐	**085234N**	WA	BNSF	Public	At Grade	Open	0094.710	KING	AUBURN	NORTHWEST	STAMPEDE	ELNSBURG-AUBURN	COVINGTON WY SE
☐	**085647H**	WA	BNSF	Public	At Grade	Open	0019.160	KING	AUBURN	NORTHWEST	SEATTLE	SEATTLE-VANC WA	37TH STREET NW
☐	**085650R**	WA	BNSF	Public	At Grade	Open	0019.653	KING	AUBURN	NORTHWEST	SEATTLE	SEATTLE-VANC WA	29TH ST NW
☐	**085652E**	WA	BNSF	Public	At Grade	Open	0021.262	KING	AUBURN	NORTHWEST	SEATTLE	SEATTLE-VANC WA	3RD STREET NW
☐	**085655A**	WA	BNSF	Public	At Grade	Open	0021.439	KING	AUBURN	NORTHWEST	SEATTLE	SEATTLE-VANC WA	WEST MAIN ST
☐	**085661D**	WA	BNSF	Public	At Grade	Open	0022.297	KING	AUBURN	NORTHWEST	AUBURN YD, WA	GSA TRACKS	C ST SW GSA TRK
☐	**396586D**	WA	UP	Public	At Grade	Open	0164.460	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	44th Street Northwest
☐	**396587K**	WA	UP	Public	At Grade	Open	0164.030	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	37th Street Northwest
☐	**396588S**	WA	UP	Public	At Grade	Open	0163.540	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	29th Street Northwest
☐	**396591A**	WA	UP	Public	At Grade	Open	0161.770	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	West Main Street
☐	**396593N**	WA	UP	Public	At Grade	Open	0160.970	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	15th Street Southwest
☐	**872207N**	WA	UP	Public	At Grade	Open	0162.140	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	6th Street Northwest
☐	**906458G**	WA	UP	Public	At Grade	Open	0161.990	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	H Street Northwest
☐	**922992C**	WA	UP	Public	At Grade	Open	0160.960	KING	AUBURN	Pacific Northwest	Seattle Sub	#N\A	15th Street SW
☐	**945561A**	WA	BNSF	Public	At Grade	Open	0020.982	KING	AUBURN	NORTHWEST	SEATTLE	SEATTLE-VANC WA	A ST

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Customer Notice
For the latest information, resources, and guidance
our COVID-19 information page or visit our COVID-1

APPENDIX C

UTC
Washington Utilities and Transportation Commission

Site Search Companies Search Dockets Search

WA Rail Crash Stats

2011-2021

These statistics are for crashes that occurred at highway-rail grade crossings and along railroad rights-of-way. Data is subject to change based on ongoing investigations.

Year	Crossing Collisions	Crossing Injuries	Crossing Fatalities	Trespass Fatalities
2021	40	11	4	28
2020	45	7	5	20
2019	41	9	8	15
2018	39	11	7	17
2017	47	5	13	21

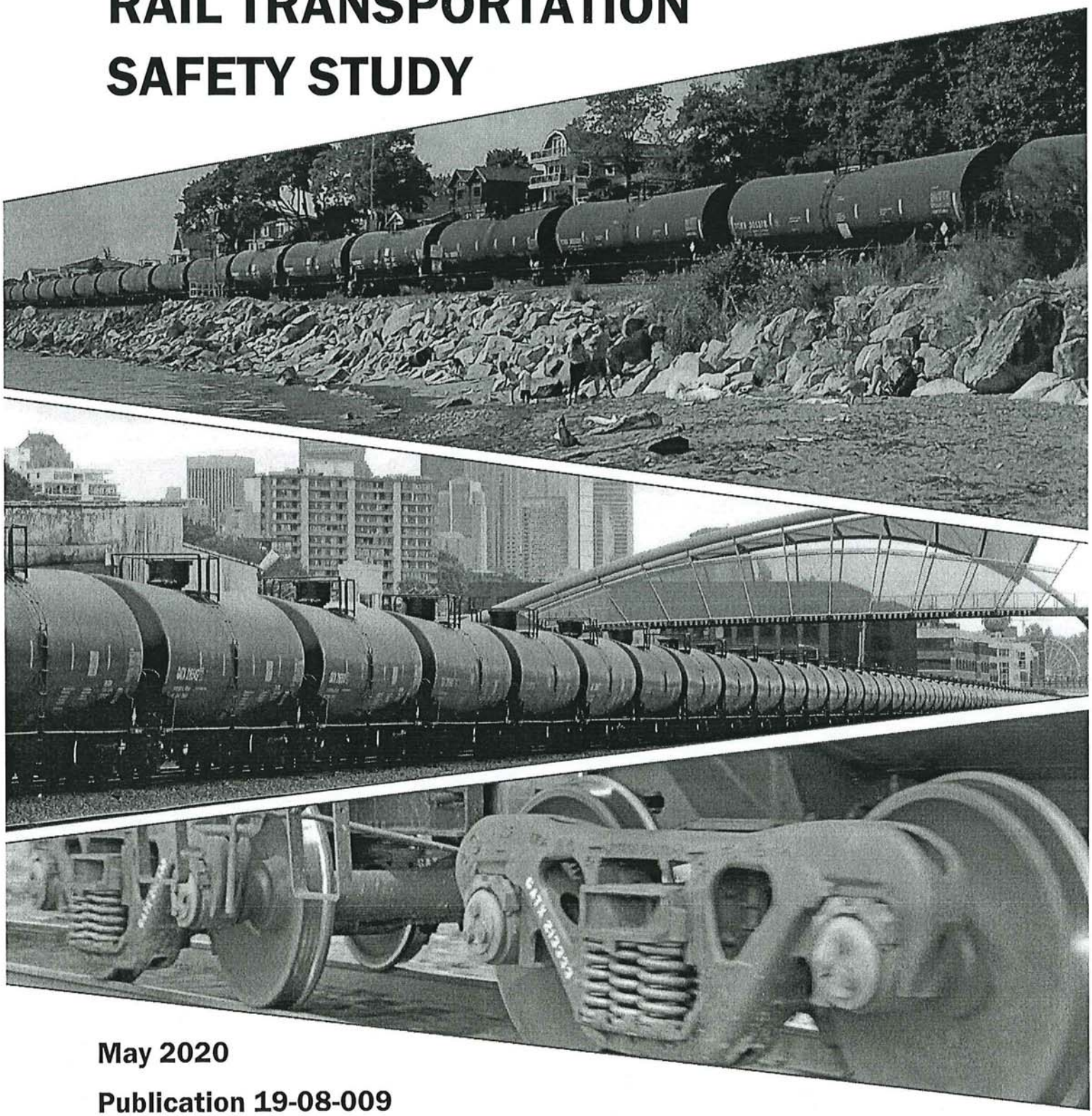
Year	Crossing Collisions	Crossing Injuries	Crossing Fatalities	Trespass Fatalities
2016	40	13	7	8
2015	37	7	5	23
2014	35	10	5	9
2013	20	10	4	17
2012	33	18	2	10
2011	29	4	8	22

Notes: Crossing Collisions include property damage incidents. As of 2016 forward, Link Light Rail fatalities are included and counted within the Trespass Fatalities.

DEPARTMENT OF ECOLOGY
State of Washington

APPENDIX D

2020 WASHINGTON RAIL TRANSPORTATION SAFETY STUDY



May 2020

Publication 19-08-009

Publication and Contact Information

This document is available on the Department of Ecology's website at:
https://apps.ecology.wa.gov/publications/summarypages/1908009.html

For more information contact:

Dan Ferguson, Lead Facility Unit Engineer
Spill Prevention, Preparedness, and Response Program
P.O. Box 47600
Olympia, WA 98504-7600
Phone: 360-407-7455

Washington State Department of Ecology — https://ecology.wa.gov

Headquarters, Olympia	360-407-6000
Northwest Regional Office, Bellevue	425-649-7000
Southwest Regional Office, Olympia	360-407-6300
Central Regional Office, Union Gap	509-575-2490
Eastern Regional Office, Spokane	509-329-3400

In the case of the Amtrak accident that occurred in Dupont, Washington, in December 2017, resulting in three fatalities, the National Transportation Safety Board (NTSB) concluded that PTC would likely have prevented this accident (NTSB, 2018a).

Accident severity reduction including amount spilled

There are a number of specific measures that can reduce the severity of accidents. For example, as with vehicular traffic, speed reductions in trains can reduce the severity of an accident by reducing the force of the impact and thereby reducing the numbers of cars that derail.

Newer designs of tank cars reduce the likelihood of damage to the cars in the event of derailments and collisions. This reduces the chance there will be a release (flowing out or spilling) of a hazardous material, or reduces the amount of material that is released or spilled. Tank cars are currently in use in Washington State are all DOT-117 cars, which are estimated to be half as likely to break open or rupture and allow the release of oil or other hazardous substances contained in the cars as the older DOT-111 cars. Some studies indicate there may be as much as an 84 percent reduction in the likelihood of a release, spill, or outflow of oil or other hazardous material in the event of a rail accident. The older cars had about 27 percent (about 1 in 4) chance of breaking open in the event of an accident. The newer cars have about a 4 percent (1 in 25) chance of rupturing or breaking open (Barkan, 2008a; Barkan et al., 2013; Barkan et al., 2015; Treichel, 2014; Treichel, 2018; Treichel et al., 2006).[8]

Accident risk reduction through preparedness and response

Once an accident has occurred, it will be the actions of emergency responders that will reduce the severity of the consequences of the accident to the extent possible. Human health and safety and the environment will be better protected if there is a well-trained, knowledgeable, and well-equipped first-response team that arrives on scene to rescue and tend to injured people, evacuate people in the vicinity of any released hazardous materials, and supervise and monitor the situation. For spill responses, a well-trained, knowledgeable, and well-equipped response team can help to reduce the spread of the released substance in some cases, or conduct cleanup operations.

In Washington State, common objectives for oil spill incidents are:

- Ensure the safety of citizens and response personnel.
- Control the source of the spill.
- Protect environmentally and culturally sensitive areas.
- Manage response effort in a coordinated manner.
- Contain and recover spilled material.
- Recover and rehabilitate affected wildlife.
- Clean up oil from affected areas.
- Keep the public and stakeholders informed of response activities.
- Minimize economic impacts.

[8] There is a more detailed discussion of tank car safety in Chapter 15 of this report.

- Terminate the response (demobilize at the end).

Timeliness of emergency response is critical in reducing the impacts of an accident. The speed of the response will depend on the location of the incident in relation to emergency response equipment and personnel and access to the site. In some of the more remote parts of Washington State, this presents a challenge.

Geographic factors for Washington rail transportation risk

The risk from rail accidents in the various geographic areas of Washington depends on:

- The likelihood of accidents, which depends on both the rail traffic in the area and the conditions that might increase accidents, such as track geometry, grades, curves, flood zones, landslide-prone slopes, and other track features.
- The number of highway-rail grade crossings and both the rail and vehicular traffic going through those crossings.
- The types of commodities that are being transported through different geographic areas.
- The environmental sensitivity of the area to spills of different types of oils and other hazardous materials.
- The proximity of rails to high-consequence areas, particularly densely-populated areas.
- The accessibility and remoteness of the sites for emergency response operations.

Geographic risk issues are considered in greater detail in Chapter 23.

Potential issues for consideration by the Rail Safety Committee

Many of the safety measures that may prevent or reduce the frequency of rail accidents are under the jurisdiction of the federal government rather than Washington State. However, state officials and members of the Rail Safety Committee can play a vital role in influencing decision-making at the federal level. There are still many issues that can be approached at the state and local levels by the Rail Safety Committee, such as the development of voluntary safety measures or standards, and promoting safety at highway-rail crossings. The committee would foster communication and cooperative approaches to promote safe practices on Washington railroads.

Issues that the Rail Safety Committee may wish to consider are summarized in Chapter 25.

16. Continue monitoring intelligence and analyzing threats or suspicious activities involving railroad infrastructure or assets. Continued threat monitoring is a vital action for the Commonwealth. Through this monitoring, state and local law enforcement, in conjunction with the railroads, may provide early warning of any criminal activity and other threats to railroad infrastructure or trains.
17. Consider railroad safety and security in the overall Port of Virginia risk assessment. The Hampton Roads Area Maritime Security Executive Committee (AMSEC), co-chaired by the USCG and Federal Bureau of Investigation (FBI), is currently working on a comprehensive revision to the overall risk assessment for the entire Port of Virginia, including the Yorktown terminal facility that receives crude oil for transfer to barges and further maritime transport to refineries along the East Coast. Multiple local, state, and federal agencies, including the Office of the Secretary of Public Safety and Homeland Security, are represented on the AMSEC and its risk assessment working group.
18. Continue existing regional/collaborative planning efforts. The Federal Clean Water Act, and subsequent Oil Pollution Act of 1990, established a requirement for the existence of regional response teams and, at the local level, inland and coastal area committees. These organizations serve as preparedness and response planning bodies whose membership is made up of federal, state, local, and Non-Governmental Organizations (NGOs) entities that have roles in all-hazards response planning. Virginia Department of Environmental Quality (VDEQ), Virginia Department of Emergency Management (VDEM), and other state agencies will continue working with planning partners in the framework of these existing contingency planning entities (EPA Regional Response Team III, the Coastal Virginia Area Committee, and the Upper Chesapeake Estuary Committee) to evaluate gaps associated with threats posed by shipments of bulk flammable liquids.
19. Develop a Geographic Response Plan (GRP) for above the tidal James (i.e., up the James River from the fall line in Richmond). GRPs provide responders with tactical guidance including maps, descriptions of at-risk sensitive areas, key resources, booming and equipment deployment strategies to protect those areas/resources, and environmental protection priorities for various spill scenarios. Virginia's Coastal Area Contingency Plan contains GRPs for Virginia's tidal waters including the James River up to Richmond; however, no formal GRPs exist above the tidal James except as issues are addressed through local emergency operations plans (EOPs). The Task Force proposes a collaborative local, state, federal, and NGO effort to identify at-risk sensitive areas and key resources for the current CBR route; and to develop integrated GRPs/EOPs for this corridor.

Response

20. Develop/improve air and water plume modeling capabilities for response/recovery activities. Plume models are an important tool for predicting the fate and transport of airborne vapors and combustion products, and waterborne transport of materials following a spill or release of

flammable liquids. While some modeling capability does exist within the Commonwealth, the predictive quality and efficacy of such models should be evaluated by the relevant Task Force agencies and improvements made as needed.

21. Maintain capability to assess impacts on public health and drinking water systems. Virginia Department of Health (VDH), with support from its federal partners and their deployable experts, has the capacity to determine the potential health impacts of hazardous materials spills on the public at-large, and on drinking water systems. The Task Force recommends that VDH maintain these capabilities at the highest level.
22. Provide improvements/upgrades to regional HAZMAT Teams. The Task Force recommends that VDEM continue supporting the regional contract HAZMAT response teams, identify a mechanism to increase funding to the localities providing staff for these teams, and increase the number of VDEM regional hazardous materials officers in areas with substantial volumes of bulk flammable liquids and other hazardous materials.
23. Coordinate behavioral health response. VDH has legal authority over behavioral health response at the state level. The Task Force recommends that VDH ensure that incidents arising from the bulk transport of flammable liquid by rail are included in their behavioral health response plans.

Information Sharing

24. Information sharing regarding transport and derailment. The Task Force believes the bulk transport of flammable liquids by rail deserves greater transparency and communication. The Task Force recommends that stakeholders explore better mechanisms to share information, while still honoring the legitimate security and competitive advantage concerns associated with rail transport. Similarly, there is a need to pass information regarding derailments of all types in a more timely and accurate manner.
25. Develop a standard reporting template. The USDOT Emergency Order of May 7, 2014, does not specify a reporting template for CBR shipments or derailments. The Task Force supports the development of a standardized reporting template for use nationwide.
26. Develop a national comment forum. The Task Force notes that there is no current vehicle for the easy exchange of information on bulk transport of flammable liquids by rail between states. The Task Force supports the development of such a vehicle at the federal level.
27. Notify stakeholders of all updates and safety issues received. The operational environment around the bulk transport of flammable liquids by rail is dynamic and involves many groups and areas of concern. The Task Force recommends that a process be established where relevant technical, safety, and incident information updates can be distributed to all affected parties, with the appropriate safeguards against unauthorized use.
28. Formalize and strengthen information sharing agreements at all levels of government and with the private sector. The issue of rail safety and security cuts across all levels of government, the private sector, and the citizenry at

Table 121: Hazard Distances for Evacuation and Safety Zones (One-Car Release)[378]

Hazardous Material	Dispersion Hazard	Fire Hazard	Explosion Hazard	Toxic Exposure Hazard
Ammonia	28 ft	7 ft	n/a	2.1 miles
Sulfuric Acid	n/a	n/a	n/a	23 ft
Bakken Crude	227 ft	n/a	441 ft	n/a
DilBit	80 ft	168 ft	173 ft	n/a
Ethanol	33 ft	350 ft	44 ft	n/a
Propane	86 ft	26 ft	569 ft	n/a

The most likely release scenario involves a single car. However, it is possible that a rail accident will involve a larger number of cars, potentially causing releases from multiple cars. This is particularly true for unit trains and key trains with 20–120 tank cars of Class 3 flammables and other liquid hazardous commodities. Hazard distances for 10-car releases[379] are shown in Table 122. Note that the hazard distances are in all directions.

Table 122: Hazard Distances for Evacuation and Safety Zones (Ten-Car Release)[380]

Hazardous Material	Dispersion Hazard	Fire Hazard	Explosion Hazard	Toxic Exposure Hazard
Ammonia	62 ft	23 ft	n/a	9.5 miles
Sulfuric Acid	n/a	n/a	n/a	46 ft
Bakken Crude	643 ft	n/a	1,342 ft	n/a
DilBit	174 ft	485 ft	620 ft	n/a
Ethanol	56 ft	987 ft	69 ft	n/a
Propane	932 ft	92 ft	790 ft	n/a

Plume modeling

The New York State Emergency Response Commission conducted a workshop on the modeling of Bakken crude plumes in December 2014. This had been one of the recommendations from the first report (NYSERC 2015). The major finding was that New York State's toxic plume modeling capabilities are limited. A large-scale emergency exhausts resources at the municipal and county levels of government and warrants support from the state to effectively respond to the event.

The NYSERC report stated:

> Plume modeling provides the capability to predict the geographic extent, or hazard area affected by an incident, in this scenario due to an accident/explosion involving a rail car carrying crude oil. This analysis then informs first responders

[378] Analyses conducted by Risknology, Inc.
[379] The 10-car release is consistent with the PHMSA Fast Act ruling issued on 28 February 2019, which stipulates contingency planning requirements for worst-case discharges of 300,000 gallons (roughly the capacity of 10 714-bbl tank cars).
[380] Analyses conducted by Risknology, Inc.

> and public officials on areas that may need to be evacuated due to health and safety issues....
>
> Emergency air plume modeling poses a variety of challenges, particularly with regard to interpreting model results given the uncertain nature of what is released during an emergency, and the capability to conduct modeling given the overall mission or focus of an agency, and the resources that it employs. (pp. 1-2)

The workshop participants concluded that 90 percent of the local hazardous materials teams along the Bakken crude virtual pipeline possess a rudimentary plume modeling capability to support the initial phase of an incident. None of the currently available modeling software has Bakken crude as a specific source term (or input) into that model. Other products that have similar physical and/or chemical properties such as paraffin hydrocarbons (n-hexane) can be used to make a determination of a plume associated with a spill or release (not combustion), but will come with a degree of uncertainty as to the exact contents of that plume.

The workshop participants also concluded that a good knowledge of potential human exposure and chemical toxicity is important to make decisions about health effects. Toxicity of the various surrogates (hexane, n-heptane, generic particles) used to model the plume during the workshop will not be the same as toxicity of the Bakken crude, and therefore model outputs using surrogates cannot be solely used as the basis for health decisions. Additionally, some emergency response models compare estimates of dose to emergency planning guidelines, such as Acute Exposure Guidelines (AEGLs) or Temporary Emergency Exposure Limits (TEELs). These guidelines are derived assuming exposure to a single chemical (not mixtures) and are associated with serious health effects. These kinds of values should only be used when more appropriate values are not available and if used, AEGL-1 or TEEL-1 values should be used for determining protective actions since these are levels that are not associated with death, impaired abilities, or irreversible effects.

As stated in the NYSERC report:

> There are several models that are available to the State to conduct plume modeling. These models vary in capability and applicability including some that are in use by local response agencies, and some that are only available to the State or Federal agencies. The following is a brief overview of modeling software...

HPAC V5.0 (Hazard Prediction and Assessment Capability)

> HPAC predicts hazards and provides exposure information for populations in the vicinity of accidents involving releases from nuclear and chemical facilities, and facilities/transportation containers. HPAC models atmospheric dispersion of vapors, particles, or liquid droplets from multiple sources using pre-defined (not site-specific) release rates, and using meteorological input that may range from wind speed and direction at only a single measurement location to 4-dimensional gridded wind and temperature fields.

WISER (Wireless Information System for Emergency Responders)

WISER[381] is a system designed to assist emergency responders in hazardous material incidents. WISER provides a wide range of information on hazardous substances, including substance identification support, physical characteristics, health information (e.g., Material Safety Data Sheets and Emergency Response Guidelines), and containment and suppression advice. WISER is an emergency "look-up" resource and not a dispersion model.

CAMEO/ALOHA/MARPLOT (NOAA)

The CAMEO (Computer Aided Management of Emergency Operations) suite of software contains several separate integrated software applications, including ALOHA and MARPLOT. ALOHA is the air hazard modeling program. MARLPOT is a mapping program. Both programs were developed jointly by NOAA and the Environmental Protection Agency (EPA). The programs can provide users with initial guidance on protective action decisions for chemical releases, and can model plumes to give users predictions of what level of contamination may exist. Data extrapolated from the model can then be used to make decisions regarding dose/exposure and any follow-on protective actions.

HYSPLIT (Hybrid Single Particle Lagrangian Trajectory Model)

The HYSPLIT model is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. The program includes the integration of ALOHA, and advanced advection algorithms, updated stability and dispersion equations, and the option to include modules for chemical transformations. Without the additional dispersion modules, HYSPLIT computes the advection of a single pollutant particle, or simply its trajectory. Some of the applications include tracking and forecasting the release of radioactive material, volcanic ash, wildfire smoke, and pollutants (such as mercury) from various stationary emission sources.

CAL3QHC, CAL3QHCR, and AERMOD

The CAL3QHC and CAL3QHCR are steady-state Gaussian based dispersion models, and the AERMOD is a dispersion model capable of providing hourly pollutant concentrations due to various sources (point, areas, volume). These models are used for regulatory compliance purposes to demonstrate compliance with National Ambient Air Quality Standards (NAAQS) of criteria pollutants, and are not suitable for plume modeling for emergency applications.

[381] WISER is a mobile app. https://wiser.nlm.nih.gov/

SAFER STAR

The SAFER STAR (SAFER) program is a tool designed by Center for Toxicology & Environmental Health LLC (CTEH) to help manage an emergency and to provide early warning to those who may risk exposure to a potentially harmful substance. CTEH claims that SAFER accurately models the effects of chemical accidents (toxic releases, fires, and explosions), and that the program includes state-of-the-science algorithms for addressing atmospheric dispersion, thermal radiation and blast overpressure modeling. In addition, SAFER provides mapping and topographical databases for the region of interest. Once the release is identified, SAFER rapidly assembles appropriate maps and topographical data". (pp. 7-8)

Plume modeling for Washington State

For Washington State, having modeling capability and training of personnel in the use of these models would be valuable for incorporation into training and table-top exercises to simulate a variety of hypothetical catastrophic events. A model may assist in determining areas of greatest concern for exposure, and to determine evacuation zones. The use of a plume model would require training for users. It would also be necessary to assure that there is access to appropriate input data on the chemical substances involved, as well as geographic and environmental data on local conditions.

In the event of a real spill emergency, however, it may take too much time to use the model to make any meaningful predictions and decisions.

The use of modeling for plumes of toxic substances is different than the use of trajectory models for oil spills, which can be used, especially in larger spills, to strategize the placement of protective booms and on-water recovery equipment. Many plumes from releases from a limited number of tank cars would be dissipated within minutes or hours. In an actual emergency, air monitoring would likely be a more valuable approach to determining concentrations of concern.

Regardless of the plume model chosen, in a real emergency situation the accuracy and availability of the data on the chemical composition of the released material combined with the thermodynamic conditions and the real-time weather conditions will have significant effects on the reliability of the model outputs. For releases in urban areas with high buildings and other obstructions, the reliability of the modeled plume outcome may be questionable.

Plume modeling with accurate input data would help determine more precisely the geographic areas for evacuation for simulated scenarios, and if conducted in advance, inform decision-making in an actual emergency.

Passenger train accident emergency response

Emergency response considerations extend to passenger train accidents, such as the December 2017 Amtrak accident in DuPont, Washington. Although these accidents might involve the spillage of diesel fuel from locomotives, the primary concern is for the rescue and medical care of trapped passengers, some of whom may be seriously injured or dead.

APPENDIX E

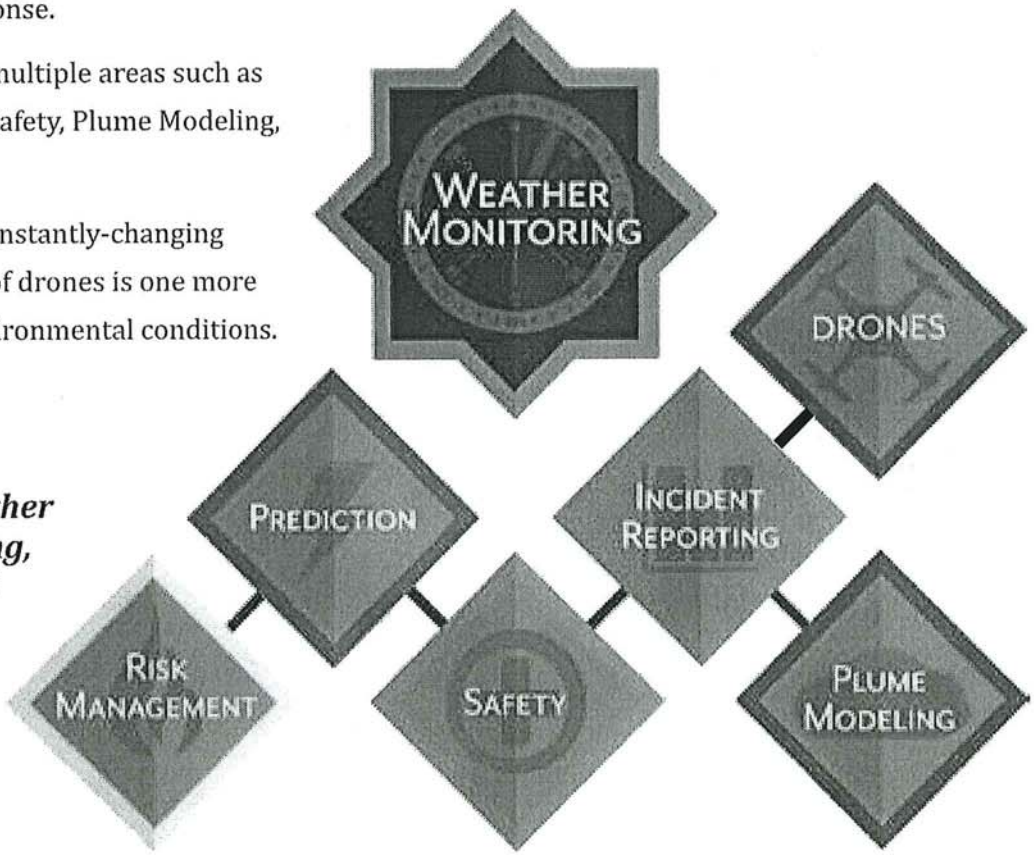
5 REASONS INCIDENT RES NEEDS A WEATHER STATION

Professional Weather Monitoring for Incident Response

With severe wildfires last summer and storms this winter, we see that weather conditions directly impact response risk and fire behavior. The ability to access real-time, location-specific met data is imperative for safe and effective incident response.

Weather monitoring assists in multiple areas such as Risk Management, Prediction, Safety, Plume Modeling, and Reporting.

Additionally, to keep up with constantly-changing technology, the increasing use of drones is one more reason to keep informed of environmental conditions.



"Being aware of the weather conditions before, during, and after an incident is imperative."[1]

- Chuck Sallade,
Firefighter Nation

Columbia Weather Systems

RISK MANAGEMENT

Weather data is a key component of RISK MANAGEMENT and assessment from the planning/preparation stages, PPE and resource management, to decisions regarding public safety such as shelter-in-place or evacuate.

Utilize weather data in these phases:

1. Evaluate historic weather conditions for planning/preparation
2. Assess current response conditions (normal and/or severe weather for transport and approach
3. Monitor for changing meteorological conditions throughout an incident

"No PPE risk assessment would be complete without adequate consideration of a jurisdiction's prevailing climate and weather conditions."

-Battalion Chief
Henry Costo,
PA Fire Department

An example cited by Battalion Chief Henry Costo in Fire Rescue Magazine: "No PPE risk assessment would be complete without adequate consideration of a jurisdiction's prevailing climate and weather conditions, as well as the potential for extremes of temperature, humidity, wind, rain, storms, flooding, snow accumulations, ice, etc. Keep in mind that many jurisdictions experience significant weather variations even within their own boundaries—such as the beaches vs. inland areas of San Diego and Los Angeles counties."[2]

Weather stations from Columbia Weather Systems are a force multiplier – offering automated met data collection and archiving in addition to monitoring current conditions.

Whether from a fixed-base system at the Fire Station or Dispatch Center, a vehicle-mount weather station on the Incident Command Vehicle, or a portable weather station for HazMat, met data can be a key piece of the risk management puzzle.

PREDICTION

"The risk involved in fire suppression can be reduced if firefighters and fire managers pay attention and understand weather conditions that impact fire behavior,"[3] states the Introduction to Wildland Fire Behavior, a training manual developed in conjunction with the National Interagency Fire Center. This principle applies to hazmat as well as urban and wildland-urban interface fire response.

Weather monitoring is a cornerstone for PREDICTING FIRE BEHAVIOR. Government agencies partner with the National Weather Service to provide forecasts with local offices including Fire Analysts and Meteorologists.

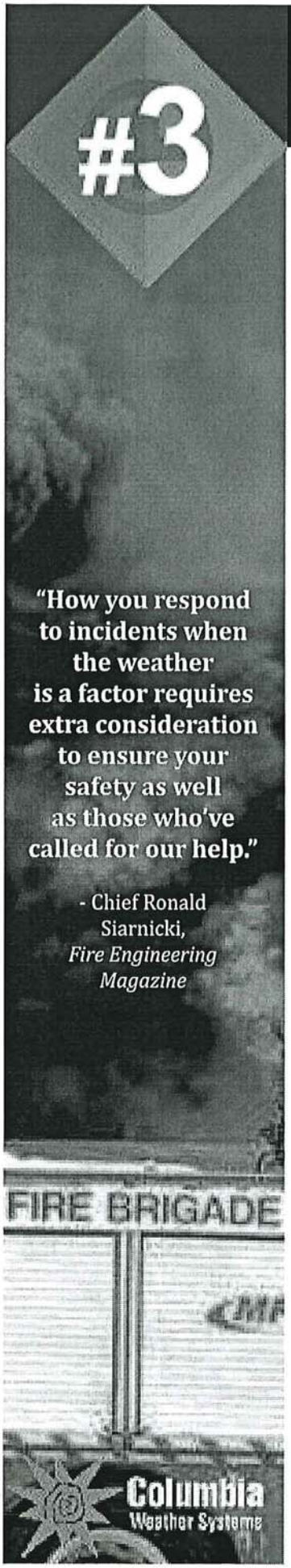
Additionally, on-site monitoring provides the edge in real-time decision-making. For example, a Fire Behavior Outlook concludes: "Be alert to the potential influence of thunderstorms on your fire – outflow winds, even miles from a storm, can dramatically increase fire behavior very quickly."[4]

Here are a few examples of how weather parameters affect fire behavior:[5]

- Above average **temperatures** are common on large fires. Many firefighter fatalities have occurred on fires where record high temperatures were set.
- Small changes in **relative humidity** that cannot be felt or seen can have a significant impact on fire behavior.
- **Wind** impacts the fire environment by 1) increasing the supply of oxygen to the fire, 2) determining the direction of fire spread, 3) increasing the drying of the fuels and 4) carrying sparks and firebrands ahead of the main fire causing new spot fires.

Starting with the forecast, local met data is combined with fuel conditions to determine the intensity and path of a fire, and the ideal location for fighting it.

Apparatus rigged with automated weather stations take meteorological monitoring to the incident, helping predict fire behavior in real time and in strategic locations.



SAFETY

Extreme summer heat, winter freeze, weather-related disasters. Professional weather monitoring improves the SAFETY of incident response with calculated parameters for perceived temperature and alarm notifications for extreme conditions and operational safety. "One of the most overlooked elements that affect firefighting operations and the health of firefighters themselves is the weather conditions we operate in," said Tom Warren, retired assistant chief, Providence RI, in a Fire Engineering article.[6] Besides having a direct impact on firefighter health, weather impacts the severity of fires, increasing risk and safety hazards.

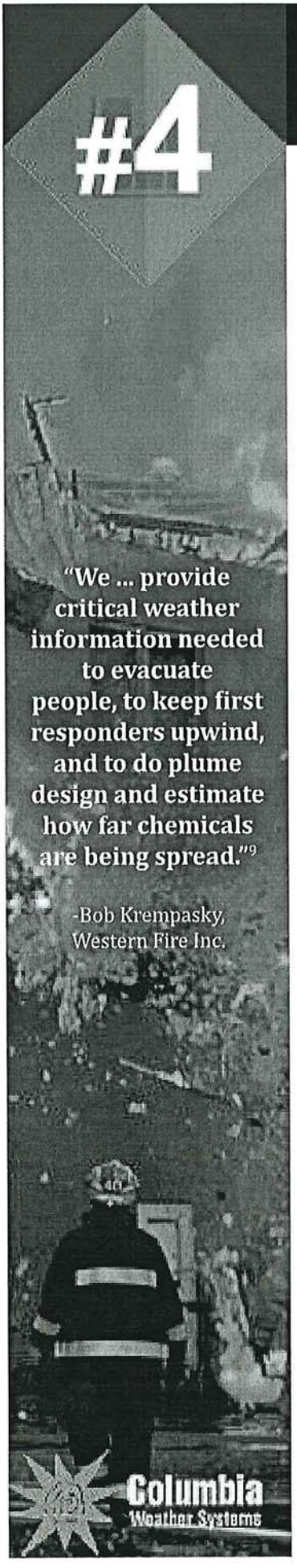
Summer months bring danger of heat-related disorders and fire due to dry fuel conditions. High heat and humidity can lead to heat exhaustion or heat stroke. The variability of wind can pose safety and fire control problems, which can result in fatalities.

In **winter,** on-scene operational considerations include the impact of cold temperatures and wind when operating from elevated positions such as aerial ladders or platforms. Ladders can freeze up, impacting their ability to extend or retract. Hand tools may be slippery and difficult to hold. Ice and slippery conditions may further impede operations.

> *"We also have to be attuned to what's happening as a result of snow, ice, freezing rain or wind ... Maintaining situational awareness is imperative." ~Chief Ronald Siarnicki*[7]

Extreme weather emergencies and weather-related disasters such as hurricanes bring inherent risks of their own. In such circumstances, the role of Safety Officer can include monitoring and evaluating weather conditions keeping in mind crew fatigue, hydration, and PPE; with authority to suspend operations if conditions present too high a risk for personnel.

Weather monitoring, especially for working conditions, is not just actual meteorological parameters, but also perceived, for example, wind chill in the winter and heat index in the summer. Professional weather monitoring equipment can calculate these **factors for more informed decision-making.** Accurate met data with on-site or vehicle-mounted weather stations can improve the safety of emergency responders and help mitigate hazards. Alarms can be set for risk conditions such as high wind speed, or extreme temperatures, automatically notifying appropriate personnel. Reliable weather data provides critical information for responders to be prepared and take appropriate action.



PLUME MODELING

Fire departments are frequently tasked with responding when hazardous chemicals are accidentally released into the environment, especially in an inhabited area. Many crucial decisions such as approach, staging, and potential evacuation, rely on accurate, up-to-the minute local weather data. One key tool is toxic PLUME MODELING which combines information about the chemical release with meteorological data overlaid on a map.

Weather conditions greatly impact toxic cloud movement. Up-to-date meteorological data is imperative for monitoring cloud movement to ensure responders and local inhabitants stay out of harm's way.

"Depending upon meteorology, the toxic cloud could be several miles long, but only a few blocks wide. Changing wind patterns could cause the plume to shift or meander in another direction." ~ John S. Nordin, Ph.D.[8]

Plume modeling software can often accept met data from Internet sources and or directly from a weather station. While weather data is generally available on the Internet, many Internet applications upload data hourly or at 15-minute intervals, and the nearest data point may be miles away. On-site weather stations upload data in a matter of seconds.

A weather station is standard gear for hazmat response teams. When the State of Oregon Fire Marshal established a state-wide Regional HazMat Emergency Response program, the teams were outfitted with weather stations from Columbia Weather Systems. In use for over 10 years, the systems recently underwent testing, upgrades and battery replacement. New hazmat vehicles include vehicle-mount weather stations with GPS.

On-site weather data can greatly increase the accuracy of plume modeling. Weather stations from Columbia Weather systems can automatically integrate with the plume modeling component of software such as MarPlot/CAMEO, Safer Systems, and PEAC by Aristatek. Additionally, vector wind measurements from WeatherMaster™ Software can be used to project an initial plume corridor before the modeling software can gather sufficient data.

#5 REPORTING

Accurate weather data leads to more accurate incident reporting, which can lead to better outcomes.

Successful management of emergency incidents increasingly depends on reliable on-scene data and communication technologies.

For incident command, planning and personnel accountability can include weather monitoring technology with seamless inclusion of met data in incident reporting for documentation and analysis.

Weather data is one piece that leads to a fuller and more detailed big picture. Weather data is a component of several NFIRS modules. Incident reports can include conditions during the incident such as wind and humidity, as well as weather conditions that contributed to the incident such as freezing temperatures. Analysis includes how weather conditions impacted the incident itself and response such as tactics and personnel – what was effective, what can improve, how to be prepared for next time.

With rapid deployment, on-scene portable or vehicle-mounted weather stations can quickly and automatically transmit met data and integrate seamlessly into reporting software such as Adashi, SAFER systems, and PEAC.

"Weather conditions played a role in this incident with frozen hydrants, wind affecting the fire conditions, and a slightly delayed response time due to road conditions."[10]

- Fire Investigation Report, National Institute for Occupational Safety & Health

DRONES (BONUS)

With their ability to improve situational awareness, DRONES are becoming increasingly valuable to incident response. Also known as Unmanned Aerial Vehicles (UAVs), drones are used for package delivery such as defibrillators, search and rescue, and communications.

During Hurricane Harvey's aftermath in 2017, drones were deployed to assess the extent of damage, presence of hazardous materials, and search for survivors. Last month, two teens stranded off the coast of Australia were rescued by a drone, which was able to launch a self-inflating raft into the water in under two minutes.

Fire Chief Jonathan McMahan of College Station, TX reported a recent incident: "Fast moving urban interface wildland fire in south College Station yesterday ... 10 exposed houses protected, and fire stopped close to an apartment complex. 2 fire department drones in the air providing immediate situational awareness to the incident command team."[11]

Weather conditions are a critical factor in drone operation. Access to current meteorological data can help prevent damage to the UAV and its surroundings. These are some important parameters to monitor for safe drone operation:

- Temperature: UAVs are designed to fly within certain temperature ranges. Extremes can cause damage, overheating, and shorter flight times due to battery drain.
- Wind Speed/Gusts: High wind speed and strong gusts cause difficulty in maneuvering and steady positioning.
- Precipitation, Humidity: UAVs do not function well in moisture.

As emergency response departments incorporate drone technology, access to current met data can be a key factor in the plan of action.

Response vehicles utilizing weather stations take **automatic meteorological monitoring** to the incident, creating crucial situational awareness for incident command and helping to **achieve success** in drone-incorporated missions.

CONCLUSION

Extreme weather, hazmat, wildland, whatever the situation, weather stations can provide meteorological information on-scene and up-to-the-minute to help you make the right decisions.

One final quote: "As fire service leaders, it is essential that we assure our personnel have the right information, and that it goes to all the right people at exactly the right time so everyone is empowered to make the right decisions," says Todd J. LeDuc in a Fire Engineering article. He continues, "This goal becomes challenging given the wide breadth of available data ..."[13]

At Columbia Weather Systems, we recognize that met data is a small but critical segment of the data available to incident response. Weather monitoring systems can provide that information on-scene automatically and up-to-the-minute to help you make the right decisions.

Our job is to make weather monitoring easy so you can do your job better. Contact us to help you select the best weather station for your requirements. Visit ColumbiaWeather.com or call 503-629-0887 or toll free 888-508-7375.

Notes

[1]Sallade, Chuck. (2011, May). Weather Monitoring in the WUI. Retrieved from http://www.firerescuemagazine.com/articles/print/volume-6/issue-6/wildland/weather-monitoring-in-the-wui.html

[2]Costco, Henry. (April 2012). Elements of a PPE Risk Assessment. FireRescue1. Retrieved from http://www.firerescuemagazine.com/articles/print/volume-7/issue-4/firefighter-safety-and-health/elements-of-a-ppe-risk-assessment.html

[3] National Wildfire Coordination Group. (2006). Section 2C. Introduction to Wildland Fire Behavior: Online Course. Boise, ID. Retrieved from training.nwcg.org

[4]Nordin, John. Evacuate or Shelter in Place. Retrieved from https://aristatek.com/drjevacuation.aspx
NWCC Predictive Services Fire Behavior Outlook issued November 8, 2017

[5]Ibid.

[6] Warren, Tom. (2013, July). Firefighter Safety: Preparing for the Weather: Summer. Fire Engineering. Retrieved from http://www.fireengineering.com/articles/2013/07/preparing-for-the-weather-summer.html

[7]Siarnicki, Ronald. (2014, Jan.) Safety tips for winter weather response. FireRescue1. Retrieved from https://www.firerescue1.com/apparatus/articles/1658859-Safety-tips-for-winter-weather-response/
U.S. Fire Administration. (n.d.). Retrieved from https://www.usfa.fema.gov/data/nfirs/

[8] Nordin, John. Evacuate or Shelter in Place. Retrieved from https://aristatek.com/drjevacuation.aspx
NWCC Predictive Services Fire Behavior Outlook issued November 8, 2017

[9]Krempasky, Bob. (2011, June). Wildland Firefighting. Retrieved from https://columbiaweather.com/applications/wildland-firefighting/

[10]Career Lieutenant and Career Fire Fighter Die and Four Career Fire Fighters are Seriously Injured during Three Alarm Apartment Fire - New York. (2014, October 15). Retrieved from https://www.cdc.gov/niosh/fire/reports/face200503.html

[11]McMahan, Jonathan. (2018, January 23). Fast moving urban interface wildland fire in south College Station yesterday. [LinkedIn update]. Retrieved from https://www.linkedin.com/in/jonathan-mcmahan-8605197b/detail/recent-activity/shares

[12]Larson, J. (2016, October). Drones and the Fire Service. Retrieved from http://www.fireengineering.com/articles/print/volume-169/issue-10/features/drones-and-the-fire-service.html

[13]LeDuc, Todd. (2017, December). Big Data Driving Operational Performance and Fireground Safety. Fire Engineering. Retrieved from http://www.fireengineering.com/articles/2017/12/big-data-operational-fireground-safety.html

Additional References:

Avsec, Robert. (2018, February). Drones in the fire service: Expanding operational uses. *FireRescue1*. Retrieved from https://www.firerescue1.com/emergency-response-in-the-drone-age/articles/376101018-Drones-in-the-fire-service-Expanding-operational-uses/

Chitumalla, Pavan Kumar; Harris, Douglas; Thuraisingham, Bhavani; and Khan, Latifur. (2010, April). Emergency Response Applications: Dynamic Plume Modeling and Real-Time Routing. IEEE Internet Computing. Retrieved from https://www.utdallas.edu/~bxt043000/Publications/Journal-Papers/DS-DM/J81 Emergency_Response_Applications_Dynamic_Plume_Modeling_and_Real_time_Routing.pdf

FEMA. (2008, April) Special Report: Fire Department Preparedness for Extreme Weather Emergencies and Natural Disasters. Retrieved from https://www.usfa.fema.gov/downloads/pdf/publications/tr_162.pdf

Gerrish, John. (2006, Spring). HazMat Weather Part I: Mitigating the Unthinkable Retrieved from https://columbiaweather.com/anl_0406.html#hazmat

Gerrish, John. (2006, Autumn). HazMat Weather Part II: Weather Monitoring as a Force Multiplier. Retrieved from https://columbiaweather.com/anl_f06.html#hazmat2

Hutson, Matthew. (2017, Sep.) Hurricanes Show Why Drones are Future Disaster Relief. MACH. Retrieved from https://www.nbcnews.com/mach/science/hurricanes-show-why-drones-are-future-disaster-relief-ncna799961

Lee, Michael. (2009, Jan.) Impacts of Winter Weather. *Fire Rescue1*. Retrieved from https://www.firerescue1.com/fire-news/447195-impacts-of-winter-weather-part-2/

McSweeney, Kelley. (2017, Sep.) Drones Help With Hurricane Recovery Efforts. ZDNet. Retrieved from http://www.zdnetcom/article/drones-help-with-hurricane-recovery-efforts/

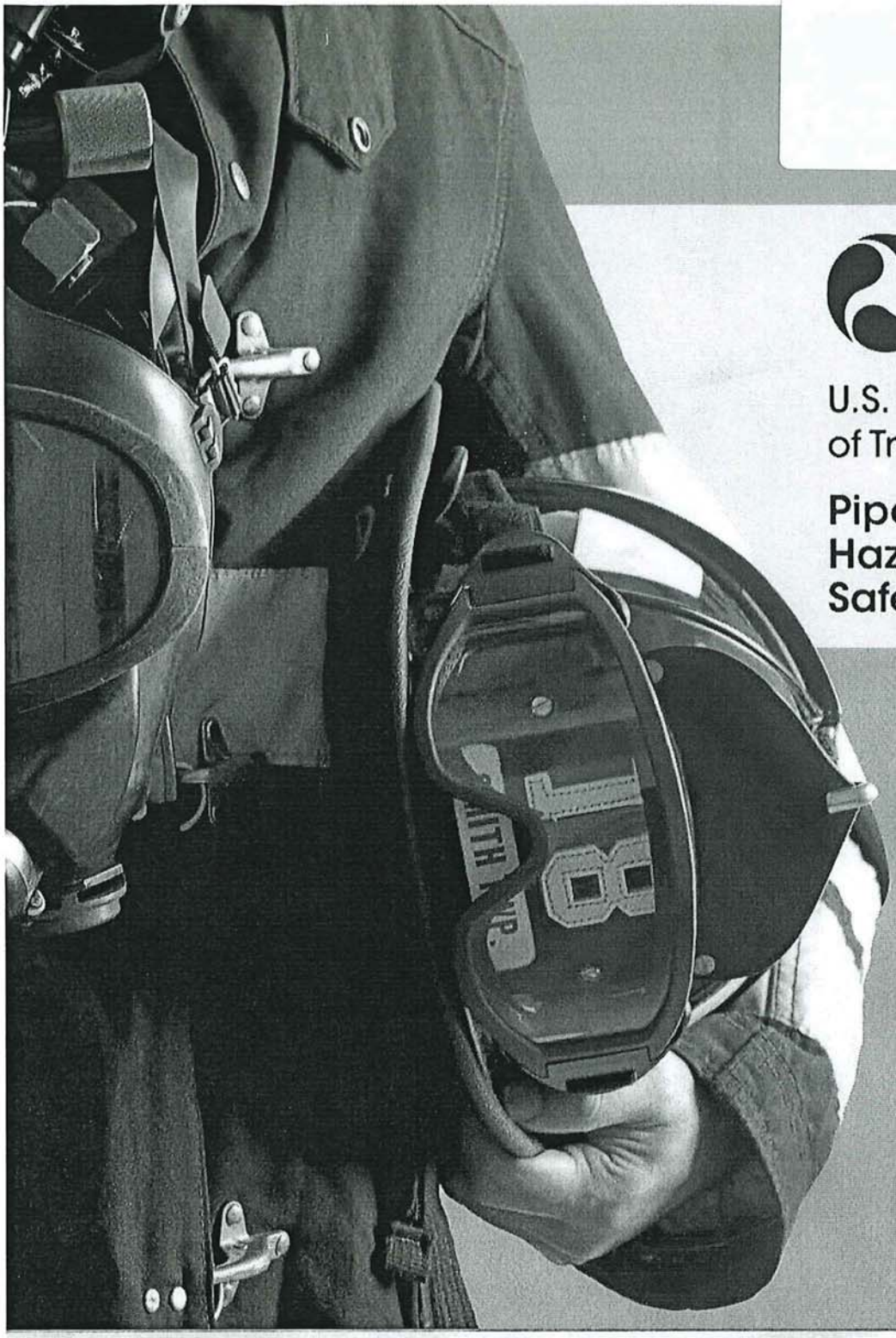
National Wildfire Coordination Group. (2006). Section 2C.15. Introduction to Wildland Fire Behavior: Online Course. Boise, ID. Retrieved from https://training.nwcg.gov/pre-courses/s290/S-290%20Student%20CD/S-190_Student%20Workbook.pdf

NVDrones. (2016, June). 5 Ways Weather Affects Your Drone's Performance. Retrieved from https://blog.nvdrones.com/5-ways-weather-affects-your-drones-performance-de86141bd132

Petrillo, Alan (2016, September) New Hazmat Rigs Part of 10-Truck Order in Oregon. *Fire Apparatus and Emergency Equipment*. Retrieved from http://www.fireapparatusmagazine.com/articles/print/volume-21/issue-9/departments/special-delivery/new-hazmat-rigs-part-of-10-truck-order-in-oregon.html

Spell, Jim (2018, Jan). Why you should approach every call as a hazmat incident. *FireRescue1*. Retrieved from https://www.firerescue1.com/fire-products/hazmat-equipment/articles/371209018-Why-you-should-approach-every-call-as-a-hazmat-incident/

APPENDIX F



U.S. Department
of Transportation

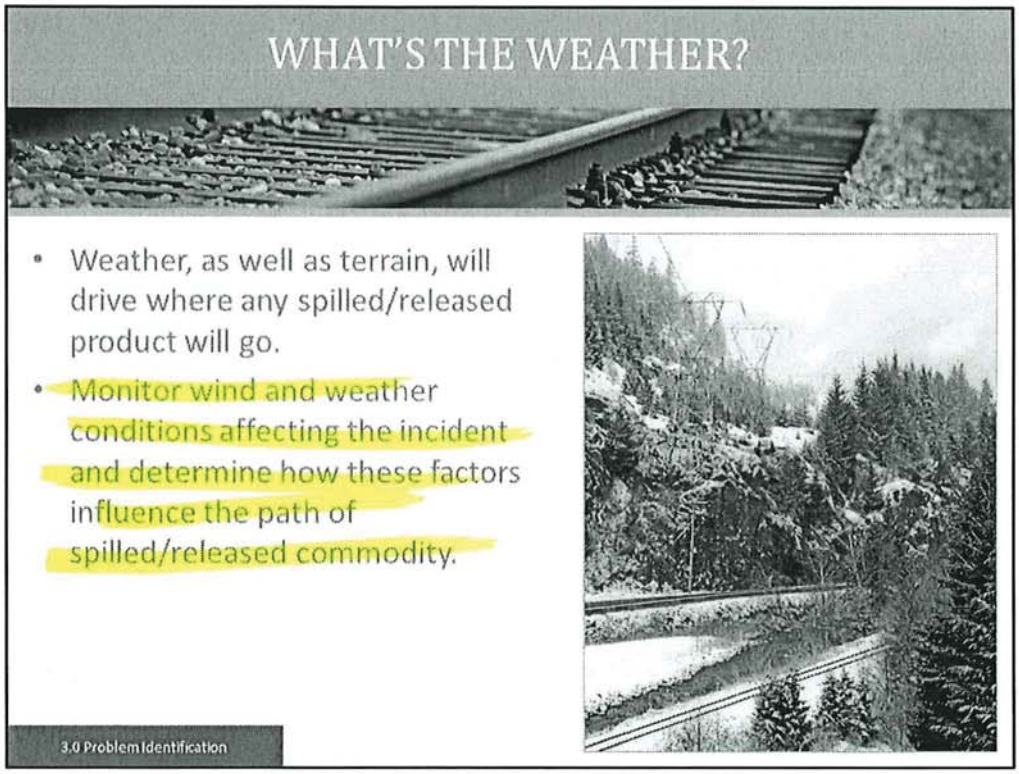
**Pipeline and
Hazardous Materials
Safety Administration**

TRANSPORTATION RAIL INCIDENT PREPAREDNESS & RESPONSE:

HIGH HAZARD FLAMMABLE TRAINS

INSTRUCTOR LESSON PLAN

(VERSION 2.0, FINAL, AUGUST 1, 2018)



INSTRUCTOR NOTES:

- Weather, as well as terrain, will drive where any spilled/released product will go.
- Monitor wind and weather conditions affecting the incident and determine how these factors influence the path of spilled/released commodity.
  - ✓ Portable/tactical weather station (temperature, wind direction & velocity)
  - ✓ Smartphone apps (*Weather Underground*, National Weather Service (NWS), etc.)
  - ✓ Have the NWS number in your Emergency Response Plan
  - ✓ You need to know where any smoke, vapors, and spilled/released products are headed
  - ✓ Local weather conditions may vary from where the local weather report is provided

EPA and USCG FOSCs can arrange for sophisticated dispersion modeling plume information through the Defense Threat Reduction Agency (DTRA). These models can provide quickly and can be updated as weather conditions change and are integrated into a GIS viewer with population and sensitive receptor data. The National Oceanic and Atmospheric Administration (NOAA) on behalf of USCG can provide plume dispersion modeling for air inquiries and oil trajectory modeling for spills which occur along a navigable water or riverbed.

- Risks refer to the probability of suffering harm or loss and are different at each incident and need to be evaluated by the Incident Commander.

- Emergency responders can use a number of reference materials such as the ERG, Safety Data Sheets (SDSs), technical specialists available by contacting the shipper or railroad, or contacting the Chemical Transportation Emergency Center (CHEMTREC) at 1-800-424-9300, or the 24-hour emergency contact telephone number required to be included on the shipping papers by the federal hazardous materials regulations.

- Evaluate the risks of personnel intervening directly in the incident. Consider the limitations of the people involved and the ability to have adequate resources available on site (e.g., sufficient firefighting foam concentrate, water supplies, appliances, equipment, trained personnel and technical expertise) and the ability to sustain operations for extended periods of time (hours or days).

- The level of risk will be influenced by the following factors:

    - Hazardous nature of the material(s) involved
    - Quantity of the material(s) involved
    - Type(s) of stress applied to the container and breach / release scenarios
    - Proximity of exposures and nature of terrain
    - Level of available resources (*e.g., adequate water and foam supplies, location of foam supply, response time and appliances/equipment*)

- Emergency response personnel need to consider the following factors that may influence the behavior of a hazardous material:

    - Inherent properties and quantity of the material
    - Design characteristics of the container
    - Environmental factors (*e.g., weather, topography, surrounding physical structures*)

- The following factors should be considered to help estimate the potential impact of the problem:

    - Has the container been breached? If so, is product flowing?
    - Where will the container and its contents go if released?
    - Why are the container and its contents likely to go there?
    - How will the container and its contents get there?
    - When will the container and its contents get there?
    - What harm will the container and its contents cause when they get there?
    - How much material has been released? What is the proximity of the release to people, property and the environment?
    - Is the material on fire? Are other tank cars at risk of becoming involved?
    - Do you have the capability of successfully controlling fire spread, which in some cases may require a minimum of approximately 500 gallons per minute per exposed tank car?

APPENDIX G

Columbia Weather Systems, Inc.
5285 N.E. Elam Young Parkway, Suite C100
Hillsboro, Oregon 97124
Phone: (503) 629-0887
Fax: (503) 629-0898
www.columbiaweather.com
sales@columbiaweather.com

Quotation

To: South King Fire & Rescue
31617 1st Ave South
Federal Way, WA 98003
USA
Phone: 253-632-4246 Fax:
Attention: Mike Lawson

Quote Date: June 13, 2022
Quote Number: 23216 **Rev:** 0
Customer Number: 22757

We are pleased to quote on the following:

Qty	Part Number	Description	Price	Extension
1	9931-500-A-3	Magellan MX500 Vehicle-Mount Weather Station with optional Tripod	$4,005.00	$4,005.00
		Standard System Includes: GMX500 Transmitter Sensors include: Ultrasonic Wind Direction Sensor Ultrasonic Wind Speed Sensor Temperature Relative Humidity Barometric Pressure Built-in Electronics Compass Built-in GPS 50-ft sensor cable Interface Module with dual communication ports RS-232 Communication Cable and Power Supply Mounting Adapter Comprehensive user manual Vehicle-Mount Mast, 9-ft telescoping, detachable spring-loaded latch-pin mechanism, anodized aluminum Mounting brackets, vehicle side for telescoping mast or Free standing Tripod Vehicle Mount Bulkhead with Wiring Harness Assembly, 50foot external and 50 foot internal sensor cables, Weatherproof Cap Cover		
1	9530-KIT4	Accessory Kit for Portable Weather Station - No Tripod	$2,749.50	$2,749.50
		Orion Nomad Portable Weather Station Accessory Kit Standard Kit Includes: Two 2.4 GHz wireless transceivers - 1 mile range Two 12V, 7.0 AH, Sealed Gel Batteries and charger system Heavy-Duty polyethylene transportation case housing wireless transceiver, batteries, wiring harness, and quick-connect plug-in jack(s) - foam lined with external wheels and extending handle - Black		

Qty	Part Number	Description	Price	Extension
1	8290	WeatherMaster Software for Windows® operating system	$394.20	$394.20
		Graphical weather monitoring software for Windows operating system; displays, reports, and records current weather conditions. Readings datalogged in an SQL database for future analysis and inclusion with other Windows-based programs. Additional calculates parameters such as Heat Index, Wind Chill, Wet Bulb, and Dew Point. Internet capable, alarm notification, and multi-station communication features. Includes Cameo/Aloha Interface and North-orientation offset. Includes three computer licenses		
1	8252	USB to Serial Adapter, DB-9 male	$113.40	$113.40
		To provide a serial port for communication between the weather station and software		

	Amount	**$7,262.10**
Sub Total	**Sub Total**	**$7,262.10**
Shipping	**Shipping**	**$115.00**
Total (US$)	**Total (US$)**	**$7,377.10**

Payment Terms: Net 30

Lead Time: 25 Business Days after receipt of order

Shipping Terms FOB Factory

This quote is valid for: 60 Days

Please contact me at 503-629-0887 if you have any questions.
Thank you for giving us the opportunity to provide this quotation.

Regards, Nader Khoury

Tax ID 91-1830459

Notes: Shipping charges are estimated and subject to change
Government Discount applied to all line items

PRICES COVERED IN THIS QUOTATION ARE SUBJECT TO CHANGE WITHOUT NOTICE UNLESS OTHERWISE INDICATED. ALL ORDERS ARE CONTINGENT UPON ACCEPTANCE BY THE SUPPLIER. DELIVERIES ARE SUBJECT TO DELAYS CAUSED BY STRIKES, FLOODS, FIRES, RIOTS, THE CONTINGENCIES OF TRANSPORTATION, UNAVOIDABLE ACCIDENTS, ACTS OF GOD, OR ANY OTHER CAUSES OF DELAY BEYOND THE CONTROL OF THE SUPPLIER. ANY TAXES IMPOSED BY ANY GOVERNMENT AUTHORITY ON THE SALE OF THIS ORDER AND NOT SHOWN ABOVE SHALL BE PAID BY THE BUYER. ALL FOB QUOTATIONS ARE SUBJECT TO PRESENT FREIGHT AND INSURANCE RATES. A CHARGE OF 1½ PERCENT PER MONTH (18 PERCENT PER ANNUM) WILL BE CHARGED ON ALL PAST DUE ACCOUNTS.

ORDER CANCELLATION FEE: 25% OF ORDER VALUE.
SYSTEMS ARE BUILT TO ORDER AND ONCE SHIPPED ARE NON RETURNABLE, NON REFUNDABLE.
ALL PRICES ARE IN US DOLLARS.

APPENDIX H

Lawson, Mike R.

From: Self, Kurt <KSelf@PugetSoundFire.org>
Sent: Wednesday, June 8, 2022 11:41 AM
To: Carson, Brian; Graziani, Jon; Brown, Ernie; BBigger@RentonRFA.org; Lawson, Mike R.; 'Jeff Hendrickx'; Chambers, Beau; Case, Brian; Rock, Rich; Hardman, Daniel; Self, Kurt; Richardson, Alex; Bonilla, Giovanni; Renn, Adam; Cox, Patrick
Cc: Reher, Tyler; Catlin, J. Monte; Jones, Jennifer; James, Garrett; Seery, Mike; Kuske, Tyler; Butler, Ryan; Scarduzio, Meade; Morrow, James; Vanderhalf, Jacob; Fox, Jason; Dean, Zachary; Schoonhoven, Brian; Hudson, Elias; Tonda, Robert; deMestre, Cameron; Merrell, Gary; Hayward, Andrew; Frazier, David; Phillips, Brandon; Kelley, Gregory; Rawson, Caleb; Maybee, Coleman; Frank, Andrew
Subject: BNSF Railway Drill
Attachments: Hazmat zone 3 BNSF Drill Summary.docx; Learning outside about railcars.jpg; Rail top learning.jpg; Decon.jpg; Classroom portion.jpg; Lifting strongback.jpg; Crew making entry.jpg; Crew getting ready to stop leak 2.jpg; Preincident saefty meeting.jpg; Crew on top of railcar.jpg; Crew getting ready to stop leak.jpg; Crew in MT94 working on tank.jpg; Drill safety briefing.jpg

Hey Guys,

Attached is the the zone hazmat drill summary for last weeks drill at the Auburn Railyard as well as some pictures.

Chief Cox and Graziani thank you for working so hard to get the rescue down there for a couple days. It really made the drill more realistic having an ops team arriving first to the scenario part of the drill. Hopefully your teams got something out of it that will help out if they every have a railway incident.

Brett, Mike and Jeff please forward the summary to your crews.

And once again as always I just wanted to say special thanks to you all and your crews for the

Thanks again.....Kurt

Kurt Self, ***76A Hazmat Station Captain***
Puget Sound Regional Fire Authority | Operations
20676 72nd Ave S
Kent, Wash 98032
Main Phone Number 253-856-4376
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Hazmat zone 3 BNSF Drill Summary

1.The drill

The Zone 3 hazmat drill that took place May 31st thru June 3rd was a 2-part drill. Drill took place at the Auburn BNSF rail yard located at 1399 A St SE, Auburn, Washington. With a total of 53 students from different agencies thru out zone 3 participating.

First part was a railroad safety and hazmat best practices on railcar emergencies taught by BNSF personnel (Kent Farquhar) as well has zone 3 hazmat personnel (Kurt Self). This was taught inside the classroom using a PowerPoint slide show as well as handouts and outside using a training railcar as a prop to show the different parts of railcars we might need to address during a railcar incident. Classroom and outside show time was approximately 90 minutes in length.

The second part of the drill was a scenario involving the training rail car that had both a victim as well as a chlorine leak on the railcar. Crews were tasked with a rescue/recon element in the first part for the first arriving teams and a plugging and patching element in a level A assembly involving all crews as the second part.

For a summary of the rescue/recon portion all 4 days all crews were able to identify a line-of-sight viable victim within minutes of the first arriving unit and crews were able to get said victim out of the hot zone into a safe cold zone with a gross decon with the fastest occurring within 3 minutes of arrival longest 7 minutes upon arrival. With these crews able to also identify that we had a chlorine leak as well and to start a zone 3 major hazmat leak response.

For the summary of second part of the drill involved crews stopping a chlorine leak onto of a railcar. Crews were tasked with identifying the hazards involving a chlorine leak, research the proper PPE, meters, and equipment to stop the leak. And then execute the plan to stop the leak with drill ending when the leak was stopped at the valve itself. With teams able to stop the leak anywhere from 45 minutes to 1 hour and 4 minutes.

2. Lessons learned and best practices

Some of the lessons learned and best practices that we identified in the 4 days are as follows.

A) First dispatched hazmat unit identify the hazmat play call early and announce over responding fire frequency. And if information makes unit feel response should be ungraded. Upgrade early to get a full zone hazmat response.
B) First arriving unit be prepared to affect rescue. This means full bunkers, SCBA and if a hazmat unit have meters running and bear claws ready to attach to personnel entering the hot zone to rescue victims. With one member of unit staying outside in cold zone as a safety person in full bunkers and SCBA.
C) Set up emergency decon with first arriving engine.
D) Isolate 360 with an ops team and 1 tech with a meter ASAP.
E) For large isolation zones consider shelter in place with people effected told to stay inside shut off HVAC and if gases and or fumes are heavier than air stay out of low areas in house and/or businesses. Use reverse 911 to call these folks and PD to shut down roads.
F) Enroute or as soon as we know the chemical, techs should be generating a plume model in FIRST or WISER and emailing to IC and HMGS. FIRST allows EM to import the maps into most reverse 911 programs.
G) First arriving ops officer take IC and first arriving hazmat officer take hazmat group.
H) If hazmat group have IC assign arriving hazmat teams directly to you and hazmat group will assign those units specific tasks. Using the preplanned hazmat handouts.
I) **Use the preplanned hazmat handouts!!!**
J) If the incident involves personnel climbing in or onto railcar or highway trailers use fire department ladders to gain access and if you need to go level A strong consideration for MT94's if conditions allow as they are a way easier level A assembly to move around in than an enclosed level A suit.
K) Entry teams should be 3 techs with a backup/standby team of 3 as well.
L) Call Chemtrec and DOE early as they have helpful information that could help in safely and effectively taking care of your incident. As well if incident

involves chlorine Chemtrec will dispatch a chlorine response team to your incident immediately.

M) Have equipment ready to be used before you send the teams into the hot zone.

3. Instructors comments

The instructors from BNSF stated that they were impressed with the professional learning attitude our units had when it came the classroom and outside learning portion of the drill.

And for the part of the drill that involved the scenario. They stated that our teams were some of the most competent hazmat units that they had ever worked with thru out the United States and the skills and the knowledge and the efficiently that we operated under was second to none as far as they were concerned. And stated and I quote" We would go into any hazmat incident with your teams, any day, any time".

And I would agree with that statement.

Thanks again to all our teams for the hard work.....Kurt