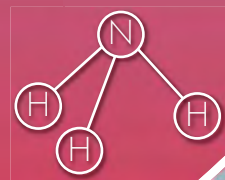
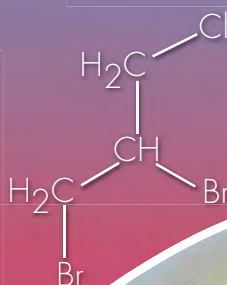
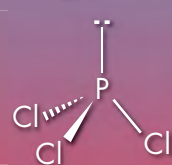
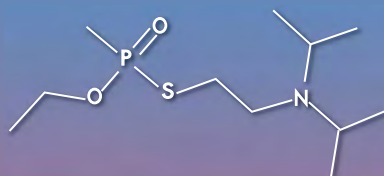
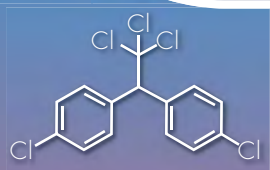
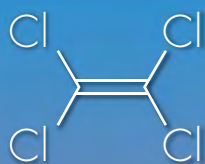


EPA Emergency Response Air Monitoring Guidance Tables



12P-0003

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Glossary

Attachment A – Hazard Evaluation Flow Chart for Unknowns



Executive Summary

Background

The United States Environmental Protection Agency (EPA) assembled the following 20 tables for use by field responders. The tables cover an array of response types and should be used as guidance only.

These tables are a quick-reference guide to assist field responders during an emergency response or a time-critical site clean-up. Additional guidance and resources may need to be consulted for further information.

For radiological responses, refer to the site-specific health and safety plan (SSHASP), *Radiation Playbook*, and the EPA memorandum *Turnback Guidance for EPA Personnel Responding to Radiological Emergencies*. Consult with a health physicist for guidance in determining an action level.

User Responsibilities

To verify the data in these tables, refer to the Agency for Toxic Substances and Disease Registry (ATSDR), EPA toxicologists, the National Institute of Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), device manufacturer handbooks (most are available online), equipment operating guides, and other authoritative regulatory guidance. More current data from any source used to compile these tables supersedes the information in these tables. This document does not supersede the SSHASP for any response.

During responses to unknown situations, use the most conservative criterion, approach, and personal protective equipment (PPE) as outlined in the SSHASP. For responses involving metals in a particulate form, a particulate air monitoring instrument (*e.g.*, Personal DataRAM or DataRAM) will be the instrument that can provide real-time data. The instrumentation reading will be in total milligram per cubic meter (mg/m^3) of particulate and not the metal of interest. Consult with a toxicologist or industrial hygienist for guidance in determining an action level. When monitoring for combustible atmosphere, a combustible gas indicator (*e.g.*, MultiRAE) will need to be used. The action level for a combustible atmosphere is a lower explosive level (LEL) greater than 10%. A normal oxygen level in the ambient air should be between 19.5%-23.5% oxygen (normal 20.8%). An oxygen level below 19.5% or above 23.5% will require a reassessment of the situation. Teflon tubing is to be used for calibration instead of tygon tubing for volatile organic compounds.

If you have any changes or revisions please email:

zintak.leonard@epa.gov or ben.maradkel@westonsolutions.com

Glossary

~	approximately
>	greater than
<	less than
%	percent
∞	infinity
$\mu\text{g}/\text{m}^3$	microgram per cubic meter
A1	carcinogenic effects
A4	concern that the compound may be carcinogenic, but supporting data are lacking
A-TWA	ATSDR time-weighted average
ACGIH	American Conference of Governmental Industrial Hygienists
AEGL	Acute Exposure Guideline Levels
ATSDR	Agency for Toxic Substances and Disease Registry
C	ceiling (concentrations that should not be exceeded during any part of work exposure)
C-STEL	CDC short-term exposure limit
CDC	Centers for Disease Control
CF	correction factor
Cl	chlorine
CO	carbon monoxide
cpm	counts per minute
EPA	United States Environmental Protection Agency
eV	electron volt
FID	flame ionization detector
GPL	general public limit
H ₂ S	hydrogen sulfide
HCN	hydrocyanic acid
HGV	Health Guidance Value
IDLH	Immediately Dangerous to Life and Health
IP	ionization potential
ISO	isobutylene
LEL	lower explosive level
m ³	cubic meter
mg/kg	milligram per kilogram
mg/m ³	milligram per cubic meter
$\mu\text{R}/\text{hr}$	micro-Roentgens per hour
NA	not available/applicable
ND	non-detect
ng/m ³	nanogram per cubic meter
NH ₃	ammonia
NIOSH	National Institute for Occupational Safety and Health
NL	not listed
NR	no response
O ₂	oxygen

Glossary (continued)

OSHA	Occupational Safety and Health Administration
pCi/L	picocuries per liter
PAH	polyaromatic hydrocarbon
PID	photoionization detector
ppb	parts per billion
PDR	personal dataRAM
PEL	Permissible Exposure Limit (OSHA)
PPE	personal protective equipment
ppm	parts per million
R/hr	Roentgen per hour
REL	Recommended Exposure Limit (NIOSH)
SO ₂	sulfur dioxide
SPM	Single-Point Monitor
SSHASP	site-specific health and safety plan
ST	short-term
STEL	Short-Term Exposure Limit
TLV	Time-Limited Value (ACGIH)
TWA	Time-Weighted Average
U-STEL	USA CHPPM short-term exposure limit
U-WPL	USA CHPPM worker protection limit
USA CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
VOC	volatile organic compound
Vol.	volume
WPL	worker protection limit
Y w/option	Yes with option; see manufacturer's instrument manual for information

Table 1 -- Acid (Spill or Release)

Instrument Guidance

Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
						TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Gases Produced from Acid Reactions															
Oxygen	MultiRAE/AreaRAE O ₂ Sensor	0-30% Vol.	Y	12.35 eV	NA	<19.5% O ₂ (simple asphyxiant)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dräger Tube	5-23% Vol.	Y												
	Dräger Chip	1-25% Vol.	N (Y w/option)												
	Dräger Pac III	0-100% Vol.	Y												
	GFG Inc. Micro IV	0-25%	Y												
Hydrogen	Dräger Tube	0.2-2% Vol.	Y	15.42 eV	NA	<19.5% O ₂ (simple asphyxiant)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Dräger Pac III	0-2000 ppm	Y												
	GFG Inc. Micro IV	0-4% Vol.	Y												
Radiation ²															
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	$\alpha = 2500 \text{ ft}^3$ $\beta/\gamma = 1250 \text{ ft}^3$
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N			300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N			300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.															



Table 1 -- Acid (Spill or Release)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wisner.nlm.nih.gov/>

<http://www.skcin.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

WISER website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

Acronyms:

≥ -- greater than or equal to

< -- less than

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

IDLH -- immediately dangerous to life and health

IP -- ionization potential

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

S -- skin notation (compound may be absorbed through the skin)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

Vol. -- volume

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 2 -- Ammonia (Spill or Release)

Instrument Guidance						Regulatory Guidance							Reference			
Target Compound	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Gas																
Ammonia	MultiRAE/AreaRAE NH ₃ Sensor	0-50 ppm	Y	10.18 eV	NA	1 ppm = 0.7 mg/m ³	PEL = 50 ppm REL = 25 ppm, ST 35 ppm TLV = 25 ppm, ST 35 ppm	300 ppm	30 ppm	30 ppm	30 ppm	30 ppm	25 ppm	Silica Gel Tube, 226-10-06	NIOSH 6015	0.1-0.2 L/min; 72 L
	MultiRAE Pro NH ₃ Sensor	0-100 ppm	Y													
	Dräger Tube	≥0.25-3 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)													
	Dräger Pac III	0-300 ppm	Y													
	SPM	2.6-75 ppm	N (Y w/option)													
	ToxiRAE II NH ₃	0-50 ppm	Y													
	MIRAN SapphRe*	0-500 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.7 (10.6 lamp)												
TVA 1000B**	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y	10.6 lamp 21.666 (10 ppm) - 22.980 (2000 ppm)													
Radiation ¹																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																



Table 2 -- Ammonia (Spill or Release)

Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aeq/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wiser.nlm.nih.gov/>

<http://www.skinc.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

Wireless Information System for Emergency Responders (WISER) website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*MIRAN SaphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

**PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Table 3 -- Chemical Plant (Fire)

Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² EPA and ATSDR Health Guidance Values

³ Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wiser.nlm.nih.gov/>

<http://www.skinc.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

WISER website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SaphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

Ca -- carcinogenic

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

m³ -- cubic meter

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NL -- not listed

ng/m³ -- nanograms per cubic meter

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TCE -- trichloroethylene

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 4 -- Chlorine (Spill or Release)

Instrument Guidance

Regulatory Guidance

Reference

Target Compound	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
						TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Gas															
Chlorine	MultiRAE/AreaRAE Cl ₂ Sensor	0-10 ppm	Y	11.48 eV	1 ppm = 2.9 mg/m ³	PEL = C 1 ppm REL = C 0.5 ppm (15 mins), ST 1 ppm TLV = 0.5 ppm, ST 1 ppm	10 ppm	0.5 ppm	0.5 ppm	0.5 ppm	0.5 ppm	1 ppm	PTFE Cassette, 225-9006	NIOSH 6011	0.3-1 L/min; 90 L
	MultiRAE Pro Cl ₂ Sensor	0-50 ppm	Y												
	Dräger Pac III Cl Sensor	0.1-20 ppm	Y												
	Dräger Tube	≥0.2-30 ppm	Y												
	Dräger Chip	≥0.2-10 ppm	N (Y w/option)												
	SPM	0.05-1.5 ppm	N (Y w/option)												
Radiation ¹															
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N			300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N			300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.															



Table 4 -- Chlorine (Spill or Release)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

Use teflon tubing for calibration instead of tygon tubing.

¹ Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

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Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

IDLH -- immediately dangerous to life and health

IP -- ionization potential

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 5 -- Electroplating Facility (Spill, Release, or Fire)

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERP-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
	MIRAN SapphRe**	4.5-250 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y													
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)													
	SPM	1.1-30 ppm	N (Y w/option)		3.3 (10.6 lamp)											
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	GFG Inc. Micro IV	0-500 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID)	Y													
Nitric Oxide	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y	11.95 eV	NA	1 ppm = 1.23 mg/m ³	PEL = 25 ppm REL = 25 ppm TLV = 25 ppm	100 ppm	NA	NA	NA	0.5 ppm	NA	Molecular Sieve Tube, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	ToxiRAE II NO	0-250 ppm	Y													
	Dräger Pac III	0-100 ppm	Y													
	GFG Inc. Micro IV	0-100 ppm	Y													
Nitrogen Dioxide	MultiRAE/AreaRAE NO ₂ Sensor	0-20 ppm	Y	9.75 eV	NA	1 ppm = 1.88 mg/m ³	PEL = C 5 ppm REL = ST 1 ppm TLV = 3 ppm, ST 5 ppm	20 ppm	0.5 ppm	0.5 ppm	0.5 ppm	0.5 ppm	1 ppm	Molecular Sieve Tube, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L
	Dräger Tube	≥0.5-25 ppm	Y													
	Dräger Chip	0.5-25 ppm	N (Y w/option)													
	SPM	0.3-9 ppm	N (Y w/option)													
	ToxiRAE II NO ₂	0-20 ppm	Y		16 (10.6 lamp)											
	Dräger Pac III	0-50 ppm	Y													
	GFG Inc. Micro IV	0-30 ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID)	Y													



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Sulfur Dioxide	MultiRAE/AreaRAE SO ₂ Sensor	0-20 ppm	Y	12.3 eV	NA	1 ppm = 2.62 mg/m ³	PEL = 5 ppm REL = 2 ppm, ST 5 ppm TLV = 2 ppm, ST 5 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	MCE Cassette, 225-9005	NIOSH 6004	0.5-1.5 L/min; 180 L
	Dräger Pac III	0-100 ppm	Y													
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	N (Y w/option)													
	MIRAN SapphIRe**	6-30 ppm	Y													
	GFG Inc. Micro IV	1-10 ppm	Y													
	SPM	0.2-6 ppm	N (Y w/option)													
TCE	Dräger Tube	≥2-50 ppm	Y	9.47 eV	NA	1 ppm = 5.37 mg/m ³	PEL = 100 ppm, C 200 ppm, 300 ppm (5 mins) REL = Ca TLV = 50 ppm, ST 200 ppm	1000 ppm Ca	130 ppm	84 ppm	77 ppm	10ppm	100 ppm	Anasorb CSC Tube, 226-01	NIOSH 1022	0.01-0.2 L/min; 10 L
	Dräger Chip	≥5-100 ppm	N (Y w/option)													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		0.54 (10.6 lamp)											
	TVA 1000B***	0.5-2000 ppm	Y		10.6 lamp 0.605 (10 ppm) - 2.129 (2000 ppm)											
PCE	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	9.47 eV	0.54 (10.6 lamp)	1 ppm = 6.78 mg/m ³	PEL = 100 ppm, C 200 ppm, 300 ppm REL = Ca 100 ppm TLV = 25, ST 100 ppm	150 ppm Ca	35 ppm	35 ppm	35 ppm	25 ppm	100 ppm	Anasorb CSC Tube, 226-01	NIOSH 1003	0.01-0.2 L/min; 3 L
	TVA 1000B***	0.5-2000 ppm	Y		10.6 lamp 0.738 (10 ppm) - 1.99 (2000 ppm)											
Vinyl Chloride	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	9.99 eV	2 (10.6 lamp)	1 ppm = 2.56 mg/m ³	PEL = 1 ppm, C 5 ppm (15 mins) REL = Ca TLV = 5 ppm	NA	250 ppm	140 ppm	70 ppm	1 ppm	500 ppm	Anasorb CSC Tube, 226-01	NIOSH 1007	0.05 L/min; 5 L
	Dräger Tube	≥0.5-30 ppm	Y													
	Dräger Chip	≥0.3-10 ppm	N (Y w/option)		NA											
	MIRAN SapphIRe**	2-20 ppm	Y													
	Dräger Pac III	0-100 ppm	Y		10.6 lamp 2.334 (10 ppm) - 4.397 (2000 ppm)											
	TVA 1000B***	0.5-2000 ppm	Y													
Phosgene	Dräger Tube	0.02-15 ppm	Y	11.2 eV	NA	1 ppm = 4.05 mg/m ³	PEL = 0.1 ppm REL = 0.1 ppm, C 0.2 ppm (15 mins) TLV = 0.1 ppm	2 ppm	0.3 ppm*	0.08 ppm*	0.04ppm*	0.1 ppm	NA	XAD-2 Tube, 226-117	OSHA 61	1 L/min; 240 L
	Dräger Chip	0.05-2 ppm	N (Y w/option)													
	MIRAN SapphIRe**	0.05 ppm	Y													
	TVA 1000B***	0.5-2000 ppm (PID)	Y													
	MultiRAE Pro COCl ₂ Sensor	0-1 ppm	Y													
	MultiRAE/AreaRAE PID***	0-200 ppm	Y		8.5 (11.7 lamp)											



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEG-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Sulfuric Acid	Dräger Tube	1-5 mg/m ³ (acid)	Y	12.4 eV	NA	NA	PEL = 1 mg/m ³ REL = 1 mg/m ³ TLV = 1 mg/m ³ , ST 3 mg/m ³	15 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	2 mg/m ³	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	pH Paper	NA	Y													
	SPM	26-750 ppb	N (Y w/option)													
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	2-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m ³	PEL = C 5 ppm REL = C 5 ppm TLV = C 5 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	0.5 ppm	NA	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	MultiRAE Pro HCl Sensor	0-15 ppm	Y													
	Dräger Tube	≥1-10 ppm	Y													
	Dräger Chip	≥1-25 ppm	N (Y w/option)													
	pH Paper	NA	Y													
	SPM	0.5-15 ppm	N (Y w/option)													
	Dräger Pac III	0-30 ppm	Y													
GFG Inc. Micro IV	0-30 ppm	Y														
Nitric Acid	Dräger Tube	≥1-50 ppm	Y	11.95 eV	NA	1 ppm = 2.58 mg/m ³	PEL = 2 ppm REL = 2 ppm, ST 4 ppm TLV = 2 ppm, ST 4 ppm	25 ppm	0.53 ppm	0.53 ppm	0.53 ppm	0.53 ppm	1 ppm	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	pH Paper	NA	Y													
	SPM	0.2-6 ppm	N (Y w/option)													
Hydrocyanic Acid (Hydrogen Cyanide)	MultiRAE/AreaRAE HCN Sensor	0-100 ppm	Y	13.6 eV	NA	1 ppm = 1.1 mg/m ³	PEL = 10 ppm S REL = ST 4.7 ppm S TLV = C 10 ppm S	50 ppm	2.0 ppm	1.3 ppm	1 ppm	1.9 ppm	NA	Soda Lime Tube, 226-28	NIOSH 6010	0.05-0.2 L/min; 2-90 L
	MultiRAE Pro HCN Sensor	0-50 ppm	Y													
	Dräger Tube	2-30 ppm	Y													
	Dräger Chip	2-50 ppm	N (Y w/option)													
	pH Paper	NA	Y													
	ToxiRAE II HCN	0-100 ppm	Y													
	SPM	1.1-30 ppm	N (Y w/option)													
	Dräger Pac III	0-50 ppm	Y													
GFG Inc. Micro IV	0-50 ppm	Y														
Metals - as particulates																
Cadmium	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.005 mg/m ³ REL = Ca TLV = 0.01 mg/m ³ (dust), 0.002 mg/m ³ (respirable)	9 mg/m ³ Ca	0.10 mg/m ³	0.063 mg/m ³	0.041 mg/m ³	0.005 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7048	1-3 L/min; 480 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Copper	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.1 mg/m ³ (fume), 1 mg/m ³ (dust) REL = 0.1 mg/m ³ (fume), 1 mg/m ³ (dust)	100 mg/m ³	NA	NA	NA	1 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7029	1-3 L/min; 480 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Chromium (VI)	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.005 mg/m ³ REL = 0.001 mg/m ³ TLV = 0.05 mg/m ³	15 mg/m ³	NA	NA	NA	NA	NA	PVC Cassette, 225-802	NIOSH 7600	1-4 L/min; 240 L
	DataRAM 4****	0.001-400 mg/m ³	N													



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Metals - as particulates (continued)																
Lead	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.05 mg/m ³ REL = 0.05 mg/m ³ TLV = 0.05 mg/m ³	100 mg/m ³	NA	NA	NA	0.05 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7300	1-4 L/min; 50-2000 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Nickel	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 1 mg/m ³ REL = 0.015 mg/m ³ TLV = 0.1 mg/m ³ (soluble), 1 mg/m ³ (insoluble)	10 mg/m ³	NA	NA	NA	4.5 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7300	1-4 L/min; 5-1000 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Particulate																
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N													
	eBAM	0-100 mg/m ³	N													
Radiation ²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ βγ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																

Table 5 -- Electroplating Facility (Spill, Release, or Fire)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wiser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

µg/m³ -- micrograms per cubic meter

µR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short-term

TCE -- trichloroethylene

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 6 -- General Industrial (Fire/Fireworks)

(Also refer to Table 3)

Instrument Guidance							Regulatory Guidance							Reference				
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Health Guidance Values ²		Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Particulate																		
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N															
	eBAM	0-100 mg/m ³	N															
Radiation ³																		
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N						300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N						300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																		

Table 6 -- General Industrial (Fire/Fireworks)

(Also refer to Table 3)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² EPA and ATSDR Health Guidance Values

³ Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

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EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wiser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

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AEGL -- acute exposure guideline levels

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CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

S -- skin notation (compound may be absorbed through the skin)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

(If the Landfill is on fire, also refer to Table 3)

Instrument Guidance

Regulatory Guidance

— Reference.

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Gases																
Methane	TVA 1000B***	1-50,000 ppm (FID) no response (PID)	Y	12.98 eV	NA	NA	<19.5% O ₂ (simple asphyxiant ³)	NA	30 ppm	30 ppm	30 ppm	NA	NA	NA	NA	NA
	MIRAN SapphiRe**	7.5-100 ppm	Y													
	MultiRAE/AreaRAE	0-100% LEL, 0-30% O ₂	Y													
	Landtec GEM 500	0-70% to specification 0-100% reading	Y													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
	MIRAN SapphiRe**	4.5-250 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y													
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)		3.3 (10.6 lamp)											
	SPM	1.1-30 ppm	N (Y w/option)													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	GFG Inc. Micro IV	0-500 ppm	Y													
TVA 1000B***	0.5-2,000 ppm (PID)	Y	NA													
Sulfur Dioxide	MultiRAE/AreaRAE SO ₂ Sensor	0-20 ppm	Y	12.3 eV	NA	1 ppm = 2.62 mg/m ³	PEL = 5 ppm REL = 2 ppm, ST 5 ppm TLV = 2 ppm, ST 5 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	MCE Cassette, 225-9005	NIOSH 6004	0.5-1.5 L/min; 180 L
	Dräger Pac III	0-100 ppm	Y													
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	N (Y w/option)													
	MIRAN SapphiRe**	6-30 ppm	Y													
	GFG Inc. Micro IV	1-10 ppm	Y													
	SPM	0.2-6 ppm	N (Y w/option)													



Table 7 -- Landfill (Release or Fire)

(If the Landfill is on fire, also refer to Table 3)

Instrument Guidance

Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Radiation ²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.															





Table 7 -- Landfill (Release or Fire)

(If the Landfill is on fire, also refer to Table 3)

Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

³ ACGIH TLV = 1000 ppm

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wiser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

**** Radon is unlike any other gas and does not follow the typical guidelines. Consult with a Health Physicist.

*****The sensitivity of the SabreAlert is dependent on several factors including, radon background, filter type, flow rate, acute and chronic window settings, and, of course, the energy of the radioactive isotope of interest.

Acronyms:

≥ -- greater than or equal to

< -- less than

% -- percent

∞ -- infinity

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

LEL -- lower explosive limit

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

pCi/L -- picocuries per liter

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 8 -- Magnesium (Fire)

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERP-G-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Benzene	UltraRAE-PID***	0.1-2000 ppm	Y	9.24 eV	NA	1 ppm = 3.19 mg/m ³	PEL = 1 ppm REL = 0.1 ppm, ST 1 ppm TLV = 10 ppm	500 ppm	52 ppm	18 ppm	9 ppm	1 ppm	50 ppm	Anasorb CSC Tube, 226-01	NIOSH 1501	≤0.2 L/min; 6 L
	Dräger Tube	≥0.5-10 ppm	Y													
	Dräger Chip	≥0.2-10 ppm	N (Y w/option)													
	MIRAN SapphIRe**	10-200 ppm	Y													
	ppbRAE-PID***	1ppb-200ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y		0.53 (10.6 lamp) 10.6 lamp 0.702 (10 ppm) - 1.781 (2000 ppm)												
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
MIRAN SapphIRe**	4.5-250 ppm	Y														
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y													
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)													
	SPM	1.1-30 ppm	N (Y w/option)													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		3.3 (10.6 lamp)											
	GFG Inc. Micro IV	0-500 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID)	Y		NA											
Sulfur Dioxide	MultiRAE/AreaRAE SO ₂ Sensor	0-20 ppm	Y	12.3 eV	NA	1 ppm = 2.62 mg/m ³	PEL = 5 ppm REL = 2 ppm, ST 5 ppm TLV = 2 ppm, ST 5 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	MCE Cassette, 225-9005	NIOSH 6004	0.5-1.5 L/min; 180 L
	Dräger Pac III	0-100 ppm	Y													
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	N (Y w/option)													
	MIRAN SapphIRe**	6-30 ppm	Y													
	GFG Inc. Micro IV	1-10 ppm	Y													
	SPM	0.2-6 ppm	N (Y w/option)													
Hydrogen	MultiRAE/AreaRAE	0-100% LEL, 0-30% O ₂	Y	15.43 eV	NA	1 ppm = 0.82 mg/m ³	PEL = 3 ppm REL = 3 ppm TLV = 5 ppm	30 ppm	1 ppm	1 ppm	1 ppm	0.35 ppm	NA	Hydrogen Tube, 810-30	OSHA CSI	NA



Regulatory Guidance

Reference

The seal of the Environmental Protection Agency Emergency Response Technical Group is a circular emblem. It features a red outer ring with the words "ENVIRONMENTAL PROTECTION AGENCY" in white, uppercase letters. Inside this ring is a white circle containing the words "EMERGENCY RESPONSE TECHNICAL GROUP" in red, uppercase letters.

Table 8 -- Magnesium (Fire)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wisser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Regulatory Guidance

Reference



Table 9 -- Mercury (Spill or Release)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ EPA and ATSDR Health Guidance Values

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wiser.nlm.nih.gov/>

<http://www.skincinc.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

WISER website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

Acronyms:

≥ -- greater than or equal to

AEGL -- acute exposure guideline levels

ATSDR -- Agency for Toxic Substances and Disease Registry

CDC -- Centers for Disease Control and Prevention

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

IDLH -- immediately dangerous to life and health

IP -- ionization potential

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

S -- skin notation (compound may be absorbed through the skin)

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TWA -- time-weighted average

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Table 10 -- Oil (Spill, Release, or Fire)

Instrument Guidance

Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERP-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Benzene	UltraRAE-PID***	0.1-2000 ppm	Y	9.24 eV	NA	1 ppm = 3.19 mg/m ³	PEL = 1 ppm REL = 0.1 ppm, ST 1 ppm TLV = 10 ppm	500 ppm	52 ppm	18 ppm	9 ppm	1 ppm	50 ppm	Anasorb CSC Tube, 226-01	NIOSH 1501	≤0.2 L/min; 6 L
	Dräger Tube	≥0.5-10 ppm	Y													
	Dräger Chip	≥0.2-10 ppm	N (Y w/option)													
	MIRAN SapphiRe**	10-200 ppm	Y		0.53 (10.6 lamp)											
	ppbRAE-PID***	1ppb-200ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y	10.6 lamp 0.702 (10 ppm) - 1.781 (2000 ppm)													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
MIRAN SapphiRe**	4.5-250 ppm	Y														
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y													
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)		3.3 (10.6 lamp)											
	SPM	1.1-30 ppm	N (Y w/option)													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	GFG Inc. Micro IV	0-500 ppm	Y		NA											
TVA 1000B***	0.5-2,000 ppm (PID)	Y														
Sulfur Dioxide	MultiRAE/AreaRAE SO ₂ Sensor	0-20 ppm	Y	12.3 eV	NA	1 ppm = 2.62 mg/m ³	PEL = 5 ppm REL = 2 ppm, ST 5 ppm TLV = 2 ppm, ST 5 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	MCE Cassette, 225-9005	NIOSH 6004	0.5-1.5 L/min; 180 L
	Dräger Pac III	0-100 ppm	Y													
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	N (Y w/option)													
	MIRAN SapphiRe**	6-30 ppm	Y													
	GFG Inc. Micro IV	1-10 ppm	Y													
SPM	0.2-6 ppm	N (Y w/option)														
PAHs - as particulates																
PAHs*****	Personal DataRAM*****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.2 mg/m ³ REL = 0.1 mg/m ³	80 mg/m ³	NA	NA	NA	0.075 mg/m ³	0.25 mg/m ³	PTFE Cassette, 226-30-04	NIOSH 5506	2 L/min; 480 L
	DataRAM 4*****	0.001-400 mg/m ³	N													

Table 10 -- Oil (Spill, Release, or Fire)

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		A EGL-1			TEEL-0	ERP-G-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Radiation ²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																





Table 10 -- Oil (Spill, Release, or Fire)

Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

Consult ATSDR for site-specific action levels

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wiser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

*****PAHs are most conservative value (anthracene, benzo(a)pyrene, chrysene, naphthalene, phenanthrene, pyrene)

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PAH -- polyaromatic hydrocarbon

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short-term

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 11 -- Pesticide or Fertilizer (Fire)

Instrument Guidance							Regulatory Guidance							Reference				
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Health Guidance Values ²		Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																		
Benzene	UltraRAE-PID***	0.1-2000 ppm	Y	9.24 eV	NA	1 ppm = 3.19 mg/m ³	NA	NA	PEL = 1 ppm REL = 0.1 ppm, ST 1 ppm TLV = 10 ppm	500 ppm	52 ppm	18 ppm	9 ppm	1 ppm	50 ppm	Anasorb CSC Tube, 226-01	NIOSH 1501	≤0.2 L/min; 6 L
	Dräger Tube	≥0.5-10 ppm	Y															
	Dräger Chip	≥0.2-10 ppm	N (Y w/option)															
	MIRAN SaphiRe**	10-200 ppm	Y															
	ppbRAE-PID***	1ppb-200ppm	Y															
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y															
TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y	0.53 (10.6 lamp) 10.6 lamp 0.702 (10 ppm) - 1.781 (2000 ppm)															
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	NA	NA	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y															
	Dräger Tube	≥2-300 ppm	Y															
	Dräger Chip	5-150 ppm	N (Y w/option)															
	ToxiRAE II CO	≥0-500 ppm	Y															
	GFG Inc. Micro IV	0-2000 ppm	Y															
	MIRAN SaphiRe**	4.5-250 ppm	Y															
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	NA	NA	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y															
	Dräger Tube	≥0.2-6 ppm	Y															
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)															
	SPM	1.1-30 ppm	N (Y w/option)															
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		3.3 (10.6 lamp)													
	GFG Inc. Micro IV	0-500 ppm	Y		NA													
	TVA 1000B***	0.5-2,000 ppm (PID)	Y															
Sulfur Dioxide	MultiRAE/AreaRAE SO ₂ Sensor	0-20 ppm	Y	12.3 eV	NA	1 ppm = 2.62 mg/m ³	NA	NA	PEL = 5 ppm REL = 2 ppm, ST 5 ppm TLV = 2 ppm, ST 5 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	MCE Cassette, 225-9005	NIOSH 6004	0.5-1.5 L/min; 180 L
	Dräger Pac III	0-100 ppm	Y															
	Dräger Tube	≥0.1-3 ppm	Y															
	Dräger Chip	≥0.4-10 ppm	N (Y w/option)															
	MIRAN SaphiRe**	6-30 ppm	Y															
	GFG Inc. Micro IV	1-10 ppm	Y															
	SPM	0.2-6 ppm	N (Y w/option)															
Phosgene	Dräger Tube	0.02-15 ppm	Y	11.2 eV	NA	1 ppm = 4.05 mg/m ³	NA	NA	PEL = 0.1 ppm REL = 0.1 ppm, C 0.2 ppm (15 mins) TLV = 0.1 ppm	2 ppm	0.3 ppm*	0.08 ppm*	0.04ppm*	0.1 ppm	NA	XAD-2 Tube, 226-117	OSHA 61	1 L/min; 240 L
	Dräger Chip	0.05-2 ppm	N (Y w/option)															
	MIRAN SaphiRe**	0.05 ppm	Y															
	TVA 1000B***	0.5-2000 ppm (PID)	Y		8.5 (11.7 lamp)													
	MultiRAE Pro COCl ₂ Sensor	0-1 ppm	Y															
	MultiRAE/AreaRAE PID***	0-200 ppm	Y															

Table 11 -- Pesticide or Fertilizer (Fire)

Instrument Guidance							Regulatory Guidance										Reference													
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Health Guidance Values ²		Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling														
							Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume												
VOCs and Gases (continued)																														
Methyl Bromide	Dräger Tube	≥0.5-30 ppm	Y	10.54 eV	NA	1 ppm = 3.89 mg/m ³	NA	NA	PEL = C 20 ppm S REL = Ca TLV = 5 ppm S	250 ppm Ca	210 ppm*	67 ppm*	67 ppm*	1 ppm	NA	Anasorb 747 Tube, 226-83	OSHA PV2040	0.01-0.1 L/min; 3 L												
	TVA 1000B***	0.5-2000 ppm (PID)	Y																											
	MultiRAE/AreaRAE PID***	0-200 ppm	Y																											
Phosphorus (elemental ³)	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	NA	NA	PEL = 0.1 mg/m ³ REL = 0.1 mg/m ³ TLV = 0.1 mg/m ³	5 mg/m ³	3.7 ppm	0.93 ppm	0.47 ppm	0.1 mg/m ³	NA	Tenax Tube, 226-35-03	NIOSH 7905	0.01-0.2 L/min; 12 L												
	DataRAM 4****	≥0.5-15 ppm	N																											
Phosphorus Pentoxide	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	NA	NA	PEL = 1 mg/m ³ REL = 3 mg/m ³ ACGIH TLV = 1 mg/m ³	250 mg/m ³	NA	NA	NA	1 mg/m ³	1 mg/m ³	MCE Cassette, 225-3-01	OSHA ID 111	1 L/min; 480 L												
	DataRAM 4****	0.001-400 mg/m ³	N																											
Phosphine	MultiRAE/AreaRAE PH ₃ Sensor	0-5 ppm	Y	9.96 eV	NA	1 ppm = 1.39 mg/m ³	NA	NA	PEL = 0.3 mg/m ³ REL = 0.3 mg/m ³ , ST 1 ppm TLV = 0.3 mg/m ³	50 ppm	2 ppm*	0.5 ppm*	0.25 ppm*	0.3 ppm	NA	Silica Gel Tube, 226-165A	NIOSH 6002	0.01-0.2 L/min; 12 L												
	MultiRAE Pro PH ₃ Sensor	0-1000 ppm ext. range	Y																											
	ToxiRAE	0-5 ppm	Y																											
	Dräger Pac III	0-10 ppm	Y																											
	Dräger Tube	≥0.1-1 ppm	Y																											
	Dräger Chip	0.1-2.5 ppm or N (Y w/option)	Y																											
	GFG Inc. Micro IV	0-10 ppm	Y																											
	SPM	32-900 ppb	N (Y w/option)																											
	MultiRAE/AreaRAE PID***	0-200 ppm	Y		3.9 (10.6 lamp)																									
TVA 1000B***	0.5-2000 ppm (PID)	Y	NA																											
Nitrogen Dioxide	MultiRAE/AreaRAE NO ₂ Sensor	0-20 ppm	Y	9.75 eV	NA	1 ppm = 1.88 mg/m ³	NA	NA	PEL = C 5 ppm REL = ST 1 ppm TLV = 3 ppm, ST 5 ppm	20 ppm	0.5 ppm	0.5 ppm	0.5 ppm	0.5 ppm	1 ppm	Molecular Sieve Tube, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L												
	Dräger Tube	≥0.5-25 ppm	Y																											
	Dräger Chip	0.5-25 ppm	N (Y w/option)																											
	SPM	0.3-9 ppm	N (Y w/option)																											
	ToxiRAE II NO ₂	0-20 ppm	Y																											
	Dräger Pac III	0-50 ppm	Y																											
	GFG Inc. Micro IV	0-30 ppm	Y																											
	TVA 1000B***	0.5-2000 ppm (PID)	Y																											
MultiRAE/AreaRAE PID***	0-2000 ppm	Y	16 (10.6 lamp)																											
Nitric Oxide	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y	11.95 eV	NA	1 ppm = 1.23 mg/m ³	NA	NA	PEL = 25 ppm REL = 25 ppm TLV = 25 ppm	100 ppm	NA	NA	NA	0.5 ppm	NA	Molecular Sieve Tube, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L												
	ToxiRAE II NO	0-250 ppm	Y																											
	Dräger Pac III	0-100 ppm	Y																											
	GFG Inc. Micro IV	0-100 ppm	Y																											
Metals - as particulates																														
Lead	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	NA	NA	PEL = 0.05 mg/m ³ REL = 0.05 mg/m ³ TLV = 0.05 mg/m ³	100 mg/m ³	NA	NA	NA	0.05 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7300	1-4 L/min; 50-2000 L												
	DataRAM 4****	0.001-400 mg/m ³	N																											
Cadmium	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	NA	NA	PEL = 0.005 mg/m ³ REL = Ca TLV = 0.01 mg/m ³ (dust), 0.002 mg/m ³ (respirable)	9 mg/m ³ Ca	0.10 mg/m ³	0.063 mg/m ³	0.041 mg/m ³	0.005 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7048	1-3 L/min; 480 L												
	DataRAM 4****	0.001-400 mg/m ³	N																											

Table 11 -- Pesticide or Fertilizer (Fire)

Instrument Guidance							Regulatory Guidance							Reference				
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Health Guidance Values ²		Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Metals - as particulates (continued)																		
Arsenic (inorganic compounds)	Personal DataRAM****	0.001-400 mg/m ³	N	9.81 eV	NA	NA	NA	NA	PEL = 0.01 mg/m ³ REL = C 0.002 mg/m ³ (15 mins) TLV = 0.01 mg/m ³	5 mg/m ³ Ca	NA	NA	NA	0.025 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7900	1-3 L/min; 30 L
	DataRAM 4****	0.001-400 mg/m ³	N															
	TVA 1000B***	0.5-2000 ppm (PID)	Y															
	MultiRAE/AreaRAE PID***	0-200 ppm	Y															
Arsenic (organic compounds)	Dräger Tube	0-3 mg organic arsenic/m ³	Y	NA	NA	NA	NA	NA	PEL = 0.5 mg/m ³ TLV = 0.2 mg/m ³	NA	NA	NA	NA	0.025 mg/m ³	NA	PTFE Filter, 225-17-01	NIOSH 5022	1-3 L/min; 960 L
Mercury	Lumex RA-915	0.000002-0.05 mg/m ³	N	NA	NA	NA	1000 ng/m ³	3000 ng/m ³	PEL = C 0.1 mg/m ³ S REL = 0.05 mg/m ³ S (vapor), C 0.1 mg/m ³ (other) TLV = 0.025 mg/m ³ S	10 mg/m ³	1.7 mg/m ³ *	0.67 mg/m ³ *	0.33 mg/m ³ *	0.025 mg/m ³ *	NA	Anasorb C300 Tube, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 48 L
	Lumex RA-915 Light	0.0001-0.1 mg/m ³	N															
	Jerome 431X	0.003 to 0.999 mg/m ³	N															
	Jerome J405	0.0005-0.999 mg/m ³	N															
	Jerome 471	0.00003-0.25 mg/m ³	N															
	Dräger Tube	0.0000005-0.000002 mg/m ³	Y															
Particulate																		
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N															
	eBAM	0-100 mg/m ³	N															
Radiation ⁴																		
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N						300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N						300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																		

Table 11 -- Pesticide or Fertilizer (Fire)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² EPA and ATSDR Health Guidance Values

³ Emits irritating oxides of phosphorus, may re-ignite upon exposure to air

⁴ Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wiser.nlm.nih.gov/>

<http://www.skinc.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

WISER website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SaphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

m³ -- cubic meter

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

ST -- short term

TEEL -- temporary emergency exposure limit

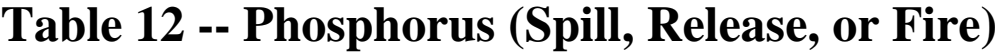
TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

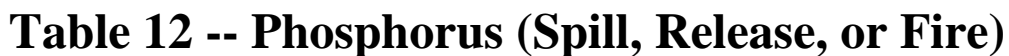
VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Phosphorus Compounds and Gases																
Phosphorus (elemental ³)	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.1 mg/m ³ REL = 0.1 mg/m ³ TLV = 0.1 mg/m ³	5 mg/m ³	3.7 ppm	0.93 ppm	0.47 ppm	0.1 mg/m ³	NA	Tenax Tube, 226-35-03	NIOSH 7905	0.01-0.2 L/min; 12 L
	DataRAM 4****	≥0.5-15 ppm	N													
Red Phosphorus	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.49 eV	NA	NA	NA	NA	3.7 ppm	0.93 ppm	0.47 ppm	0.05 mg/m ³	0.4 mg/m ³ *	Tenax Tube, 226-35-03	NIOSH 7905	0.2 L/min; 12 L
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Phosphorus Pentoxide	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 1 mg/m ³ REL = 3 mg/m ³ ACGIH TLV = 1 mg/m ³	250 mg/m ³	NA	NA	NA	1 mg/m ³	1 mg/m ³	MCE Cassette, 225-3-01	OSHA ID 111	1 L/min; 480 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Benzene	UltraRAE-PID***	0.1-2000 ppm	Y	9.24 eV	NA	1 ppm = 3.19 mg/m ³	PEL = 1 ppm REL = 0.1 ppm, ST 1 ppm TLV = 10 ppm	500 ppm	52 ppm	18 ppm	9 ppm	1 ppm	50 ppm	Anasorb CSC Tube, 226-01	NIOSH 1501	≤0.2 L/min; 6 L
	Dräger Tube	≥0.5-10 ppm	Y													
	Dräger Chip	≥0.2-10 ppm	N (Y w/option)													
	MIRAN SapphiRe**	10-200 ppm	Y													
	ppbRAE-PID***	1ppb-200ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
MIRAN SapphiRe**	4.5-250 ppm	Y														
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y													
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)													
	SPM	1.1-30 ppm	N (Y w/option)													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	GFG Inc. Micro IV	0-500 ppm	Y													
TVA 1000B***	0.5-2,000 ppm (PID)	Y	3.3 (10.6 lamp)	NA												



Normal gamma radiation background is from 5-20 $\mu\text{R/hr}$; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 $\mu\text{R/hr}$ or greater, contact a radiation safety specialist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.

Table 12 -- Phosphorus (Spill, Release, or Fire)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

³ Emits irritating oxides of phosphorus, may re-ignite upon exposure to air

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aeql/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wiser.nlm.nih.gov/>

<http://www.skinc.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

WISER website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SaphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IC -- ion chromatography

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

µg/cm² -- micrograms per square centimeter

µR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Table 13 -- Tire Fire

(Also can be used for Auto Fluff Fire)

Instrument Guidance

Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Metals - as particulates																
Lead	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.05 mg/m ³ REL = 0.05 mg/m ³ TLV = 0.05 mg/m ³	100 mg/m ³	NA	NA	NA	0.05 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7300	1-4 L/min; 50-2000 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Particulate																
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N													
	eBAM	0-100 mg/m ³	N													
Radiation ²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																





Table 13 -- Tire Fire

(Also can be used for Auto Fluff Fire)

Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wiser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SaphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

*****PAHs are most conservative value (anthracene, benzo(a)pyrene, chrysene, naphthalene, phenanthrene, pyrene)

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PAH -- polyaromatic hydrocarbon

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGl-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	2-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m ³	PEL = C 5 ppm REL = C 5 ppm TLV = C 5 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	0.5 ppm	NA	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	MultiRAE Pro HCl Sensor	0-15 ppm	Y													
	Dräger Tube	≥1-10 ppm	Y													
	Dräger Chip	≥1-25 ppm	N (Y w/option)													
	pH Paper	NA	Y													
	SPM	0.5-15 ppm	N (Y w/option)													
	Dräger Pac III	0-30 ppm	Y													
GFG Inc. Micro IV	0-30 ppm	Y														
Nitric Acid	Dräger Tube	≥1-50 ppm	Y	11.95 eV	NA	1 ppm = 2.58 mg/m ³	PEL = 2 ppm REL = 2 ppm, ST 4 ppm TLV = 2 ppm, ST 4 ppm	25 ppm	0.53 ppm	0.53 ppm	0.53 ppm	0.53 ppm	1 ppm	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	pH Paper	NA	Y													
	SPM	0.2-6 ppm	N (Y w/option)													
Sulfuric Acid	Dräger Tube	1-5 mg/m ³	Y	12.4 eV	NA	NA	PEL = 1 mg/m ³ REL = 1 mg/m ³ TLV = 1 mg/m ³ , ST 3 mg/m ³	15 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	2 mg/m ³	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	pH Paper	NA	Y													
	SPM	26-750 ppb	N (Y w/option)													
Hydrocyanic Acid (Hydrogen Cyanide)	MultiRAE/AreaRAE HCN Sensor	0-100 ppm	Y	13.6 eV	NA	1 ppm = 1.1 mg/m ³	PEL = 10 ppm S REL = ST 4.7 ppm S TLV = C 10 ppm S	50 ppm	2.0 ppm	1.3 ppm	1 ppm	1.9 ppm	NA	Soda Lime Tube, 226-28	NIOSH 6010	0.05-0.2 L/min; 2-90 L
	MultiRAE Pro HCN Sensor	0-50 ppm	Y													
	Dräger Tube	2-30 ppm	Y													
	Dräger Chip	2-50 ppm	N (Y w/option)													
	pH Paper	NA	Y													
	ToxiRAE II HCN	0-100 ppm	Y													
	SPM	1.1-30 ppm	N (Y w/option)													
Dräger Pac III	0-50 ppm	Y														
GFG Inc. Micro IV	0-50 ppm	Y														
Naphthalene	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	8.12 eV	0.42 (10.6 lamp)	1 ppm = 5.24 mg/m ³	REL = 10 ppm ST, 15 ppm PEL = 10 ppm	250 ppm	NA	NA	NA	10 ppm	15 ppm*	Sorbent Tube, 226-110	NIOSH 1501	0.02 L.min; 10 L
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y		NA											
PAHs - as particulates																
PAHs*****	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.2 mg/m ³ REL = 0.1 mg/m ³	80 mg/m ³	NA	NA	NA	0.075 mg/m ³	0.25 mg/m ³ *	PTFE Cassette, 226-30-04	NIOSH 5506	2 L/min; 480 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Pentachlorophenol and Dioxin-Furans - as particulates																
Pentachloro phenol	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.5 mg/m ³ REL = 0.5 mg/m ³ S	2.5 mg/m ³	NA	NA	NA	0.5 mg/m ³	2 mg/m ³ *	Styrene Cassette, 225-3LF	NIOSH 5512	0.5-1 L/min; 480 L
	DataRAM 4****	0.001-400 mg/m ³	N													



Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGl-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Pentachlorophenol and Dioxin-Furans - as particulates (continued)																
Dioxin-Furan	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	NA	NA	NA	NA	NA	1E-8 mg/m ³	0.0015 mg/m ³ *	PUF Tube Filter	EPA TO-9A	225-280 L/min; NA
	DataRAM 4****	0.001-400 mg/m ³	N													
Metals - as particulates																
Arsenic (inorganic compounds)	Personal DataRAM****	0.001-400 mg/m ³	N	9.81 eV	NA	NA	PEL = 0.01 mg/m ³ REL = C 0.002 mg/m ³ (15 mins) TLV = 0.01 mg/m ³	5 mg/m ³ Ca	NA	NA	NA	0.025 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7900	1-3 L/min; 30 L
	DataRAM 4****	0.001-400 mg/m ³	N													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Arsenic (organic compounds)	Dräger Tube	0-3 mg organic arsenic/m ³	Y	NA	NA	NA	PEL = 0.5 mg/m ³ TLV = 0.2 mg/m ³	NA	NA	NA	NA	0.025 mg/m ³	NA	PTFE Filter, 225-17-01	NIOSH 5022	1-3 L/min; 960 L
Copper	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.1 mg/m ³ (fume), 1 mg/m ³ (dust) REL = 0.1 mg/m ³ (fume), 1 mg/m ³ (dust) TLV = 0.2 mg/m ³ (fume), 1 mg/m ³ (dust, mist)	100 mg/m ³	NA	NA	NA	1 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7029	1-3 L/min; 480 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Chromium (VI)	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.005 mg/m ³ REL = 0.001 mg/m ³ TLV = 0.05 mg/m ³	15 mg/m ³	NA	NA	NA	NA	NA	PVC Cassette, 225-802	NIOSH 7600	1-4 L/min; 240 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Lead	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 0.05 mg/m ³ REL = 0.05 mg/m ³ TLV = 0.05 mg/m ³	100 mg/m ³	NA	NA	NA	0.05 mg/m ³	NA	MCE Cassette, 225-3-01	NIOSH 7300	1-4 L/min; 50-2000 L
	DataRAM 4****	0.001-400 mg/m ³	N													
Particulate																
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N													
	eBAM	0-100 mg/m ³	N													



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGl-1			TEEL-0	ERP-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Radiation²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.															

Table 14 -- Wood-Treating Facility (Spill or Release)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

PAC-1 is based on the applicable AEGL-1, ERPG-1, or TEEL-1 value

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wiser.nlm.nih.gov/>

<http://www.skcin.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

WISER website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

*PAC-1--There are no ERPG-1 for this compound

**MIRAN SaphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

*****PAHs are most conservative value (anthracene, benzo(a)pyrene, chrysene, naphthalene, phenanthrene, pyrene)

Acronyms:

≥ -- greater than or equal to

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

S -- skin notation (compound may be absorbed through the skin)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 15 -- Volcano

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERP-G-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
MIRAN SapphIRe**	4.5-250 ppm	Y														
Carbon Dioxide	Dräger Pac III	0-5% Vol.	Y	13.77 eV	NA	1 ppm = 1.8 mg/m ³	PEL = 5000 ppm, ST 30,000 ppm REL = 5000 ppm, ST 30,000 ppm TLV = 5000 ppm, ST 30,000 ppm	40,000 ppm	NA	NA	NA	5000 ppm	NA	Carbon Dioxide Tube, 800-01381	NA	0.02-0.1 L/min; NA
	Dräger Tube	2-12% Vol.	Y													
	Dräger Chip	200-25,000 ppm	N (Y w/option)													
	MIRAN SapphIRe**	7.5-2000 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y													
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)		3.3 (10.6 lamp)											
	SPM	1.1-30 ppm	N (Y w/option)													
	MultiRAE/AreaRAE PJD***	0-2000 ppm	Y		NA											
	GFG Inc. Micro IV	0-500 ppm	Y													
TVA 1000B***	0.5-2,000 ppm (PID)	Y														
Sulfur Dioxide	MultiRAE/AreaRAE SO ₂ Sensor	0-20 ppm	Y	12.3 eV	NA	1 ppm = 2.62 mg/m ³	PEL = 5 ppm REL = 2 ppm, ST 5 ppm TLV = 2 ppm, ST 5 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	MCE Cassette, 225-9005	NIOSH 6004	0.5-1.5 L/min; 180 L
	Dräger Pac III	0-100 ppm	Y													
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	N (Y w/option)													
	MIRAN SapphIRe**	6-30 ppm	Y													
	GFG Inc. Micro IV	1-10 ppm	Y													
	SPM	0.2-6 ppm	N (Y w/option)													
Particulate																
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N													
	eBAM	0-100 mg/m ³	N													

Instrument Guidance

Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEG-1			TEEL-0	ERP-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Radiation ²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	$\alpha = 2500 \text{ ft}^3$ $\beta/\gamma = 1250 \text{ ft}^3$
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.															



Table 15 -- Volcano



Notes:

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TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

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EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wisner.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SaphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

Vol. -- volume

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP ²	PID CF (ISO) ²	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA/AEL	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Nerve																
Tabun (GA)	APD 2000	15 ppb	N	NA	NA	1 ppm = 6.63 mg/m ³	WPL = 0.00003 mg/m ³ STEL = 0.0001 mg/m ³ GPL = 0.000001 mg/m ³	0.1 mg/m ³	0.00042 ppm (0.0028 mg/m ³)	0.00021 ppm (0.0014 mg/m ³)	0.00015 ppm (0.001 mg/m ³)	0.000125 ppm	0.00042 ppm*	Tenax Tube, DAAMS	NA	NA
	ChemPro 100i	0.1 mg/m ³	N													
	AP2C	1.5 ppb	N													
	AP4C	10 µg/m ³	N													
	SAW Mini-CAD	0.17 ppm	N													
	HAPSITE	0.1-10 ppb	N													
	M256 A-1	0.001 ppm	Y													
	Dräger CDS Tube	0.025 ppm	Y													
MultiRAE/AreaRAE PID**	0-2000 ppm	Y	0.8 (10.6 lamp)													
TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y	NA													
Sarin (GB)	APD 2000	15 ppb	N	NA	NA	1 ppm = 5.73 mg/m ³	WPL = 0.00003 mg/m ³ STEL = 0.0001 mg/m ³ GPL = 0.000001 mg/m ³	0.1 mg/m ³	0.00048 ppm (0.0028 mg/m ³)	0.00024 ppm (0.0014 mg/m ³)	0.00017 ppm (0.001 mg/m ³)	0.00015 ppm	0.00048 ppm*	XAD-2 OVS Tube, 226-30-16	OSHA CSI	1 L/min; 480 L
	ChemPro 100i	0.1 mg/m ³	N													
	AP2C	1.5 ppb	N													
	AP4C	10 µg/m ³	N													
	SAW Mini-CAD	0.17 ppm	N													
	HAPSITE	0.1-10 ppb	N													
	M256 A-1	0.0008 ppm	Y													
	Dräger CDS Tube	0.025 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	3-6 (10.6 lamp)												
TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y	<16 eV	NA												
Soman (GD)	APD 2000	15 ppb	N	NA	NA	1 ppm = 7.45 mg/m ³	WPL = 0.00003 mg/m ³ STEL = 0.0001 mg/m ³ GPL = 0.000001 mg/m ³	NA	0.00018 ppm (0.0014 mg/m ³)	0.000091 ppm (0.0007 mg/m ³)	0.000065 ppm (0.0005 mg/m ³)	0.00003 ppm	0.00018 ppm*	Sorbent Tube, DAAMS***	NA	NA
	ChemPro 100i	0.1 mg/m ³	N													
	AP2C	1.5 ppb	N													
	AP4C	10 µg/m ³	N													
	SAW Mini-CAD	0.02 ppm	N													
	HAPSITE	0.1-10 ppb	N													
	M256 A-1	0.001 ppm	Y													
	Dräger CDS Tube	0.025 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	~3 (10.6 lamp)												
TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y	<10.6 eV	NA												

Table 16 -- Chemical Warfare Agents

Instrument Guidance

Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP ²	PID CF (ISO) ²	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA/AEL	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Nerve (continued)																
Cyclo-Sarin (GF)	APD 2000	15 ppb	N	NA	NA	1 ppm = 7.36 mg/m ³	PEL = 0.003 mg/m ³ U-STEEL = 0.001 mg/m ³ WPL = 0.00003 mg/m ³ GPL = 0.000001 mg/m ³ A-TWA = 0.00003 mg/m ³	NA	0.00020 ppm (0.0014 mg/m ³)	0.0001 ppm (0.0007 mg/m ³)	0.00007 ppm (0.0005 mg/m ³)	0.00006 ppm	0.0002 ppm*	NA	NA	NA
	ChemPro 100i	0.1 mg/m ³	N													
	AP2C	1.5 ppb	N													
	AP4C	10 µg/m ³	N													
	SAW Mini-CAD	0.01 ppm	N													
	HAPSITE	0.1-10 ppb	N													
	M256 A-1	0.002 ppm	Y													
	Dräger CDS Tube	0.025 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.6 eV	~3 (10.6 lamp)											
TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y	NA													
VX	APD 2000	15 ppb	N	NA	NA	1 ppm = 10.93 mg/m ³	STEL = 0.00001 mg/m ³ WPL = 0.000001 mg/m ³ GPL = 0.0000006 mg/m ³	0.003 mg/m ³	0.000016 ppm (0.00017 mg/m ³)	0.0000091 ppm (0.0001 mg/m ³)	0.0000065 ppm (0.000071 mg/m ³)	0.000005 ppm	0.000016 ppm*	Sorbent Tube, Tenax	NA	NA
	ChemPro 100i	0.1 mg/m ³	N													
	AP2C	1.5 ppb	N													
	AP4C	10 µg/m ³	N													
	SAW Mini-CAD	0.01 ppm	N													
	HAPSITE	0.1-10 ppb	N													
	M256 A-1	0.002 ppm	Y													
	Dräger CDS Tube	0.025 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y													
	TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y	~0.5 (10.6 lamp)												
				NA												
Blister																
Mustard (H) & Distilled Mustard (HD)	APD 2000	300 ppb	N	NA	NA	1 ppm = 6.5 mg/m ³	STEL = 0.003 mg/m ³ WPL = 0.0004 mg/m ³ GPL = 0.00002 mg/m ³	0.7 mg/m ³	0.01 ppm (0.067 mg/m ³)	0.003 ppm (0.017 mg/m ³)	0.001 ppm (0.0083 mg/m ³)	0.0035 ppm	0.01 ppm*	Sorbent Tube, Tenax	NA	NA
	ChemPro 100i	2 mg/m ³	N													
	AP2C	1.5 ppb	N													
	AP4C	0.5 mg/m ³	N													
	SAW Mini-CAD	0.09 ppm	N													
	HAPSITE	0.1-10 ppb	N													
	M256 A-1	0.31 ppm	Y													
	Dräger CDS Tube	1 mg/m ³	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	<11.1 eV	~0.5 (10.6 lamp)											
	TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y		NA											



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP ²	PID CF (ISO) ²	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA/AEL	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/Total Volume
Blister (continued)																
Nitrogen Mustard (HN1, HN2, HN3)	APD 2000	300 ppb	N	NA	NA	1 ppm = HN1 -- 6.95 mg/m ³ HN2 -- 6.38 mg/m ³ HN3 -- 8.36 mg/m ³	NA	HN1 = 1 ppm HN2 =NI HN3 = NI	0.0022 mg/m ³ *	0.0056 mg/m ³ *	0.0028 mg/m ³ *	HN1: 0.004 mg/m ³ 001 mg/m ³ HN3: 0.001 mg/m ³	HN1: 0.0125 mg/m ³ * HN2: 0.003 mg/m ³ * HN3: 0.003 mg/m ³ *	NA	NA	NA
	ChemPro 100i	5 mg/m ³ (HN3)	N													
	AP4C	10 mg/m ³	N													
	SAW Mini-CAD	does not	N													
	M256 A-1	0.6 ppm	Y													
	Dräger CDS Tube	1 mg/m ³	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	<11.1 eV	~0.5 (10.6 lamp)											
TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y	NA													
Lewisite (L)	APD 2000	200 ppb	N	NA	NA	1 ppm = 8.47 mg/m ³	NA	NA	0.12 mg/m ³ *	0.035 mg/m ³ *	0.018 mg/m ³ *	0.12 mg/m ³	0.12 mg/m ³ *	Sorbent Tube, Tenax	NA	NA
	ChemPro 100i	2 mg/m ³	N													
	AP4C	1.5 mg/m ³	N													
	M256 A-1	1 ppm	Y													
	Dräger CDS Tube	3 mg/m ³	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	~10.6 eV	1 (10.6 lamp)											
	TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y		NA											
Phosgene Oxime (CX)	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	~10.6 eV	1 (10.6 lamp)	1 ppm = 4.66 mg/m ³	NA	NA	0.028 mg/m ³	0.0069 mg/m ³	0.0035 mg/m ³	0.0075 mg/m ³	0.028 mg/m ³ *	NA	NA	NA
	TVA 1000B**	0.5-2000 ppm (PID) 1-50,000 ppm (FID)	Y		NA											
Systemic/Blood																
Hydrogen Cyanide (AC), HCN	AP4C	10 mg/m ³ or 1.5 ppm	N	NA	NA	1 ppm = 1.1 mg/m ³	REL = ST 4.7 mg/m ³ S PEL = 10 ppm S TLV = C 4.7 ppm S	50 ppm	2 ppm	1.3 ppm	1 ppm	1.9 ppm	2 ppm*	Soda Lime Tube, 226-28	NIOSH 6010	0.05-0.2 L/min; 2-90 L
	ChemPro 100i	50 mg/m ³	N													
	M256 A-1	7.13 ppm	Y													
	Dräger CDS Tube	1 ppm	Y													
	Dräger CDS Chips	2 ppm	Y													
Cyanogen Chloride (CK)	M256 A-1	0.25 ppm	Y	12.34 eV	NA	1 ppm = 2.51 mg/m ³	REL = C 0.3 mg/m ³ TLV = C 0.3 ppm	NA	NA	NA	NA	0.02 ppm	0.06 ppm*	XAD-2 Tube, 226-117	OSHA CSI	0.2 L/min; 1 L
	ChemPro 100i	50 mg/m ³	N													
	Dräger CDS Tube	3.13 ppm	Y													

Table 16 -- Chemical Warfare Agents

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP ²	PID CF (ISO) ²	Conversion	Occupational Action Levels		A EGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA/AEL	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Systemic/Blood (continued)																
Arsine (SA)	ChemPro 100i	3 ppm	N	9.89 eV	NA	1 ppm = 3.19 mg/m ³	REL = C 0.002 mg/m ³ PEL = 0.05 ppm TLV = 0.05 ppm	3 ppm	0.17 ppm*	0.04 ppm*	0.02 ppm*	0.005 ppm	0.025 ppm*	Anasorb CSC Tube, 226-01	NIOSH 6001	0.02-0.2 L/min; 10 L
	Dräger CDS Tube	0.1 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y													
	TVA 1000B**	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Radiation³																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																



Table 16 -- Chemical Warfare Agents

Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels.

² Estimated response of warfare agent detection products by PID. Source: RAE TN-159.

⁴ Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

PAC-1 is based on the applicable AEGL-1, ERPG-1, or TEEL-1 value

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aeql/pubs/chemlist.htm>

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

<http://wiser.nlm.nih.gov/>

<http://www.skinc.com/>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

CDC NIOSH Pocket Guide to Chemical Hazards website

WISER website

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

*PAC-1--There are no ERPG-1 for this compound

**PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

***The method can capture GD, but laboratory analysis capability maybe limited.

Acronyms:

~ -- approximately

≥ -- greater than or equal to

< -- less than

A-TWA -- ATSDR time-weighted average

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

AEL -- airborne exposure limits (CDC)

ATSDR -- Agency for Toxic Substances and Disease Registry

C -- ceiling (concentrations that should not be exceeded during any part of work exposure)

C-STEL -- CDC short-term exposure limit

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

cpm -- counts per minute

DAAMS - Depot Area Air Monitoring System

DOE -- U.S. Department of Energy

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

GPL -- general population limit

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

mg/m³ -- milligrams per cubic meter

µg/m³ -- micrograms per cubic meter

µR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppb -- parts per billion

ppm -- parts per million

R/hr -- Roentgens per hour

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

STEL -- short-term exposure limit

TEEL -- temporary emergency exposure limit (DOE)

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

WISER -- Wireless Information System for Emergency Responders

WPL -- worker population limit

Y w/option - yes with option; see manufacturer's instrument manual for information



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERP-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Benzene	UltraRAE-PID***	0.1-2000 ppm	Y	9.24 eV	NA	1 ppm = 3.19 mg/m ³	PEL = 1 ppm REL = 0.1 ppm, ST 1 ppm TLV = 10 ppm	500 ppm	52 ppm	18 ppm	9 ppm	1 ppm	50 ppm	Anasorb CSC Tube, 226-01	NIOSH 1501	≤0.2 L/min; 6 L
	Dräger Tube	≥0.5-10 ppm	Y													
	Dräger Chip	≥0.2-10 ppm	N (Y w/option)													
	MIRAN SapphlRe**	10-200 ppm	Y													
	ppbRAE-PID***	1ppb-200ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		0.53 (10.6 lamp)											
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y		10.6 lamp 0.702 (10 ppm) - 1.781 (2000 ppm)											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m3	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
	MIRAN SapphlRe**	4.5-250 ppm	Y													
Ethanol	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	10.47 eV	10 (10.6 lamp)	1 ppm = 1.89 mg/m ³	PEL = 1000 ppm REL = 1000 ppm TLV = 1000 ppm	3300 ppm	NA	NA	NA	500 ppm	1800 ppm	Anasorb CSC Tube, 226-01	NIOSH 1400 (Alcohols I)	≤ 0.05 L/min; 1 L
	Dräger Tube	25-2000 ppm	Y													
	Dräger Chip	100-2500 ppm	N (Y w/option)													
	MIRAN SapphlRe*	5-2000 ppm	Y													
		0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Gasoline	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	NA	0.9	1 ppm = 4.5 mg/m ³ (approx.)	PEL = None TLV = 300 ppm	NA	730 ppm	730 ppm	730 ppm	200 ppm	200 ppm	Anasorb CSC Tube, 226-01	OSHA PV2028	≤ 0.1 L/min (10 L max vol.); 10 L
		TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)		Y											
Nitric Oxide	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y	11.95 eV	NA	1 ppm = 1.23 mg/m ³	PEL = 25 ppm REL = 25 ppm TLV = 25 ppm	100 ppm	NA	NA	NA	0.5 ppm	NA	Molecular Sieve Tube, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	ToxiRAE II NO	0-250 ppm	Y													
	Dräger Pac III	0-100 ppm	Y													
	GFG Inc. Micro IV	0-100 ppm	Y													



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Hydrogen Sulfide	MultiRAE/AreaRAE H ₂ S Sensor	0-100 ppm	Y	10.46 eV	NA	1 ppm = 1.4 mg/m ³	PEL = C 20 ppm, 50 ppm (10 mins) REL = C 10 ppm (10 mins) TLV = 10 ppm, ST 15 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Silica Gel Tube, 266-177	OSHA 1008	0.05 L/min; 12 L
	MultiRAE Pro H ₂ S Sensor	0-1000 ppm ext. range	Y													
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)		3.3 (10.6 lamp)											
	SPM	1.1-30 ppm	N (Y w/option)													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	GFG Inc. Micro IV	0-500 ppm	Y		NA											
TVA 1000B***	0.5-2,000 ppm (PID)	Y														
Sulfur Dioxide	MultiRAE/AreaRAE SO ₂ Sensor	0-20 ppm	Y	12.3 eV	NA	1 ppm = 2.62 mg/m ³	PEL = 5 ppm REL = 2 ppm, ST 5 ppm TLV = 2 ppm, ST 5 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	MCE Cassette, 225-9005	NIOSH 6004	0.5-1.5 L/min; 180 L
	Dräger Pac III	0-100 ppm	Y													
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	N (Y w/option)													
	MIRAN SapphIRe**	6-30 ppm	Y													
	GFG Inc. Micro IV	1-10 ppm	Y													
SPM	0.2-6 ppm	N (Y w/option)														
Ammonia	MultiRAE/AreaRAE NH ₃ Sensor	0-50 ppm	Y	10.18 eV	NA	1 ppm = 0.7 mg/m ³	PEL = 50 ppm REL = 25 ppm, ST 35 ppm TLV = 25 ppm, ST 35 ppm	300 ppm	30 ppm	30 ppm	30 ppm	30 ppm	25 ppm	Silica Gel Tube, 226-10-06	NIOSH 6015	0.1-0.2 L/min; 72 L
	MultiRAE Pro NH ₃ Sensor	0-100 ppm	Y													
	Dräger Tube	≥0.25-3 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)													
	Dräger Pac III	0-300 ppm	Y													
	SPM	2.6-75 ppm	N (Y w/option)													
	ToxiRAE II NH ₃	0-50 ppm	Y													
	MIRAN SapphIRe*	0-500 ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		9.7 (10.6 lamp)											
TVA 1000B***	0.5-2,000 ppm (PID)	Y	10.6 lamp 21.666 (10 ppm) - 22.980 (2000 ppm)													
Sodium Hydroxide	Dräger pH Tube	Qualitative	Y	NA	NA	NA	PEL = 2 mg/m ³ REL = C 2 mg/m ³ TLV = C 2 mg/m ³	10 mg/m ³	NA	NA	NA	0.5 mg/m ³	0.5 mg/m ³	PTFE Filter, 225-17-01	NIOSH 7401	1-4 L/min; 360 L
	pH Paper	NA	Y													
Sulfuric Acid	Dräger Tube	1-5 mg/m ³	Y	12.4 eV	NA	NA	PEL = 1 mg/m ³ REL = 1 mg/m ³ TLV = 1 mg/m ³ , ST 3 mg/m ³	15 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	2 mg/m ³	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	pH Paper	NA	Y													
	SPM	26-750 ppb	N (Y w/option)													

Table 17 -- Ethanol (Spill, Release, or Fire)

Instrument Guidance

Regulatory Guidance

Reference

Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Particulate																
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N													
	eBAM	0-100 mg/m ³	N													
Radiation ²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft ³ β/γ = 1250 ft ³
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																

EMERGENCY
RESPONSE
TECHNICAL
GROUP

Table 17 -- Ethanol (Spill, Release, or Fire)



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wisner.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

Vol. -- volume

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Red-Fuming Nitric Acid	Dräger Tube	≥1-50 ppm	Y	11.95 eV	NA	1 ppm = 2.58 mg/m ³	REL = 2 ppm PEL = 2 ppm TLV = 2 ppm	25 ppm	0.53 ppm	0.53 ppm	0.53 ppm	0.53 ppm	1 ppm	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2 L/min, 48 L
	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y													
	MultiRAE/AreaRAE NO ₂ Sensor	0-20 ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
Nitrous Oxide	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y	12.89 eV	NA	1 ppm = 1.80 mg/m ³	REL = 25 ppm TLV = 50 ppm	NA	NA	NA	NA	50 ppm	150 ppm*	PVDF Bag, 248-05	NIOSH 6600	0.1-4 L/min; 3 L
	MultiRAE/AreaRAE NO ₂ Sensor	0-20 ppm	Y													
Hydroxyl-terminated polybutadiene	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	REL = 50 ppm Ca PEL = 1 ppm TLV = 2 ppm	NA	NA	NA	NA	NA	NA	NA	NA	NA
	DataRAM 4****	0.001-400 mg/m ³	N													
	ppbRAE-PID***	1ppb-200ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
Ammonium Perchlorate	MultiRAE/AreaRAE Cl ₂ Sensor	0-10 ppm	Y	NA	NA	NA	NA	NA	NA	NA	NA	5 mg/m ³	15 mg/m ³ *	NA	NA	NA
	Dräger Tube ClO ₂	0.025-3 ppm	Y													
	Dräger Tube HCl	≥1-10 ppm	Y													
	MultiRAE/AreaRAE O ₂ Sensor	0-30% Vol.	Y													
Acetaldehyde	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	10.22 eV	6 (10.6 lamp)	1 ppm = 1.80 mg/m ³	REL = Ca PEL = 200 ppm TLV = C 25 ppm	2000 ppm Ca	45 ppm	45 ppm	45 ppm	25 ppm	10 ppm	XAD-2 Tube, 226-27	NIOSH 2538	0.02 L/min; 10 L
	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y													
	Dräger Tube	100-1000 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m ³	REL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
	MIRAN SapphRe**	4.5-250 ppm	Y													



*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.

Table 18 -- Spacecraft Debris



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wisner.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

Spacecraft Maximum Allowable Concentrations for Selected Airborne Contaminates, Volume 5, 2008

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SaphiRe has problems with complex mixtures (e.g.; distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PBAN -- polybutadiene acrylic acid acrylonitrile

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

Vol. -- volume

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information



Table 19 -- Special Event

(Also refer to Hazardous Evaluation Flow Chart for Unknowns and Table 16)

Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wiser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

*****Detectability after attack = 1 hour (2% OC); Designed to identify the presence of OC

Acronyms:

≥ -- greater than or equal to

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

Vol. -- volume

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Table 20 -- Clandestine Lab

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Acids																
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	2-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m ³	PEL = C 5 ppm REL = C 5 ppm TLV = C 5 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	0.5 ppm	NA	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	MultiRAE Pro HCl Sensor	0-15 ppm	Y													
	Dräger Tube	≥1-10 ppm	Y													
	Dräger Chip	≥1-25 ppm	N (Y w/option)													
	pH Paper	NA	Y													
	SPM	0.5-15 ppm	N (Y w/option)													
	Dräger Pac III	0-30 ppm	Y													
GFG Inc. Micro IV	0-30 ppm	Y														
Sulfuric Acid	Dräger Tube	1-5 mg/m ³	Y	12.4 eV	NA	NA	PEL = 1 mg/m ³ REL = 1 mg/m ³ TLV = 1 mg/m ³ , ST 3 mg/m ³	15 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	0.2 mg/m ³	2 mg/m ³	Silica Gel Tube, 226-10-03	NIOSH 7903	0.2-0.5 L/min; 48 L
	pH Paper	NA	Y													
	SPM	26-750 ppb	N (Y w/option)													
Hydriodic Acid (Iodine Vapors)	pH Paper	NA	Y	NA	NA	NA	NA	NA	1 ppm	1 ppm	1 ppm	0.35 ppm	1 ppm*	Anasorb 747 Tube, 226-80	OSHA ID 212	0.5 L/min; 2.5 L
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
VOCs and Gases																
Acetone	Dräger Tube	≥40-12,000	Y	9.69 eV	NA	1 ppm = 2.38 mg/m ³	REL = 250 ppm PEL = 1000 ppm TLV = 500 ppm	2500 ppm	200 ppm	200 ppm	200 ppm	200 ppm	200 ppm*	Anasorb CSC Tube, 226-01	NIOSH 1300	0.01 to 0.2 L/min; 2 L
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		1.1 (10.6 lamp)											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y	14.01 eV	NA	1 ppm = 1.15 mg/m ³	PEL = 50 ppm REL = 35 ppm, C 200 ppm TLV = 25 ppm	1200 ppm	83 ppm*	33 ppm*	27 ppm*	50 ppm	200 ppm	Sample Bag, 245-05	OSHA ID 209	NA
	MultiRAE Pro CO Sensor	0-2000 ppm ext. range	Y													
	Dräger Tube	≥2-300 ppm	Y													
	Dräger Chip	5-150 ppm	N (Y w/option)													
	ToxiRAE II CO	≥0-500 ppm	Y													
	GFG Inc. Micro IV	0-2000 ppm	Y													
MIRAN SapphIRe**	4.5-250 ppm	Y														
Carbon Dioxide	Dräger Pac III	0-5% Vol.	Y	13.77 eV	NA	1 ppm = 1.8 mg/m ³	PEL = 5000 ppm, ST 30,000 ppm REL = 5000 ppm, ST 30,000 ppm TLV = 5000 ppm, ST 30,000 ppm	40,000 ppm	NA	NA	NA	5000 ppm	NA	Carbon Dioxide Tube, 800-01381	NA	0.02-0.1 L/min; NA
	Dräger Tube	2-12% Vol.	Y													
	Dräger Chip	200-25,000 ppm	N (Y w/option)													
	MIRAN SapphIRe**	7.5-2000 ppm	Y													
Ether	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	9.53 eV	NA	1 ppm = 3.03 mg/m ³	REL = 400 ppm, ST 500 ppm PEL = 400 ppm TLV = 400 ppm, ST 500 ppm	1900 ppm	NA	NA	NA	400 ppm	500 ppm*	Anasorb CSC Tube, 226-01	NIOSH 1610	0.01 to 0.2 L/min; 0.25-3 L
Iodine Crystal (Iodine Vapors)	Dräger Tube	≥0.1-6 ppm	Y	9.31 eV	NA	1 ppm = 10.38 mg/m ³	REL = C 0.1 ppm PEL = C 0.1 ppm TLV = C 0.1 ppm	2 ppm	NA	NA	NA	0.01 ppm	0.1 ppm*	Anasorb CSC Tube, 226-67	NIOSH 6005	0.5 to 1 L/min; 15 L
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		0.1 (10.6 lamp)											

Table 20 -- Clandestine Lab

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Nitric Oxide	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y	11.95 eV	NA	1 ppm = 1.23 mg/m ³	PEL = 25 ppm REL = 25 ppm TLV = 25 ppm	100 ppm	NA	NA	NA	0.5 ppm	NA	Molecular Sieve Tube, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	ToxiRAE II NO	0-250 ppm	Y													
	Dräger Pac III	0-100 ppm	Y													
	GFG Inc. Micro IV	0-100 ppm	Y													
Nitrogen Dioxide	MultiRAE/AreaRAE NO ₂ Sensor	0-20 ppm	Y	9.75 eV	NA	1 ppm = 1.88 mg/m ³	PEL = C 5 ppm REL = ST 1 ppm TLV = 3 ppm, ST 5 ppm	20 ppm	0.5 ppm	0.5 ppm	0.5 ppm	0.5 ppm	1 ppm	Molecular Sieve Tube, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L
	Dräger Tube	≥0.5-25 ppm	Y													
	Dräger Chip	0.5-25 ppm	N (Y w/option)													
	SPM	0.3-9 ppm	N (Y w/option)													
	ToxiRAE II NO ₂	0-20 ppm	Y													
	Dräger Pac III	0-50 ppm	Y													
	GFG Inc. Micro IV	0-30 ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		16 (10.6 lamp)											
	TVA 1000B***	0.5-2,000 ppm (PID)	Y		NA											
Phosphine	MultiRAE/AreaRAE PH ₃ Sensor	0-5 ppm	Y	9.96 eV	NA	1 ppm = 1.39 mg/m ³	PEL = 0.3 mg/m ³ REL = 0.3 mg/m ³ , ST 1 ppm TLV = 0.3 mg/m ³	50 ppm	2 ppm*	0.5 ppm*	0.25 ppm*	0.3 ppm	NA	Silica Gel Tube, 226-165A	NIOSH 6002	0.01-0.2 L/min; 12 L
	ToxiRAE	0-5 ppm	Y													
	Dräger Pac III	0-10 ppm	Y													
	Dräger Tube	≥0.1-1 ppm	Y													
	Dräger Chip	0.1-2.5 ppm or higher	N (Y w/option)													
	GFG Inc. Micro IV	0-10 ppm	Y													
	SPM	32-900 ppb	N (Y w/option)													
MultiRAE/AreaRAE PID***	0-200 ppm	Y	3.9 (10.6 lamp)													
Red Phosphorus	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	10.49 eV	NA	NA	NA	NA	NA	NA	0.05 mg/m ³	0.4 mg/m ³ *	Tenax Tube, 226-35-03	NIOSH 7905	0.2 L/min; 12 L	
Toluene	Dräger Tube	≥5-1800 ppm	Y	8.82 eV	NA	1 ppm = 3.77 mg/m ³	REL = 100 ppm, ST 150 ppm REL = 200 ppm, C 300 ppm, 500 ppm (10-min. max. peak) TLV = 50 ppm S	500 ppm	200 ppm	200 ppm	200 ppm	20 ppm	50 ppm	Anasorb CSC Tube, 226-01	NIOSH 1501	≤0.2 L/min; 1-8 L
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		0.5 (10.6 lamp)											
Sodium Hydroxide	Dräger pH Tube	Qualitative	Y	NA	NA	NA	PEL = 2 mg/m ³ REL = C 2 mg/m ³ TLV = C 2 mg/m ³	10 mg/m ³	NA	NA	NA	0.5 mg/m3	0.5 mg/m3	PTFE Filter, 225-17-01	NIOSH 7401	1-4 L/min; 360 L
	pH Paper	NA	Y													

Table 20 -- Clandestine Lab

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Ammonia	MultiRAE/AreaRAE NH ₃ Sensor	0-50 ppm	Y	10.18 eV	NA	1 ppm = 0.7 mg/m ³	PEL = 50 ppm REL = 25 ppm, ST 35 ppm TLV = 25 ppm, ST 35 ppm	300 ppm	30 ppm	30 ppm	30 ppm	30 ppm	25 ppm	Silica Gel Tube, 226-10-06	NIOSH 6015	0.1-0.2 L/min; 72 L
	MultiRAE Pro NH ₃ Sensor	0-100 ppm	Y													
	Dräger Tube	≥0.25-3 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	N (Y w/option)													
	Dräger Pac III	0-300 ppm	Y													
	SPM	2.6-75 ppm	N (Y w/option)													
	ToxiRAE II NH ₃	0-50 ppm	Y													
	MIRAN SapphiRe*	0-500 ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
TVA 1000B***	0.5-2,000 ppm (PID)	Y	9.7 (10.6 lamp) 10.6 lamp 21.666 (10 ppm) - 22.980 (2000 ppm)													
Benzene	UltraRAE-PID***	0.1-2000 ppm	Y	9.24 eV	NA	1 ppm = 3.19 mg/m ³	PEL = 1 ppm REL = 0.1 ppm, ST 1 ppm TLV = 10 ppm	500 ppm	52 ppm	18 ppm	9 ppm	1 ppm	50 ppm	Anasorb CSC Tube, 226-01	NIOSH 1501	≤0.2 L/min; 6 L
	Dräger Tube	≥0.5-10 ppm	Y													
	Dräger Chip	≥0.2-10 ppm	N (Y w/option)													
	MIRAN SapphiRe**	10-200 ppm	Y													
	ppbRAE-PID***	1ppb-200ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Methanol	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	10.84 eV	NA	1 ppm = 1.31 mg/m ³	REL = 200 ppm, ST 250 ppm S PEL = 200 ppm TLV = 200 ppm S, ST 250 ppm S	6000 ppm	530 ppm	340 ppm	270 ppm	200 ppm	200 ppm	Silica Gel Tube, 226-51	NIOSH 2000	0.02-0.2 L/min; 5 L
	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y													
	TVA 1000B***	0.5-2,000 ppm (PID) 1-50,000 ppm (FID)	Y													
Particulate																
Particulate	Personal DataRAM****	0.001-400 mg/m ³	N	NA	NA	NA	PEL = 15 mg/m ³ (total), 5 mg/m ³ (respirable) TLV = 10 mg/m ³ (total), 3 mg/m ³ (respirable)	NA	NA	NA	NA	10 mg/m ³	NA	Filter (total) Cyclone + Filter (resp)	NIOSH 0500 (total) NIOSH 0600 (resp)	1-2 L/min (total) 1.7-2.5 L/min (resp)
	DataRAM 4****	0.001-400 mg/m ³	N													
	eBAM	0-100 mg/m ³	N													

4/5

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound ¹	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			TEEL-0	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Radiation ²																
Radiation	Ludlum Model 192	0-5,000 µR/hr	N	NA	NA	NA	60-100 µR/hr*	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	$\alpha = 2500 \text{ ft}^3$ $\beta/\gamma = 1250 \text{ ft}^3$
	Ludlum Model 2241-2 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
	Ludlum Model 2241-3 w/Pancake Probe	0-100,000 cpm or 0-200 mR/hr	N				300 cpm*									
*These are not TWA(s). Normal gamma radiation background is from 5-20 µR/hr; however, higher backgrounds may exist. If readings are 3 times background or greater than 60-100 µR/hr or greater than 300 cpm, then stop work and consult with a Health Physicist. Refer to Hazardous Evaluation Flow Chart for Unknowns in Attachment A.																

Table 20 -- Clandestine Lab



Notes:

For guidance only. These tables do not supersede a SSHASP at any time or on any response.

¹ Does not include all pollutants associated with this type of event, only the most common pollutants with the lowest action levels. Depending on the chemical of concern, certain Dräger tubes and chips can be used. In addition, single-gas instruments and sensors and/or a gas chromatography-mass spectrometry instrument may be used.

² Standard EPA Emergency Response Protocol is to screen for radiation with a Micro-R at all emergency responses. If readings are three times background, responders consult with a Health Physicist. Additional radiation equipment is available to monitor for Alpha, Beta and Gamma, but is not included in this table.

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects; however, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL-2 is the airborne concentration (expressed as ppm or mg/m³) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

TEEL-0 is the temporary level of concern derived according to a tiered, formula-like methodology; representing concentrations associated with no effects.

ERPG-1 is the acute exposure concentration of the general population for up to 1 hour associated with effects expected to be mild or transient.

Data on tables are from the following sources:

<http://www.epa.gov/oppt/aegl/pubs/chemlist.htm>

EPA's website used to research AEGLs using the chemical's name or chemical abstracts service registry numbers.

<http://www.cdc.gov/niosh/npg/npgsyn-a.html>

CDC NIOSH Pocket Guide to Chemical Hazards website

<http://wiser.nlm.nih.gov/>

WISER website

<http://www.skinc.com/>

SKC, Inc. website (Air Sampling Media Part No. is specific to SKC)

*AEGL-2--There are no AEGL-1 for this compound

**MIRAN SapphiRe has problems with complex mixtures (e.g., distinguishing benzene from gasoline vapor)

***PIDs/FIDs are non-specific detectors and cannot differentiate between VOCs, even with CFs applied. See RAE PID CF Guidance Document TN-106 for information and TVA Response Factor document P/N 50039 THERMO.

****Personal DataRAMs/DataRAMs are non-specific detectors and cannot differentiate between particulates

Acronyms:

≥ -- greater than or equal to

% -- percent

ACGIH -- American Conference of Governmental Industrial Hygienists

AEGL -- acute exposure guideline levels

CDC -- Centers for Disease Control and Prevention

CF -- conversion factor

CO -- carbon monoxide

cpm -- counts per minute

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

mg/m³ -- milligrams per cubic meter

μR/hr -- micro Roentgens per hour

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

OSHA -- Occupational Safety and Health Administration

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- time-limited value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

Vol. -- volume

WISER -- Wireless Information System for Emergency Responders

Y w/option - yes with option; see manufacturer's instrument manual for information

Attachment A – Hazard Evaluation Flowchart for Unknowns



Hazard Evaluation Flow Chart for Unknowns

Early Considerations!

Collect intelligence, Document signs and symptoms of victims, Evaluate scene and situation, Potential explosives should be evaluated by the local bomb squad, Cordon off area, Isolate, Evacuate, Disable HVAC, Seal doors and cracks, Delineate hotzone (wind direction and intensity), Turn on radiation meter while preparing entry, Approach uphill/upwind/upstream, Follow H&S plan, Sampling plan, and Decontamination procedures for personnel/sample containers/equipment, Conduct written and photographic documentation, Consult with Incident Commander and law enforcement

Calibrate instruments/Collect background readings

Team dons Level A or B PPE (consult with H&S Manager)

Air

Team enters hot zone

Liquid/Solid

1st Entry: Multi-Gas Monitor with PID* (MultiRAE); CGI/O₂*; Radiation Meter (Gamma); Ratemeter with Pancake Probe; FID; AP2C; AP4C; M256 Kit; Chemical Agent Detector Strips; digital camera

2nd Entry: Dräger tubes/chips; Multi-Gas Monitor with PID (MultiRAE); Chemical Specific Monitor (ToxiRAE); SAM940; identiFINDER; Ratemeter with Pancake Probe; SPM; Lumex MVA

Collect Air Samples As Appropriate

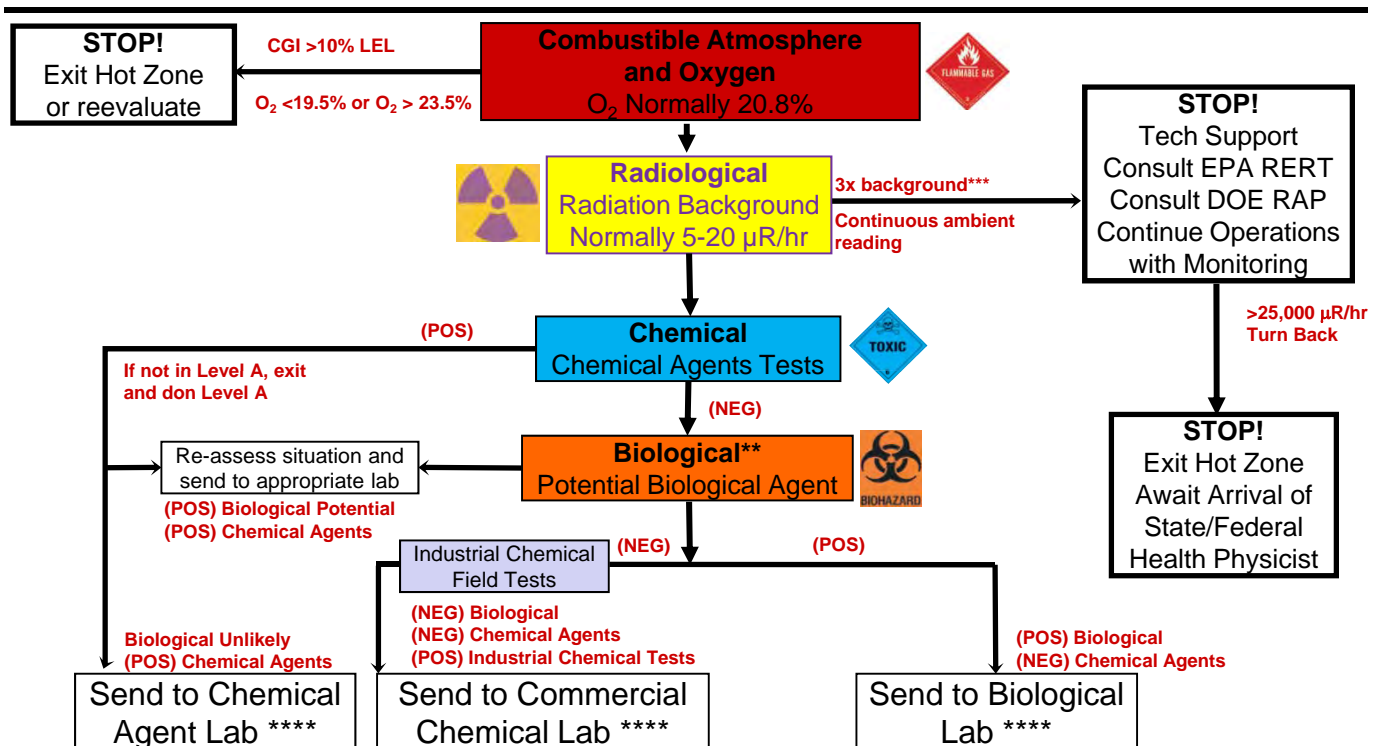
Additional Monitoring: Portable GCMS; Particulate Monitor (DataRAM); AreaRAE; TAGA; ASPECT

1st Entry: Multi-Gas Monitor with PID* (MultiRAE); CGI/O₂*; Radiation Meter (Gamma); Ratemeter with Pancake Probe; FID; pH Paper; AP2C; AP4C; M8/M9 Paper; digital camera

2nd Entry: Dräger tubes/chips; Multi-Gas Monitor with PID (MultiRAE); Chemical Specific Monitor (ToxiRAE); SAM940; identiFINDER; Ratemeter with Pancake Probe; Lumex MVA

Collect Liquid/Solid Samples As Appropriate

Additional Monitoring: Portable GCMS; Raman Spectrometer (Ahura FD)HAZMAT ID FTIR; Industrial Chemical Field Tests; PCR



*Intrinsically safe

** If the situation is suspicious send samples to biological lab.

*** >60 to 100 mR/hr OR >300 cpm w/Pancake Probe

**** Send to lab if radiation is less than 3 times background. If above, consult with laboratory prior to shipping.