EPA Emergency Response Air Monitoring Guidance Tables

2020

DRAFT

Revision 1

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Executive Summary

Background

The United States Environmental Protection Agency (EPA) assembled the following 22 tables for use by field responders. The tables cover an array of response types and should be used for guidance only. This version is Revision 1 to the 2020 EPA Emergency Response Air Monitoring Guidance Tables. Use of previous versions should be discontinued.

These tables are considered a quick-reference guide to assist On-Scene Coordinators and field responders during an emergency response or a time-critical site clean-up. Additional guidance and resources may need to be consulted for supplementary 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 presented 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.*, TSI DustTrak) will 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 Pro) 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 compound analysis.

If you have any changes or revisions, please email:
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Glossary

~	approximately
>	greater than
<	less than
%	percent
µg/m^3	micrograms per cubic meter
α	alpha
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
β	beta
C	ceiling (concentrations that should not be exceeded during any part of work exposure)
C-STEL	CDC short-term exposure limit
Ca	carcinogen
CDC	Centers for Disease Control
CF	correction factor
Cl_2	chlorine
ClO_2	chlorine dioxide
CO	carbon monoxide
cpm	counts per minute
CSC	coconut shell charcoal
EPA	United States Environmental Protection Agency
eV	electron volt
FID	flame ionization detector
GPL	general public limit
H_2	hydrogen
HCHO	formaldehyde
HCl	hydrochloric acid
HCN	hydrocyanic acid
HF	hydrogen fluoride
H_2S	hydrogen sulfide
HGV	Health Guidance Value
IDLH	Immediately Dangerous to Life and Health
IP	ionization potential
ISO	isobutylene
LEL	lower explosive level
L	liters
L/min	liters per minute
m^3	cubic meter

Glossary (continued)

MCE	mixed cellulose ester membrane
mg/kg	milligram per kilogram
mg/m^3	milligram per cubic meter
MCE	mixed cellulose ester membrane
MPC	maximum permissible concentration
mm	millimeter
µR/hr	micro-Roentgens per hour
NA	not available/applicable
NA_2CO_3	sodium carbonate
ND	non-detect
ng/m^3	nanogram per cubic meter
NO	nitric oxide
NH_3	ammonia
NIOSH	National Institute for Occupational Safety and Health
NL	not listed
NR	no response
NRC DAC	US Nuclear Regulatory Commission derived air concentration
O_2	oxygen
OSHA	Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbon
PCE	perchloroethylene
PEL	Permissible Exposure Limit (OSHA)
PH_3	phosphine
PID	photoionization detector
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PTFE	polytetrafluoroethylene
PUF	polyurethane foam
PVC	polyvinyl chloride
PVDF	polyvinylidene fluoride
R/hr	Roentgens per hour
REL	Recommended Exposure Limit (NIOSH)
S	skin notation (compound may be absorbed through the skin)
SO_2	sulfur dioxide
SPM	Single-Point Monitor
SSHASP	site-specific health and safety plan
ST	short-term
STEL	Short-Term Exposure Limit
TLV	Threshold Limit Value (ACGIH)
TVA	toxic vapor analyzer
TWA	Time-Weighted Average
$µg/m^3$	micrograms per cubic meter

Glossary (continued)

µm	micrometer
µR/hr	micro Roentgens per hour
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
γ	gamma

Table 1 -- Acid (Spill or Release)

		Instrument Guidance				Regulatory Guidance							Reference		
						Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	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	0-15 ppm	Y	12.74 eV	1 ppm = 1.49 mg/m^3	PEL = C 5 ppm REL = C 5 ppm TLV = C 2 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	1.8 ppm	3 ppm	Cartridge - two 37-mm diameter quartz fiber filters, one filter impregnated with Na_2CO_3, 225-9032	NIOSH 7907	2 L/min; 30-600 L
	Dräger Tube	0.2-3 ppm, 3-20 ppm	Y												
	Dräger Chip	≥1-25 ppm	Y												
	pH Paper	0-14	Y												
	SPM Flex	0.02-20 ppm	Y												
Nitric Acid	Dräger Tube	1-15 ppm	Y	11.95 eV	1 ppm = 2.58 mg/m^3	PEL = 2 ppm REL = 2 ppm, ST 4 ppm TLV = 2 ppm, ST 4 ppm	25 ppm	0.16 ppm	0.16 ppm	0.16 ppm	0.16 ppm	1 ppm	Cartridge - two 37-mm diameter quartz fiber filters, one filter impregnated with Na_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	pH Paper	0-14	Y												
	SPM Flex	0.02-20 ppm	Y												
Sulfuric Acid	Dräger Tube	1-5 mg/m^3	Y	12.4 eV	NA	PEL = 1 mg/m^3 REL = 1 mg/m^3 TLV = 0.2 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	Polytetrafluoroethylene (PTFE), 0.45 um pore size, 225-1704	NIOSH 7908	1-5 L/min; 15-2000 L
	pH Paper	0-14	Y												
	SPM Flex	0.005-0.75 ppm	Y												
Hydrocyanic Acid (Hydrogen Cyanide)	MultiRAE/AreaRAE HCN Sensor	0-50 ppm	Y	13.6 eV	1 ppm = 1.1 mg/m^3	PEL = 10 ppm S REL = ST 4.7 ppm S TLV = 4.7 ppm S	50 ppm	2.0 ppm	1.3 ppm	1 ppm	2 ppm	NA	Sorbent Tube – soda lime and glass fiber filter, 226-28	NIOSH 6017	0.05-0.2 L/min; 2-90 L
	Dräger Tube	0.5-50 ppm, 5-50 ppm	Y												
	Dräger Chip	2-50 ppm	Y												
	pH Paper	0-14	Y												
	SPM	0.2-30 ppm	Y												
Hydrofluoric Acid (Hydrogen Fluoride)	AreaRAE HF Sensor	0.5-10 ppm	Y	15.98 eV	1 ppm = 0.82 mg/m^3	PEL = 3 ppm REL = C 3 ppm, ST 6 ppm TLV = C 2 ppm S, 0.5 ppm	30 ppm	1 ppm	1 ppm	1 ppm	1 ppm	2 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3, 225-9031	NIOSH 7906	1-2 L/min; 15-1000 L
	Dräger Tube	0.5-15 ppm, 10-90 ppm	Y												
	pH Paper	0-14	Y												
	SPM Flex	0.4-20 ppm	Y												
Hydrobromic Acid	pH Paper	0-14	Y	11.62 eV	1 ppm = 3.31 mg/m^3	PEL = 3 ppm REL = C 3 ppm TLV = C 2 ppm	30 ppm	1 ppm	1 ppm	1 ppm	1 ppm	NA	Cartridge - two 37-mm diameter quartz fiber filters, one filter impregnated with Na_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	SPM Flex	0.02-10 ppm	Y												
Acetic Acid	Dräger Tube	5-80 ppm	Y	10.66 eV	1 ppm = 2.46 mg/m^3	PEL = 10 ppm REL = 10 ppm, ST 15 ppm TLV = 10 ppm, ST 15 ppm	50 ppm	NA	NA	NA	5 ppm	5 ppm	Sorbent Tube – charcoal 226-01	NIOSH 1603	0.01-1 L/min; 20-300 L
	Dräger Chip	2-50 ppm	Y												
	pH Paper	0-14	Y												

Table 1 -- Acid (Spill or Release)

Instrument Guidance						Regulatory Guidance							Reference		
						Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	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	1-30% Vol.	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
Radiation[2]															
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Model 2241 w/ Model 44-10 NaI Detector	0-9,999 R/hr or 999,000 cpm	N			300 cpm									

Table 1 -- Acid (Spill or Release)

Notes:
DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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.
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.
Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

*Ionization potential value not availble in the NIOSH pocket guide to chemical hazards. IP information from the Nastional Institute of Standards and Technology.

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
HCL -- hydrochloric acid
HCN -- hydrocyanic acid
HF -- hydrogen fluoride
IDLH -- immediately dangerous to life and health
IP -- ionization potential
L/min -- liter per minute
mg/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
NIOSH -- National Institute for Occupational Safety and Health
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
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 -- threshold limit value (ACGIH)
TWA -- time-weighted average
Vol. -- volume
WISER -- Wireless Information System for Emergency Responders

Table 2 - Ammonia (Spill or Release)

	Instrument Guidance						Regulatory Guidance								Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound	**Instrument**	**Detection Level**	**Intrinsically Safe (Y/N)**	**IP**	**PID LAMP, CF (ISO)**	**Conversion**	**TWA**	**IDLH**	**1-hr**	**4-hr**	**8-hr**	**15-min TWA**	**1-hr**	**Media**	**Method**	**Flow Rate/ Total Volume**
Gas																
Ammonia	AreaRAE NH_3 Sensor	0-100 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	Sorbent Tube, Silica Gel, 226-10-06	NIOSH 6015, NIOSH 6016	0.1-0.2 L/min; 96 L max
	MultiRAE Pro NH_3 Sensor	0-100 ppm	Y													
	Dräger Tube[2]	2-30 ppm	Y													
	Dräger Chip[2]	2-50 ppm	Y													
	SPM Flex	0.01-150 ppm	Y													
	MultiRAE/AreaRAE PID*	0-2000 ppm	Y		10.6 lamp, 10.9 11.7 lamp, 5.7											
Radiation[1]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 2 - Ammonia (Spill or Release)

Notes:

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[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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

[2] Dräger tubes are available at lower detection limits; however, the tubes listed have detection ranges within the action levels.

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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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/	Wireless Information System for Emergency Responders (WISER) website
http://www.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

*PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information.

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/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NH_3 -- ammonia
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
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 -- threshold limit value (ACGIH)
TWA -- time-weighted average
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

Table 3 - Chemical Plant (Fire)

	Instrument Guidance						Regulatory Guidance									Reference		
							Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	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 PGM-7360 (benzene specific mode)**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	NA	NA	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA													
	Dräger Chip	0.2-10 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47													
	TVA 2020**	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y															
	Dräger Chip	5-150 ppm	Y															
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y															
	Dräger Chip	≥0.2-5 ppm	Y															
	SPM Flex	0.001-9.999 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3													
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y															
	Dräger Chip	≥0.4-10 ppm	Y															
	SPM Flex	0.01-2.5 ppm	Y															
Nitric Oxide	UltraRAE PGM-7360**	0.05-10000 ppm	Y	9.27 eV	9.8 lamp, 6	1 ppm = 1.23 mg/m^3	NA	NA	PEL = 25 ppm REL = 25 ppm TLV = 25 ppm	100 ppm	NR	NR	NR	0.5 ppm	NA	Sorbent Tube, Molecular Sieve, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y		NA													
Vinyl Chloride	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.99 eV	10.6 lamp, 2	1 ppm = 2.56 mg/m^3	NA	NA	PEL = 1 ppm, C 5 ppm (15 mins) REL = Ca TLV = 1 ppm	NA	250 ppm	140 ppm	70 ppm	250 ppm	500 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1007/TO 15	0.05 L/min; <200mL/min (6L Summa); 0.7-5 L
	Dräger Tube	0.5-5 ppm, 5-30 ppm	Y		NA													
	Dräger Chip	≥0.3-10 ppm	Y															
	TVA 2020**	0.5-2,000 ppm (PID)	Y		10.6 lamp 1.281 (10 ppm) - 1.234 (1000 ppm)													

Table 3 - Chemical Plant (Fire)

	Instrument Guidance						Regulatory Guidance									Reference		
							Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	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)																		
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	13 ppm	0.5 ppm	0.5 ppm	0.5 ppm	0.5 ppm	1 ppm	Sorbent Tube, Molecular Sieve, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L
	Dräger Tube	0.1-5 ppm, 5-30 ppm	Y															
	Dräger Chip	0.5-25 ppm	Y															
	SPM Flex	0.3-10 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 16													
TCE	Dräger Tube	2-50 ppm, 20-250 ppm	Y	9.45 eV	NA	1 ppm = 5.37 mg/m^3	NA	NA	PEL = 100 ppm, C 200 ppm, 300 ppm (5 mins) REL = Ca TLV = 10 ppm, ST 25 ppm	1000 ppm Ca	130 ppm	84 ppm	77 ppm	130 ppm	100 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa canister/Tedlar Bag	NIOSH 1022/ TO 15	0.01-0.2 L/min; 1-30L; <200 mL/min
	Dräger Chip	≥5-100 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.54													
Phosgene	Dräger Tube	0.02-1 ppm	Y	11.55 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*	0.027 ppm	NA	Sorbent Tube, XAD-2, 226-117	OSHA 61	1 L/min; 240 L
	Dräger Chip	0.05-2 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		11.7 lamp, 8.5													
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	0-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m^3	NA	NA	PEL = C 5 ppm REL = C 5 ppm TLV = C 2 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	1.8 ppm	3 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	Dräger Tube	0.2-3 ppm, 3-20 ppm	Y															
	Dräger Chip	≥1-25 ppm	Y															
	pH Paper	0-14	Y															
	SPM Flex	0.02-20 ppm	Y															
Nitric Acid	Dräger Tube	1-15 ppm, 15-50 ppm	Y	11.95 eV	NA	1 ppm = 2.58 mg/m^3	NA	NA	PEL = 2 ppm REL = 2 ppm, ST 4 ppm TLV = 2 ppm, ST 4 ppm	25 ppm	0.16 ppm	0.16 ppm	0.16 ppm	0.16 ppm	1 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	pH Paper	0-14	Y															
	SPM Flex	0.02-20 ppm	Y															
Sulfuric Acid	Dräger Tube	1-5 mg/m^3	Y	12.4 eV	NA	NA	NA	NA	PEL = 1 mg/m^3 REL = 1 mg/m^3 TLV = 0.2 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	Filter, 37-mm diameter quartz fiber 225-1827	NIOSH 7908	1-5 L/min; 15-2000 L
	pH Paper	0-14	Y															
	SPM Flex	0.005-0.75 ppm	Y															

Table 3 - Chemical Plant (Fire)

	Instrument Guidance						Regulatory Guidance									Reference		
							Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	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)																		
Acetic Acid	Dräger Tube	5-80 ppm	Y	10.66 eV	NA	1 ppm = 2.46 mg/m^3	NA	NA	PEL = 10 ppm REL = 10 ppm, ST 15 ppm TLV = 10 ppm, ST 15 ppm	50 ppm	NA	NA	NA	5 ppm	5 ppm	Sorbent Tube, Anasorb CSC, 226-01	NIOSH 1603	0.01-1 L/min; 20-300 L
	Dräger Chip	2-50 ppm	Y															
	pH Paper	0-14	Y															
Hydrobromic Acid	pH Paper	0-14	Y	11.62 eV	NA	1 ppm = 3.31 mg/m^3	NA	NA	PEL = 3 ppm REL = C 3 ppm TLV = C 3 ppm	30 ppm	1 ppm	1 ppm	1 ppm	1 ppm	NA	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	SPM Flex	0.02-10 ppm	Y															
Hydrocyanic Acid (Hydrogen Cyanide)	MultiRAE/AreaRAE HCN Sensor	0-50 ppm	Y	13.6 eV	NA	1 ppm = 1.1 mg/m^3	NA	NA	PEL = 10 ppm S REL = ST 4.7 ppm S TLV = 4.7 ppm S	50 ppm	2.0 ppm	1.3 ppm	1 ppm	2 ppm	NA	Sorbent Tube – soda lime and glass fiber filter 226-28	NIOSH 6017	0.05-0.2 L/min; 2-90 L
	Dräger Tube	0.5-50 ppm, 5-50 ppm	Y															
	Dräger Chip	2-50 ppm	Y															
	pH Paper	0-14	Y															
	SPM	0.2-30 ppm	Y															
Hydrofluoric Acid (Hydrogen Fluoride)	AreaRAE HF Sensor	0.5-10 ppm	Y	15.98 eV	NA	1 ppm = 0.82 mg/m^3	NA	NA	PEL = 3 ppm REL = C 3 ppm, ST 6 ppm TLV = C 2 ppm S, 0.5 ppm	30 ppm	1 ppm	1 ppm	1 ppm	1 ppm	2 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9031	NIOSH 7906	1-2 L/min; 15-1000 L
	Dräger Tube	0.5-15 ppm, 10-90 ppm	Y															
	pH Paper	0-14	Y															
	SPM Flex	0.4-20 ppm	Y															
Metals - as particulates																		
Lead	TSI DustTrak II***	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Mercury	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	NA	1 µg/m^3	3 µg/m^3	PEL = C 0.1 mg/m^3 (100 µg/m^3) S REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m3) TLV = 0.025 mg/m^3 S (25 µg/m3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m3)	0.67 mg/m^3* (670 µg/m3)	0.33 mg/m^3* (330 µg/m3)	0.15 mg/m^3 (150 µg/m3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m3	N															
	Jerome 431X	0.003 to 0.999 mg/m^3	N															
	Jerome J405	0.5-999 µg/m^3	N															
	Jerome 505	0.05-0.500 µg/m^3	N															
	Dräger Tube	0.05-2 mg/m^3	Y															

Table 3 - Chemical Plant (Fire)

	Instrument Guidance						Regulatory Guidance									Reference		
							Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	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)	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	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	1.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7900	1-3 L/min; 30-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Arsenic (organic compounds)	Arsine Dräger Tube	0.05-3 mg/m^3	Y	NA	NA	NA	NA	NA	PEL = 0.5 mg/m^3 TLV = 0.2 mg/m^3	NA	NA	NA	NA	1.5 mg/m^3	NA	Filter, PTFE, w/Support Pad, 1.0um, 37mm, 225-17-01	NIOSH 5022	1-3 L/min; 50-1000 L
Chromium	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	NA	NA	PEL = 1 mg/m^3 REL = 0.5 mg/m^3 TLV = 0.5 mg/m^3	250 mg/m^3	NA	NA	NA	NA	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7024	1-3 L/min; 10-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Chromium (II)	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	NA	NA	PEL = 0.5 mg/m^3 REL = 0.5 mg/m^3 TLV = 0.5 mg/m^3	250 mg/m^3	NA	NA	NA	NA	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7024	1-3 L/min; 10-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Chromium (III)	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	NA	NA	PEL = 0.5 mg/m^3 REL = 0.5 mg/m^3 TLV = 0.5 mg/m^3	25 mg/m^3	NA	NA	NA	NA	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7024	1-3 L/min; 10-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Chromium (VI)	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	NA	NA	PEL = 0.005 mg/m^3 REL = 0.0002 mg/m^3 TLV = 0.05 mg/m^3	15 mg/m^3	NA	NA	NA	NA	NA	Preloaded Cassette, PVC, GLA-5000, 5.0um, 37mm, 2 Piece, 225-802	NIOSH 7600	1-4 L/min; 8-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															

Table 3 - Chemical Plant (Fire)

	Instrument Guidance						Regulatory Guidance									Reference		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	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	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Radiation[2]																		
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N						300 cpm									

Table 3 - Chemical Plant (Fire)

Notes:

DRAFT Only. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

[3]Dräger tubes are available at lower detection limits; however, the tubes listed have detection ranges within the action levels.

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

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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
HCl -- hydrocholoric acid
HCN -- hydrocyanic acid
HF -- hydrogen fluoride
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
m^3 -- cubic meter
MCE -- mixed cellulose ester membrane
mg/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
NO -- nitric oxide
NO_2 -- nitrogen dioxide
NL -- not listed
ng/m^3 -- nanograms per cubic meter
NIOSH -- National Institute for Occupational Safety and Health
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppm -- parts per million
PVC -- polyvinyl chloride
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 -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
$µg/m^3$ – micrograms per cubic meter
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

Table 4 - Chlorine (Spill or Release)

	Instrument Guidance					Regulatory Guidance								Reference		
						Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	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	0-50 ppm	Y	11.48 eV	1 ppm = 2.9 mg/m^3	PEL = C 1 ppm REL = C 0.5 ppm (15 mins) TLV = 0.5 ppm, ST 1 ppm	10 ppm	0.5 ppm	0.5 ppm	0.5 ppm	0.5 ppm	1 ppm	Preloaded Cassette, PTFE, Silver Membrane, Coated, 225-9006	NIOSH 6011	0.3-1 L/min; 8-360 L
	Dräger Tube	0.2-3 ppm, 3-30 ppm	Y												
	Dräger Chip	≥0.2-10 ppm	Y												
	SPM Flex	0.005-5 ppm	Y												
Radiation[1]															
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N			300 cpm									

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

Cl_2 -- chlorine

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/m^3 -- 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

PAC -- protective action criteria

PEL -- permissible exposure limit (OSHA)

ppm -- parts per million

PTFE -- polytetrafluoroethylene

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 -- threshold limit value (ACGIH)

TWA -- time-weighted average

WISER -- Wireless Information System for Emergency Responders

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

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	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, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2 40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
Nitric Oxide	UltraRAE PGM-7360**	0.05-10000 ppm	Y	9.27 eV	9.8 lamp, 6	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	Sorbent Tube, Molecular Sieve, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y		NA											
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	Sorbent Tube, Molecular Sieve, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L
	Dräger Tube	0.1-5 ppm, 5-30 ppm	Y													
	Dräger Chip	0.5-25 ppm	Y													
	SPM Flex	0.3-10 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 16											
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													

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

	Instrument Guidance						Regulatory Guidance								Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling			
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																	
TCE	Dräger Tube	2-50 ppm, 20-250 ppm	Y	9.45 eV	NA	1 ppm = 5.37 mg/m^3	PEL = 100 ppm, C 200 ppm, 300 ppm (5 mins) REL = Ca TLV = 10 ppm, ST 25 ppm	1000 ppm Ca	130 ppm	84 ppm	77 ppm	130 ppm	100 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa canister/Tedlar Bag	NIOSH 1022/ TO 15	0.01-0.2 L/min; 1-30L; <200mL/min
	Dräger Chip	≥5-100 ppm	Y														
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.54												
PCE	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.32 eV	10.6 lamp, 0.57	1 ppm = 6.78 mg/m^3	PEL = 100 ppm, C 200 ppm, 300 ppm REL = Ca TLV = 25, ST 100 ppm	150 ppm Ca	35 ppm	35 ppm	35 ppm	35 ppm	100 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1003/ TO 15	0.01-0.2 L/min; 1-40 L; <200mL/min
Vinyl Chloride	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.99 eV	10.6 lamp, 2	1 ppm = 2.56 mg/m^3	PEL = 1 ppm, C 5 ppm (15 mins) REL = Ca TLV = 1 ppm	NA	250 ppm	140 ppm	70 ppm	250 ppm	500 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1007/TO 15	0.05 L/min; <200mL/min (6L Summa); 0.7-5 L
	Dräger Tube	0.5-5 ppm, 5-30 ppm	Y		NA												
	Dräger Chip	≥0.3-10 ppm	Y														
	TVA 2020**	0.5-2,000 ppm (PID)	Y		10.6 lamp 1.281 (10 ppm) - 1.234 (1000 ppm)												
Phosgene	Dräger Tube	0.02-1 ppm	Y	11.55 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*	0.027 ppm	NA	Sorbent Tube, XAD-2, 226-117	OSHA 61	1 L/min; 240 L
	Dräger Chip	0.05-2 ppm	Y														
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		11.7 lamp, 8.5												
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 = 0.2 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	Filter, 37-mm diameter quartz fiber 225-1827	NIOSH 7908	1-5 L/min; 15-2000 L
	pH Paper	0-14	Y														
	SPM Flex	0.005-0.75 ppm	Y														
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	0-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m^3	PEL = C 5 ppm REL = C 5 ppm TLV = C 2 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	1.8 ppm	3 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	Dräger Tube	0.2-3 ppm, 3-20 ppm	Y														
	Dräger Chip	≥1-25 ppm	Y														
	pH Paper	0-14	Y														
	SPM Flex	0.02-20 ppm	Y														

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

	Instrument Guidance						Regulatory Guidance								Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling			
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																	
Nitric Acid	Dräger Tube	1-15 ppm, 15-50 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	0.16 ppm	0.16 ppm	0.16 ppm	0.16 ppm	1 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	pH Paper	0-14	Y														
	SPM Flex	0.02-20 ppm	Y														
Hydrocyanic Acid (Hydrogen Cyanide)	MultiRAE/AreaRAE HCN Sensor	0-50 ppm	Y	13.6 eV	NA	1 ppm = 1.1 mg/m^3	PEL = 10 ppm S REL = ST 4.7 ppm S TLV = 4.7 ppm S	50 ppm	2.0 ppm	1.3 ppm	1 ppm	2 ppm	NA	Sorbent Tube – soda lime and glass fiber filter 226-28	NIOSH 6017	0.05-0.2 L/min; 2-90 L
	Dräger Tube	0.5-50 ppm, 5-50 ppm	Y														
	Dräger Chip	2-50 ppm	Y														
	pH Paper	0-14	Y														
	SPM	0.2-30 ppm	Y														
Metals - as particulates																	
Cadmium	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.1 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	0.1 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7048	1-3 L/min; 25-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N														
	Pocket Pump TOUCH	NA	Y														
	Aircon-2	NA	N														
Copper	TSI DustTrak II***	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	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7029	1-3 L/min; 50-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N														
	Pocket Pump TOUCH	NA	Y														
	Aircon-2	NA	N														
Chromium (VI)	TSI DustTrak II***	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	Preloaded Cassette, PVC, GLA-5000, 5.0um, 37mm, 2 Piece, 225-802	NIOSH 7600	1-4 L/min; 8-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N														
	Pocket Pump TOUCH	NA	Y														
	Aircon-2	NA	N														

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

	Instrument Guidance						Regulatory Guidance								Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling			
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Metals - as particulates																
Lead	TSI DustTrak II***	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Nickel	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3 REL = 0.015 mg/m^3 TLV = 1.5 mg/m^3 (respirable)	10 mg/m^3	NA	NA	NA	4.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300	1-4 L/min; 5-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Particulate																
Particulate	TSI DustTrak II***	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	NA	10 mg/m^3	NA	Filter (total) Cyclone + Filter (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Ɣ = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

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

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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 - carcinogen
CDC -- Centers for Disease Control and Prevention
CF -- conversion factor
CO -- carbon monoxide
cpm -- counts per minute
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
HCl -- hydrocholoric acid
HCN -- hydrocyanic acid
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
MCE -- mixed cellulose ester membrane
mg/m^3 -- milligrams per cubic meter
$\mu g/m^3$ -- micrograms per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
NR- Not Rated
NIOSH -- National Institute for Occupational Safety and Health
NO -- nitric oxide
NO_2 -- nitrogen dioxide
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PCE -- Perchloroethylene
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppb -- parts per billion
ppm -- parts per million
PVC -- polyvinyl chloride
R/hr -- Roentgens per hour
rec. -- recommended
REL -- recommended exposure limit (NIOSH)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
ST -- short-term
TCE -- trichloroethylene
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

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 LAMP, CF (ISO)	Conversion	Health Guidance Values		Occupational Action Levels		AEGL-1			PAC-1	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 PGM-7360 (benzene specific mode)**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	NA	NA	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA													
	Dräger Chip	0.2-10 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47													
	TVA 2020**	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y															
	Dräger Chip	5-150 ppm	Y															
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	0-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m^3	NA	NA	PEL = C 5 ppm REL = C 5 ppm TLV = C 2 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	1.8 ppm	3 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	Dräger Tube	0.2-3 ppm, 3-20 ppm	Y															
	Dräger Chip	≥1-25 ppm	Y															
	pH Paper	0-14	Y															
	SPM Flex	0.02-20 ppm	Y															
Hydrocyanic Acid (Hydrogen Cyanide)	MultiRAE/AreaRAE HCN Sensor	0-50 ppm	Y	13.6 eV	NA	1 ppm = 1.1 mg/m^3	NA	NA	PEL = 10 ppm S REL = ST 4.7 ppm S TLV = 4.7 ppm S	50 ppm	2.0 ppm	1.3 ppm	1 ppm	2 ppm	NA	Sorbent Tube – soda lime and glass fiber filter 226-28	NIOSH 6017	0.05-0.2 L/min; 2-90 L
	Dräger Tube	0.5-50 ppm, 5-50 ppm	Y															
	Dräger Chip	2-50 ppm	Y															
	pH Paper	0-14	Y															
	SPM	0.2-30 ppm	Y															
Phosgene	Dräger Tube	0.02-1 ppm	Y	11.55 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*	0.027 ppm	NA	Sorbent Tube, XAD-2, 226-117	OSHA 61	1 L/min; 240 L
	Dräger Chip	0.05-2 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		11.7 lamp, 8.5													

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		Occupational Action Levels		AEGL-1			PAC-1	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)																		
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y															
	Dräger Chip	≥0.2-5 ppm	Y															
	SPM Flex	0.001-9.999 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3													
Vinyl Chloride	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.99 eV	10.6 lamp, 2	1 ppm = 2.56 mg/m^3	NA	NA	PEL = 1 ppm, C 5 ppm (15 mins) REL = Ca TLV = 1 ppm	NA	250 ppm	140 ppm	70 ppm	250 ppm	500 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1007/TO 15	0.05 L/min; <200mL/min; 0.7-5 L
	Dräger Tube	0.5-5 ppm, 5-30 ppm	Y		NA													
	Dräger Chip	≥0.3-10 ppm	Y															
	TVA 2020**	0.5-2,000 ppm (PID)	Y		10.6 lamp 1.281 (10 ppm) - 1.234 (1000 ppm)													
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y															
	Dräger Chip	≥0.4-10 ppm	Y															
	SPM Flex	0.01-2.5 ppm	Y															
Metals - as particulates																		
Lead	TSI DustTrak II***	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Mercury	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	NA	1 µg/m^3	3 µg/m^3	PEL = C 0.1 mg/m^3 (100 µg/m^3) S REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m3) TLV = 0.025 mg/m^3 S (25 µg/m3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m3)	0.67 mg/m^3* (670 µg/m3)	0.33 mg/m^3* (330 µg/m3)	0.15 mg/m^3 (150 µg/m3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-200 L
	Lumex RA-915 Light	100-3,000,000 ng/m3	N															
	Jerome 431X	0.003 to 0.999 mg/m^3	N															
	Jerome J405	0.5-999 µg/m^3	N															
	Jerome 505	0.05-0.500 µg/m^3	N															
	Dräger Tube	0.05-2 mg/m^3	Y															

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		Occupational Action Levels		AEGL-1			PAC-1	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	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Radiation[2]																		
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	NA	NA	10 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/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N						300 cpm									

Table 6 - General Industrial (Fire/Fireworks)

(Also refer to Table 3)

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[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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

*AEGL-2--There are no AEGL-1 for this compound.
**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
HCl -- hydrocholoric acid
HCN -- hydrocyanic acid
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
mg/m^3 -- milligrams per cubic meter
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
ng/m^3 -- nanograms per cubic meter
NIOSH -- National Institute for Occupational Safety and Health
NO -- nitric oxide
NO_2 -- nitrogen dioxide
OSHA -- Occupational Safety and Health Administration
MCE -- mixed cellulose ester membrane
PAC -- protective action criteria
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)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
ST -- short term
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TWA -- time-weighted average
$\mu g/m^3$ – micrograms per cubic meter
µR/hr -- micro Roentgens per hour
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

Table 7 - Landfill (Release or Fire)

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

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Gases																
Methane[3]	TVA 2020**	1-10,000 ppm (FID) no response (PID)	Y	12.61 eV	NA	NA	<19.5% O_2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MultiRAE/AreaRAE	0-100% LEL, 0 30% O_2	Y													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													

Table 7 - Landfill (Release or Fire)

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

	Instrument Guidance						Regulatory Guidance								Reference	
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Gases (continued)																
Radon**	Continuous Radon Monitor (CRM)	0.4 pCi/L - ∞	N	NA	NA	NA	NRC DAC occupational = 30pCi/l with progeny, 4000 pCi/l pure 40 hr/wk exposure period. OSHA MPC= 100pCi/l.	NA	NA	NA	NA	NA	NA	Alpha Track Detector, Activated Carbon Canister, Lucas Cell or Tedlar Bag (grab sample)	Lab read-out	Passive, min. 7-day exposure period; Instant grab, or time integrated for variable periods
Vinyl Chloride	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.99 eV	10.6 lamp, 2	1 ppm = 2.56 mg/m^3	PEL = 1 ppm, C 5 ppm (15 mins) REL = Ca TLV = 1 ppm	NA	250 ppm	140 ppm	70 ppm	250 ppm	500 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1007/TO 15	0.05 L/min; <200mL/min (6L Summa); 0.7-5 L
	Dräger Tube	0.5-5 ppm, 5-30 ppm	Y		NA											
	Dräger Chip	≥0.3-10 ppm	Y													
	TVA 2020**	0.5-2,000 ppm (PID)	Y		10.6 lamp 1.281 (10 ppm) - 1.234 (1000 ppm)											
Particulate																
Particulate	TSI DustTrak II****	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX****	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 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/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 NaI Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 7 - Landfill (Release or Fire)

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

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

[3]Ionization potential value not availble in the NIOSH pocket guide to chemical hazards. IP information from the Nastional Institute of Standards and Technology.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

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

****DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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

CO -- carbon monoxide

cpm -- counts per minute

CSC -- coconut shell charcoal

EPA -- U.S. Environmental Protection Agency

ERPG -- emergency response planning guideline

eV -- electron volt

FID -- flame ionization detector

H_2S ---hydrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

LEL -- lower explosive limit

mg/m^3 -- milligrams per cubic meter

µR/hr -- micro Roentgens per hour

MPC -- maximum permissable concentraion

NA -- not available/applicable

NIOSH -- National Institute for Occupational Safety and Health

NRC DAC -- US Nuclear Regulatory Commission derived air concentraion

O_2 -- Oxygen

OSHA -- Occupational Safety and Health Administration

PAC -- protective action criteria

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SO_2 -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- threshold limit value (ACGIH)

TVA -- toxic vapor analyzer

TWA -- time-weighted average

VOC -- volatile organic compound

WISER -- Wireless Information System for Emergency Responders

Table 8 - Magnesium (Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Benzene	UltraRAE PGM-7360 (benzene specific mode)**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA											
	Dräger Chip	0.2-10 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47											
	TVA 2020**	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													
Hydrogen	Dräger Tube	0.2-2%, 0.5-3%	Y	15.43 eV	NA	1 ppm = 0.82 mg/m^3	<19.5% O2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
	MultiRae/AreaRae	0-100% LEL, 0-30% O2	Y													
	MultiRAE/AreaRAE H_2 Sensor	0-1000 ppm	Y													

Table 8 - Magnesium (Fire)

Instrument Guidance							Regulatory Guidance								Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling			
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Metals - as particulates																
Magnesium	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 15 mg/m^3 (dust), 5 (respirable) REL= 10 (fume) TLV = 10 mg/m^3	750 mg/m^3	NA	NA	NA	18 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 5-67 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Particulate																
Particulate	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 8 - Magnesium (Fire)

Notes:

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[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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

[3]Dräger tubes are available at lower detection limits; however, the tubes listed have detection ranges within the action levels.

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/m^3) 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.

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.

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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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

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Acronyms:

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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
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
H_2 -- hydrogen
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
MCE -- mixed cellulose ester membrane
mg/m^3 -- 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
O_2 -- oxygen
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppm -- parts per million
R/hr -- Roentgens per hour
REL -- recommended exposure limit (NIOSH)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

Table 9 - Mercury (Spill or Release)

DRAFT01

Instrument Guidance | Regulatory Guidance | Reference

Target Compound	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	PPE		Air Sampling		
						Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Level C Action Level	Level B Action Level	Media	Method	Flow Rate/ Total Volume
Mercury																			
Mercury	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	1 µg/m^3	3 µg/m^3	PEL = C 0.1 mg/m^3 (100 µg/m^3) S REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m3) TLV = 0.025 mg/m^3 S (25 µg/m3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m3)	0.67 mg/m^3* (670 µg/m3)	0.33 mg/m^3* (330 µg/m3)	0.15 mg/m^3 (150 µg/m3)	NA	25 µg/m^3 TO 625 µg/m^3	>625 µg/m^3 OR If upper limit of MVA is <625 µg/m^3	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m3	N																
	Jerome 431X	0.003 to 0.999 mg/m^3	N																
	Jerome J405	0.5-999 µg/m^3	N																
	Jerome 505	0.05-0.500 µg/m^3	N																
	Dräger Tube	0.05-2 mg/m^3	Y																
Radiation[2]																			
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N					300 cpm											
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N					300 cpm											
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N					300 cpm											
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N					300 cpm											

Table 9 - Mercury (Spill or Release)

DRAFT01

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

Some inorganic compounds may cause interference with mercury readings on Lumex devices. For example, recently applied oil based paint/primer may cause a false elevation in mercury readings due to benzene present in the paint.

Upgrade from level D PPE to Level C PPE if concentrations are consistently above 25 µg in the breathing zone. Upgrade from level C PPE to level B PPE if concentrations are consistently above 625 µg or at the upper limit of the MVA being used if less than 625 µg.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

Acronyms:

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/m^3 -- milligrams per cubic meter
NA -- not available/applicable
ng/m^3 -- nanograms per cubic meter
NIOSH -- National Institute for Occupational Safety and Health
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PPE -- personal protective equipment
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
TLV -- threshold limit value (ACGIH)
TWA -- time-weighted average
$µg/m^3$ – micrograms per cubic meter
µR/hr -- micro Roentgens per hour
WISER -- Wireless Information System for Emergency Responders

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

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Benzene	UltraRAE PGM-7360 (benzene specific mode)**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA											
	Dräger Chip	0.2-10 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47											
	TVA 2020***	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													

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

	Instrument Guidance					Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
PAHs - as particulates																
PAHs****	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.2 mg/m^3 REL = 0.1 mg/m^3 TLV = 0.2 mg/m^3	80 mg/m^3	NA	NA	NA	0.15 mg/m^3	NA	Preloaded Cassette, PTFE, 2.0um, 37mm, 2 Piece, 225-1713 & Sorbent Tube, XAD-2, 226-30-04	NIOSH 5506 TO-13A	2 L/min; 200-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

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

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

****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
CO -- carbon monoxide
cpm -- counts per minute
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
MCE -- mixed cellulose ester membrane
mg/m^3 -- 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
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppb -- parts per billion
ppm -- parts per million
PTFE -- polytetrafluoroethylene
R/hr -- Roentgens per hour
rec. -- recommended
REL -- recommended exposure limit (NIOSH)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
ST -- short-term
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

Table 11 - Pesticide or Fertilizer (Fire)

	Instrument Guidance						Regulatory Guidance									Reference		
							Health Guidance Values		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																		
Benzene	UltraRAE PGM-7360 (benzene specific mode)**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	NA	NA	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA													
	Dräger Chip	0.2-10 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47													
	TVA 2020**	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y															
	Dräger Chip	5-150 ppm	Y															
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y															
	Dräger Chip	≥0.2-5 ppm	Y															
	SPM Flex	0.001-9.999 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3													
Nitric Oxide	UltraRAE PGM-7360**	0.05-10000 ppm	Y	9.27 eV	9.8 lamp, 6	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	Sorbent Tube, Molecular Sieve, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	MultiRAE/AreaRAE NO Sensor	0-250 ppm	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	Sorbent Tube, Molecular Sieve, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L
	Dräger Tube	0.1-5 ppm, 5-30 ppm	Y															
	Dräger Chip	0.5-25 ppm	Y															
	SPM Flex	0.3-10 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 16													

Table 11 - Pesticide or Fertilizer (Fire)

Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																		
Methyl Bromide	Dräger Tube	0.5-5 ppm, 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 = 1 ppm S	250 ppm Ca	210 ppm*	67 ppm*	67 ppm*	19 ppm	NA	Sorbent Tube, Anasorb 747, 226-83 / Summa Canister/ Tedlar Bag	OSHA PV2040 TO-15 NIOSH 2520	0.01-0.1 L/min; 1-5 L; 0.05-0.2 L/min, 3 L ≤200 mL/min (6L Summa)
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 1.7													
Phosgene	Dräger Tube	0.02-1 ppm	Y	11.55 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*	0.027 ppm	NA	Sorbent Tube, XAD-2, 226-117	OSHA 61	1 L/min; 240 L
	Dräger Chip	0.05-2 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		11.7 lamp, 8.5													
Phosphine	MultiRAE/AreaRAE PH_3 Sensor	0-20 ppm	Y	9.96 eV	NA	1 ppm = 1.39 mg/m^3	NA	NA	PEL = 0.3 ppm REL = 0.3 ppm, ST 1 ppm TLV = 0.3 ppm. ST 1 ppm	50 ppm	2 ppm*	0.5 ppm*	0.25 ppm*	1 ppm	NA	Sorbent Tube, Silica Gel, 226-165A	NIOSH 6002	0.01-0.2 L/min; 1-16 L
	Dräger Tube	0.01-0.3 ppm, 0.1-1 ppm	Y															
	Dräger Chip	0.1-2.5 ppm	Y															
	SPM Flex	0.003-3 ppm	Y															
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.9													
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y															
	Dräger Chip	≥0.4-10 ppm	Y															
	SPM Flex	0.01-2.5 ppm	Y															
Metals- as vapors																		
Mercury	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	NA	1 µg/m^3	3 µg/m^3	PEL = C 0.1 mg/m^3 (100 µg/m^3) S REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m3) TLV = 0.025 mg/m^3 S (25 µg/m3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m3)	0.67 mg/m^3* (670 µg/m3)	0.33 mg/m^3* (330 µg/m3)	0.15 mg/m^3 (150 µg/m3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m3	N															
	Jerome 431X	0.003 to 0.999 mg/m^3	N															
	Jerome J405	0.5-999 µg/m^3	N															
	Jerome 505	0.05-0.500 µg/m^3	N															
	Dräger Tube	0.05-2 mg/m^3	Y															

Table 11 - Pesticide or Fertilizer (Fire)

Instrument Guidance | Regulatory Guidance | Reference

Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Health Guidance Values[1]		Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							Residential	Commercial	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Metals - as particulates																		
Arsenic (inorganic compounds)	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	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	1.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7900	1-3 L/min; 30-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Arsenic (organic compounds)	Arsine Dräger Tube	0.05-3 mg/m^3	Y	NA	NA	NA	NA	NA	PEL = 0.5 mg/m^3 TLV = 0.2 mg/m^3	NA	NA	NA	NA	1.5 mg/m^3	NA	Filter, PTFE, w/Support Pad, 1.0um, 37mm, 225-17-01	NIOSH 5022	1-3 L/min; 50-1000 L
Cadmium	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	NA	NA	PEL = 0.1 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	0.1 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7048	1-3 L/min; 25-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Lead	TSI DustTrak II***	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Phosphorus Pentoxide	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	NA	NA	PEL = 1 mg/m^3; ST 3 mg/m^3 REL = 3 mg/m^3, ST 3 mg/m^3 TLV = 2 mg/m^3	250 mg/m^3	NA	NA	NA	1 mg/m^3	1 mg/m^3	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	OSHA ID 111	2 L/min; 960 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Particulate																		
Particulate	TSI DustTrak II	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX	0.001-150 mg/m^3	N															
	Pocket Pump TOUCH	NA	Y															
	Aircon-2	NA	N															
Radiation[2]																		
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N						300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N						300 cpm									

Table 11 - Pesticide or Fertilizer (Fire)

Notes:

DRAFT ONLY. 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

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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 - carcinogen
CDC -- Centers for Disease Control and Prevention
CF -- conversion factor
CO -- carbon monoxide
cpm -- counts per minute
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
m^3 -- cubic meter
MCE -- mixed cellulose ester membrane
mg/m^3 -- milligrams per cubic meter
NA -- not available/applicable
ng/m^3 -- nanograms per cubic meter
NIOSH -- National Institute for Occupational Safety and Health
NO -- nitric oxide
NO_2 -- nitrogen dioxide
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PH_3 -- phosphine
PID -- photoionization detector
ppb -- parts per billion
ppm -- parts per million
PTFE -- polytetrafluoroethylene
R/hr -- Roentgens per hour
rec. -- recommended
REL -- recommended exposure limit (NIOSH)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
ST -- short term
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
$\mu g/m^3$ – micrograms per cubic meter
µR/hr -- micro Roentgens per hour
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

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

Instrument Guidance | Regulatory Guidance | Reference

Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Phosphorus Compounds and Gases																
Phosphorus (elemental[3])	TSI DustTrak II**	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	0.27 mg/m^3	NA	Sorbent Tube, Tenax, 226-35-03	NIOSH 7905	0.01-0.2 L/min; 5-100 L
	TSI DustTrak DRX**	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Phosphorus Pentoxide	TSI DustTrak II**	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3, ST 3 mg/m^3 REL = 3 mg/m^3, ST 3 mg/m^3 TLV = 2 mg/m^3	250 mg/m^3	NA	NA	NA	1 mg/m^3	1 mg/m^3	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	OSHA ID 111	2 L/min; 960 L
	TSI DustTrak DRX**	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Red Phosphorus	MultiRAE/AreaRAE PID***	0-2000 ppm	Y	10.49 eV	NA	NA	NA	NA	3.7 mg/m^3	0.93 mg/m^3	0.47 mg/m^3	0.27 mg/m^3	NA	Sorbent Tube, Tenax, 226-35-03	NIOSH 7905	0.01-0.2 L/min; 5-100 L
Benzene	UltraRAE PGM-7360***	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA											
	Dräger Chip	0.2-10 ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		10.6 lamp, 0.47											
	TVA 2020***	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID***	0-2000 ppm	Y		10.6 lamp, 3.3											

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

Instrument Guidance							Regulatory Guidance							Reference		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Phosphorus Compounds 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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													
Particulate																
Particulate	TSI DustTrak II**	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX**	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/ϒ = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 NaI Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

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

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

[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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

***PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

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
H_2S ---hydrogen sulfide
IC -- ion chromatography
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
MCE -- mixed cellulose ester membrane
mg/m^3 -- milligrams per cubic meter
$\mu g/cm^2$ -- 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
PAC -- protective action criteria
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)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TWA -- time-weighted average
WISER -- Wireless Information System for Emergency Responders

Table 13 - Tire Fire (Auto Fluff)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Benzene	UltraRAE PGM-7360 (benzene specific mode)**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA											
	Dräger Chip	0.2-10 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47											
	TVA 2020**	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													

Table 13 - Tire Fire (Auto Fluff)

	Instrument Guidance						Regulatory Guidance								Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
PAHs - as particulates																
PAHs****	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.2 mg/m^3 REL = 0.1 mg/m^3 TLV = 0.2 mg/m^3	80 mg/m^3	NA	NA	NA	0.6 mg/m^3	NA	Preloaded Cassette, PTFE, 2.0um, 37mm, 2 Piece, 225-1713 & Sorbent Tube, XAD-2, 226-30-04	NIOSH 5506	2 L/min; 200-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Metals - as particulates																
Lead	TSI DustTrak II***	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Particulate																
Particulate	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 13 - Tire Fire (Auto Fluff)

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

****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
CO -- carbon monoxide
cpm -- counts per minute
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
MCE -- mixed cellulose ester membrane
mg/m^3 -- 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
PAC -- protective action criteria
PAH -- polyaromatic hydrocarbon
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppm -- parts per million
PTFE -- polytetrafluoroethylene
R/hr -- Roentgens per hour
rec. -- recommended
REL -- recommended exposure limit (NIOSH)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
WISER -- Wireless Information System for Emergency Responders

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

	Instrument Guidance					Regulatory Guidance							Reference		
						Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases															
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	0-15 ppm	Y	12.74 eV	1 ppm = 1.49 mg/m^3	PEL = C 5 ppm REL = C 5 ppm TLV = C 2 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	1.8 ppm	3 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	Dräger Tube	0.2-3 ppm, 3-20 ppm	Y												
	Dräger Chip	≥1-25 ppm	Y												
	pH Paper	0-14	Y												
	SPM Flex	0.02-20 ppm	Y												
Nitric Acid	Dräger Tube	1-15 ppm, 15-50 ppm	Y	11.95 eV	1 ppm = 2.58 mg/m^3	PEL = 2 ppm REL = 2 ppm, ST 4 ppm TLV = 2 ppm, ST 4 ppm	25 ppm	0.16 ppm	0.16 ppm	0.16 ppm	0.16 ppm	1 ppm	Cartridge - two 37-mm diameter quartz fiber filters, one filter impregnated with Na_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	pH Paper	0-14	Y												
	SPM Flex	0.02-20 ppm	Y												
Sulfuric Acid	Dräger Tube	1-5 mg/m^3	Y	12.4 eV	NA	PEL = 1 mg/m^3 REL = 1 mg/m^3 TLV = 0.2 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	Filter, 37-mm diameter quartz fiber 225-1827	NIOSH 7908	1-5 L/min; 15-2000 L
	pH Paper	0-14	Y												
	SPM Flex	0.005-0.75 ppm	Y												
Hydrocyanic Acid (Hydrogen Cyanide)	MultiRAE/AreaRAE HCN Sensor	0-50 ppm	Y	13.6 eV	1 ppm = 1.1 mg/m^3	PEL = 10 ppm S REL = ST 4.7 ppm S TLV = 4.7 ppm S	50 ppm	2.0 ppm	1.3 ppm	1 ppm	2 ppm	NA	Sorbent Tube – soda lime and glass fiber filter 226-28	NIOSH 6017	0.05-0.2 L/min; 2-90 L
	Dräger Tube	0.5-50 ppm, 5-50 ppm	Y												
	Dräger Chip	2-50 ppm	Y												
	pH Paper	0-14	Y												
	SPM	0.2-30 ppm	Y												
PAHs - as particulates[3]															
PAHs**	TSI DustTrak II*	0.001-400 mg/m^3	N	NA	NA	PEL = 0.2 mg/m^3 REL = 0.1 mg/m^3 TLV = 0.2 mg/m^3	80 mg/m^3	NA	NA	NA	0.6 mg/m^3	NA	Preloaded Cassette, PTFE, 2.0um, 37mm, 2 Piece, 225-1713 & Sorbent Tube, XAD-2, 226-30-04	NIOSH 5506	2 L/min; 200-1000 L
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												
Pentachlorophenol and Dioxin-Furans - as particulates															
Pentachloro phenol	TSI DustTrak II*	0.001-400 mg/m^3	N	NA	NA	PEL = 0.5 mg/m^3 REL = 0.5 mg/m^3 S TLV = 0.5 mg/m^3 S, 1 mg/m^3 ST	2.5 mg/m^3	NA	NA	NA	1 mg/m^3	NA	Cassette, SureSeal, Leak Free, 37mm, 3 Piece, Clear Styrene, 225-3LF	NIOSH 5512	0.5-1 L/min; 48-480 L
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												
Dioxin-Furan	TSI DustTrak II**	0.001-400 mg/m^3	N	NA	NA	REL = Ca	NA	NA	NA	NA	NA	NA	PUF Tube Filter, 226-131	EPA TO-9A	225-280 L/min; NA
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												

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

	Instrument Guidance					Regulatory Guidance							Reference		
						Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Metals - as particulates															
Arsenic (inorganic compounds)	TSI DustTrak II*	0.001-400 mg/m^3	N	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	1.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7900	1-3 L/min; 30-1000 L
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												
Arsenic (organic compounds)	Arsine Dräger Tube	0.05-3 mg/m^3	Y	NA	NA	PEL = 0.5 mg/m^3 TLV = 0.2 mg/m^3	NA	NA	NA	NA	1.5 mg/m^3	NA	Filter, PTFE, w/Support Pad, 1.0um, 37mm, 225-17-01	NIOSH 5022	1-3 L/min; 50-1000 L
Copper	TSI DustTrak II*	0.001-400 mg/m^3	N	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	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7029	1-3 L/min; 50-1500 L
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												
Chromium (VI)	TSI DustTrak II*	0.001-400 mg/m^3	N	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	Preloaded Cassette, PVC, GLA-5000, 5.0um, 37mm, 2 Piece, 225-802	NIOSH 7600	1-4 L/min; 8-400 L
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												
Lead	TSI DustTrak II*	0.001-400 mg/m^3	N	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												
Particulate															
Particulate	TSI DustTrak II*	0.001-400 mg/m^3	N	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX*	0.001-150 mg/m^3	N												
	Pocket Pump TOUCH	NA	Y												
	Aircon-2	NA	N												
Radiation[2]															
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N			300 cpm									
	Model 2241 w/ Model 44-10 NaI Detector	0-9,999 R/hr or 999,000 cpm	N			300 cpm									

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

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

[3] PAHs = Coal Tar Pitch Volatiles

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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

*DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

**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
HCl -- hydrocholoric acid
HCN -- hydrocyanic acid
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
L/min -- liter per minute
MCE -- mixed cellulose ester membrane
mg/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
NIOSH -- National Institute for Occupational Safety and Health
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PAH -- polyaromatic hydrocarbon
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppb -- parts per billion
ppm -- parts per million
PTFE -- polytetrafluoroethylene
PUF -- polyurethane foam
PVC -- polyvinyl chloride
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 -- threshold limit value (ACGIH)
TWA -- time-weighted average
WISER -- Wireless Information System for Emergency Responders

Table 15 - Volcano

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Carbon Dioxide	Dräger Tube	1-20% 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	30000 ppm	NA	Dräger Diffusion Tube, Carbon Dioxide, 65-20,000 ppm, 800-01381/ Gas Sampling Bag	NIOSH 6603	0.02-0.1 L/min; NA
	Dräger Chip	1000-25,000 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													
Particulate																
Particulate	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													

Table 15 - Volcano

Instrument Guidance							Regulatory Guidance								Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling			
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 15 - Volcano

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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

H_2S ---hydrogen sulfide

IDLH -- immediately dangerous to life and health

IP -- ionization potential

ISO -- isobutylene

L/min -- liter per minute

MCE -- mixed cellulose ester membrane

mg/m^3 -- 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

PAC -- protective action criteria

PEL -- permissible exposure limit (OSHA)

PID -- photoionization detector

ppm -- parts per million

R/hr -- Roentgens per hour

rec. -- recommended

REL -- recommended exposure limit (NIOSH)

SO_2 -- sulfur dioxide

SPM -- single-point monitor

SSHASP -- site-specific health and safety plan

TEEL -- temporary emergency exposure limit

TLV -- threshold limit value (ACGIH)

TWA -- time-weighted average

VOC -- volatile organic compound

Vol. -- volume

WISER -- Wireless Information System for Emergency Responders

Table 16 - Ethanol (Spill, Release, or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Benzene	UltraRAE PGM-7360**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA											
	Dräger Chip	0.2-10 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47											
	TVA 2020**	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Ethanol	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.47 eV	10.6 lamp, 7.9	1 ppm = 1.89 mg/m^3	PEL = 1000 ppm REL = 1000 ppm TLV = 1000 ppm	3300 ppm	NA	NA	NA	1800 ppm	1800 ppm	Sorbent Tube, Anasorb CSC, 226-01 / Summa Canister / Tedlar Bag	NIOSH 1400 (Alcohols I) TO-15	≤ 0.05 L/min; 1 L ≤200 mL/min
	Dräger Tube	25-2000 ppm	Y		NA											
	Dräger Chip	100-2500 ppm	Y													
	TVA 2020**	0.5-2,000 ppm (PID) 0.5-10,000 ppm (FID)	Y		10.6 lamp 1.561 (10 ppm) - 1.520 (1000 ppm)											
Gasoline	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	NA	10.6 lamp, 0.9 (1.0 for gasoline #2)	1 ppm = 4.5 mg/m^3 (approx.)	PEL = None REL = Ca TLV = 300 ppm	Ca NA	730 ppm	730 ppm	730 ppm	200 ppm	200 ppm	Sorbent Tube, Anasorb CSC, 226-01	OSHA PV2028	≤ 0.1 L/min (10 L max vol.); 10 L
	TVA 2020**	0.5-2,000 ppm (PID) 0.5-10,000 ppm (FID)	Y		NA											
Nitric Oxide	UltraRAE PGM-7360**	0.05-10000 ppm	Y	9.27 eV	9.8 lamp, 6	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	Sorbent Tube, Molecular Sieve, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y		NA											

Table 16 - Ethanol (Spill, Release, or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													
Ammonia	AreaRAE NH_3 Sensor	0-100 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	Sorbent Tube, Silica Gel, 226-10-06	NIOSH 6015	0.1-0.2 L/min; 96 L max
	MultiRAE Pro NH_3 Sensor	0-100 ppm	Y													
	Dräger Tube	≥0.25-3 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.01-150 ppm	Y													
	MultiRAE/AreaRAE PID**	0-50 ppm	Y		10.6 lamp, 10.9 11.7 lamp, 5.7											
Sodium Hydroxide	pH Paper	0-14	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	Filter, PTFE, w/Support Pad, 1.0um, 37mm, 225-17-01	NIOSH 7401	1-4 L/min; 70 1000 L
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 = 0.2 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	Filter, 37-mm diameter quartz fiber 225-1827	NIOSH 7908	1-5 L/min; 15 2000 L
	pH Paper	0-14	Y													
	SPM Flex	0.005-0.75 ppm	Y													

Table 16 - Ethanol (Spill, Release, or Fire)

Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Particulate																
Particulate	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 16 - Ethanol (Spill, Release, or Fire)

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
H_2S ---hydrogen sulfide
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
MCE -- mixed cellulose ester membrane
mg/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NH_3 -- ammonia
NIOSH -- National Institute for Occupational Safety and Health
NO -- nitric oxide
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppm -- parts per million
PTFE -- polytetrafluoroethylene
R/hr -- Roentgens per hour
rec. -- recommended
REL -- recommended exposure limit (NIOSH)
SO_2 -- sulfur dioxide
SPM -- single-point monitor
SSHASP -- site-specific health and safety plan
TEEL -- temporary emergency exposure limit
TLV -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
Vol. -- volume
WISER -- Wireless Information System for Emergency Responders

Table 17 - Spacecraft Debris

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases																
Liquid Oxygen	MultiRAE/AreaRAE O_2 Sensor	0-30% Vol.	Y	15.58 eV	NA	1 ppm = 2.21 mg/m^3	<19.5% O2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Oxygen, 3-24% Vol, 810-31B	OSHA CSI	NA
Liquid Hydrogen	MultiRAE/AreaRAE	0-100% LEL, 0 30% O_2	Y	15.43 eV	NA	1 ppm = 0.82 mg/m^3	<19.5% O2 (simple asphyxiant)	NA	NA	NA	NA	65,0000 ppm	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
Liquid Methane	TVA 2020**	0.5-10,000 ppm (FID) no response (PID)	Y	12.61 eV	NA	1 ppm = 3.77 mg/m^3	<19.5% O2 (simple asphyxiant)	NA	NA	NA	NA	65,0000 ppm	NA	Dräger Detector Tube, Natural Gas, Qualitative, 800-20001	OSHA CSI	NA
	MultiRAE/AreaRAE	0-100% LEL, 0 30% O_2	Y													
Ethanol	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.47 eV	10.6 lamp, 7.9	1 ppm = 1.89 mg/m^3	PEL = 1000 ppm REL = 1000 ppm TLV = 1000 ppm	3300 ppm	NA	NA	NA	1800 ppm	1800 ppm	Sorbent Tube, Anasorb CSC, 226-01 / Summa Canister / Tedlar Bag	NIOSH 1400 (Alcohols I) TO-15	≤ 0.05 L/min; 1 L ≤200 mL/min
	Dräger Tube	25-2000 ppm	Y		NA											
	Dräger Chip	100-2500 ppm	Y													
	TVA 2020**	0.5-2,000 ppm (PID) 0.5-10,000 ppm (FID)	Y		10.6 lamp 1.561 (10 ppm) - 1.520 (1000 ppm)											
Kerosene	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	NA	10.6 lamp, 0.6 and 9.4****	NA	PEL = NA REL = 100 mg/m^3 TLV = NA	NA	290 mg/m^3	290 mg/m^3	290 mg/m^3	NA	NA	Sorbent Tube, Anasorb CSC, 226-01	OSHA PV 2139 NIOSH 1550	0.1 L/min; 20 L 0.01 - 0.2 L/min; 1.3-20 L
	MultiRAE/AreaRAE	0-100% LEL, 0 30% O_2	Y		NA											
Hydrazine	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	8.93 eV	10.6 lamp, 2.6	1 ppm = 1.31 mg/m^3	PEL = 1 ppm S REL = C 0.03 ppm Ca TLV = 0.01 ppm S Ca	50 ppm	0.1 ppm	0.1 ppm	0.1 ppm	0.1 ppm	0.5 ppm	Midget Impinger, Glass, 25ml, Fritted Nozzle, 225-36-2	NIOSH 3503	0.2 -1 L/min; 7-100 L
	Dräger Tube	0.01-0.4 ppm, 0.4-0.6 ppm	Y		NA											
Monomethyl hydrazine (MMH)	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	8.0 eV	10.6 lamp, 2.5	1 ppm = 1.89 mg/m3	PEL = C 0.2 ppm S REL = C 0.04 ppm S TLV = C 0.01 ppm S	20 ppm Ca	0.9 ppm*	0.23 ppm*	0.11 ppm*	0.082 ppm	NA	Midget Impinger, Glass, 25ml, Fritted Nozzle, 225-36-2	NIOSH 3510	0.5 -1.5 L/min; 3-20 L
	Hydrazine Dräger Tube	0.01-0.6 ppm	Y		NA											
Dimethyl hydrazine (UDMH)	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	8.05 eV	10.6 lamp, 0.8	1 ppm = 2.46 mg/m3	PEL = C 0.5 ppm S REL =C 0.06 ppm TLV = C 0.01 ppm S	15 ppm Ca	3 ppm*	0.75 ppm*	0.38 ppm*	0.27 ppm	NA	Midget Impinger, Glass, 25ml, Fritted Nozzle, 225-36-2	NIOSH 3515	0.2 -1 L/min; 2-100 L
	Hydrazine Dräger Tube	0.01-0.6 ppm	Y		NA											
Nitrogen Tetroxide	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y	10.8 eV	NA	1 ppm = 1.88 mg/m3	PEL = C 5 ppm REL = 1 ppm TLV = NA	13 ppm	0.25 ppm	0.25 ppm	0.25 ppm	0.25 ppm	NA	Sorbent Tube, Molecular Sieve, 226-40	NIOSH 6014	25-200 ml/min; 1.5-6 L
	MultiRAE/AreaRAE NO_2 Sensor	0-20 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y													

Table 17 - Spacecraft Debris

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Hydrogen Peroxide	Dräger Tube	0.1-3 ppm	Y	10.54 eV	NA	1 ppm = 1.39 mg/m^3	REL = 1 ppm PEL = 1 ppm TLV = 1 ppm	75 ppm	NA	NA	NA	10 ppm	10 ppm	Midget Impinger, Glass, 25ml, Fritted Nozzle, 225-36-2	OSHA ID-126-SG OSHA 1019	1 L/min; 100 L
Red-Fuming Nitric Acid[4]	Dräger Tube	1-15 ppm, 5-50 ppm	Y	11.95 eV	NA	1 ppm = 2.58 mg/m^3	REL = 2 ppm PEL = 2 ppm TLV = 2 ppm	25 ppm	0.16 ppm	0.16 ppm	0.16 ppm	0.16 ppm	1 ppm	Cartridge - two 37-mm diameter quartz fiber filters, one filter impregnated with Na2CO3, 225-9032	NIOSH 7907	2 L/min; 30-600 L
	MultiRAE/AreaRAE NO_2 Sensor	0-50 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 5											
Nitrous Oxide	Nitrous fume Dräger Tube	0.2-6 ppm, 5-30 ppm	Y	12.89 eV	NA	1 ppm = 1.80 mg/m^3	REL = 25 ppm TLV = 50 ppm	NA	NA	NA	NA	910 ppm	NA	Bag, SamplePro PVDF, 5L, Dual SS Fittings, No Eyelets, 248-05	NIOSH 6600	0.1-4 L/min; 3 L
Hydroxyl-terminated polybutadiene	TSI DustTrak II***	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
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y													
Ammonium Perchlorate	MultiRAE/AreaRAE Cl_2 Sensor	0-50 ppm	Y	NA	NA	NA	PEL = 15 mg/m3 TLV = 10 mg/m3	NA	NA	NA	NA	4.6 mg/m^3	NA	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	10.6 lamp, 6	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	45 ppm	10 ppm	Sorbent Tube, XAD-2, 226-27	NIOSH 2538	0.01 - 0.05 L/min; 1-12 L
	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y		NA											
	Dräger Tube	100-1000 ppm	Y													
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													

Table 17 - Spacecraft Debris

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Ammonia	AreaRAE NH_3 Sensor	0-100 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	Sorbent Tube, Silica Gel, 226-10-06	NIOSH 6015	0.1-0.2 L/min; 96 L max
	MultiRAE Pro NH_3 Sensor	0-100 ppm	Y													
	Dräger Tube[3]	2-30 ppm	Y													
	Dräger Chip[3]	2-50 ppm	Y													
	SPM Flex	0.01-150 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 10.9 11.7 lamp, 5.7											
Formaldehyde	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.88 eV	11.7 lamp, 1.6	1 ppm = 1.23 mg/m^3	REL = Ca 0.016 ppm, C 0.1 ppm (15-min) PEL = 0.75 ppm, ST 2 ppm TLV = C 0.3 ppm	20 ppm Ca	0.9 ppm	0.9 ppm	0.9 ppm	0.9 ppm	1 ppm	Sorbent Tube, Silica Gel, High Purity, 226-119	NIOSH 2016	0.03-1.5 L/min; 1-15 L
	MultiRAE Pro HCHO Sensor	0-10 ppm	Y		NA											
	Dräger Tube	0.5-5 ppm, 0.2-2.5 ppm	Y													
Vinyl Chloride	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.99 eV	10.6 lamp, 2	1 ppm = 2.56 mg/m^3	PEL = 1 ppm, C 5 ppm (15 mins) REL = Ca TLV = 1 ppm	NA	250 ppm	140 ppm	70 ppm	250 ppm	500 ppm	Sorbent Tube, Anasorb CSC, 226-01 / Summa Canister / Tedlar Bag	NIOSH 1007 TO-15	0.05 L/min; <200mL/min (6L Summa); 0.7-5 L
	Dräger Tube	≥0.5-30 ppm	Y		NA											
	Dräger Chip	≥0.3-10 ppm	Y													
	TVA 2020**	0.5-2,000 ppm (PID)	Y		10.6 lamp 1.281 (10 ppm) - 1.234 (1000 ppm)											
Freon 113	MultiRAE/AreaRAE Cl_2 Sensor	0-10 ppm	Y	11.99 eV	NA	1 ppm = 7.67 mg/m^3	REL = 1000 ppm, ST 1250 ppm PEL = 1000 ppm TLV = 1000 ppm, ST 1250 ppm	2000 ppm	NA	NA	NA	1250 ppm	NA	Sorbent Tube, Anasorb CSC, 226-01	NIOSH 1020	0.01-0.05 L/min; 0.1-3 L
	Dräger Tube ClO_2	0.025-3 ppm	Y													
	Dräger Tube Halogenated Hydrocarbons	100-2600 ppm	Y													
	AreaRAE HF Sensor	.5-10 ppm	Y													

Table 17 - Spacecraft Debris

Instrument Guidance							Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Methanol	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.84 eV	11.7 lamp, 2.5	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	530 ppm	200 ppm	Sorbent Tube, Silica Gel, 226-51	NIOSH 2000	0.02-0.2 L/min; 1-5 L
	MultiRAE/AreaRAE LEL Sensor	0-100% LEL	Y		LEL Sensor, 2.0											
Octamethyl trisiloxane	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	<10 eV	10.6 lamp, 0.16	NA	PEL = 200 ppm	NA	NA	NA	NA	NA	NA	NA	NA	NA
	MultiRAE/AreaRAE CO Sensor	0-500 ppm	Y		NA											
	Dräger Tube Formaldehyde	0.2-5 ppm	Y													
Particulate																
Particulate	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 17 - Spacecraft Debris

Notes:
DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

[3]Dräger tubes are available at lower detection limits; however, the tubes listed have detection ranges within the action levels.

[4]RAE systems equipment will only detect fuming products, so other sources may be possible.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

*AEGL-2--There are no AEGL-1 for this compound.
**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

****Different types of jet fuel will have different correction factors.

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
Cl_2 -- chlorine
ClO_2 -- chlorine dioxide
CO -- carbon monoxide
cpm -- counts per minute
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
HCHO -- formaldehye
HCl -- hydrocholoric acid
HF -- hydrogen fluoride
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
mg/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
NH_3 -- ammonia
NIOSH -- National Institute for Occupational Safety and Health
NO -- nitric oxide
NO_2 -- nitrogen dioxide
O_2 -- oxygen
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PBAN -- polybutadiene acrylic acid acrylonitrile
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppm -- parts per million
PVDF -- polyvinylidene fluoride
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 -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
Vol. -- volume
WISER -- Wireless Information System for Emergency Responders

Table 18 - Special Event

(Also refer to Hazardous Waste Flow Chart)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
2-Chlorobenzalmalononitrile (CS)																
Tear Gas/ Coughing Smoke	AP4C	10 mg/m3 or 1.5 ppm	N	NA	NA	1 ppm =7.71 mg/m^3	REL = 0.3 ppm S PEL = 0.3 ppm TLV = 0.32 mg/m3	15 mg/m^3	0.083* mg/m^3	0.083* mg/m^3	0.083* mg/m^3	0.005 mg/m^3	0.005 mg/m^3	PTFE Filter 225-1716 and Tenax Sorbent Tube 226-35-03	P&CAM304 (II-5)	1.5 L/min ; 135 L
Phenacyl chloride or 2-chloro-1-phenylethanone (CN)																
Mace	AP4C	10 mg/m3 or 1.5 ppm	N	9.44 eV	NA	1 ppm = 6.32 mg/m^3	REL = 0.3 ppm S PEL = 0.3 ppm TLV = 0.32 mg/m3	15 mg/m^3	NA	NA	NA	NA	NA	NA	P&CAM291 (II-5)	NA
Particulate																
Particulate	TSI DustTrak II**	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX**	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 18 - Special Event

(Also refer to Hazardous Waste Flow Chart)

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

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
FID -- flame ionization detector
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
mg/m^3 -- 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
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PID -- photoionization detector
ppm -- parts per million
PTFE -- polytetrafluoroethylene
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 -- threshold limit value (ACGIH)
TWA -- time-weighted average
VOC -- volatile organic compound
Vol. -- volume
WISER -- Wireless Information System for Emergency Responders

Table 19 - Clandestine Lab

DRAFT01

	Instrument Guidance						Regulatory Guidance							Reference		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Acids																
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	0-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m^3	PEL = C 5 ppm REL = C 5 ppm TLV = C 2 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	1.8 ppm	3 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	Dräger Tube	0.2-3 ppm, 3-20 ppm	Y													
	Dräger Chip	≥1-25 ppm	Y													
	pH Paper	0-14	Y													
	SPM Flex	0.02-20 ppm	Y													
VOCs and Gases																
Acetone	Dräger Tube	40-800 ppm, 100-12,000 ppm	Y	9.69 eV	NA	1 ppm = 2.38 mg/m3	REL = 250 ppm PEL = 1000 ppm TLV = 500 ppm, ST 750 ppm	2500 ppm	200 ppm	200 ppm	200 ppm	200 ppm	NA	Sorbent Tube, Anasorb CSC, 226-01 / Summa Canister/ Tedlar Bag	NIOSH 1300 TO-15 TO-3	0.01 to 0.2 L/min; 0.5-3 L ≤200 mL/min
	TVA 2020	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp, 0.804 (10 ppm) - 0.785 (1000 ppm)											
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.9											
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min, 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Carbon Dioxide	Dräger Tube	1-20% 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	30000 ppm	NA	Dräger Diffusion Tube, Carbon Dioxide, 65-20,000 ppm, 800-01381/ Gas Sampling Bag	NIOSH 6603	0.02-0.1 L/min; NA
	Dräger Chip	200-25,000 ppm	Y													
Ether	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	9.53 eV	10.6 lamp, 1.1	1 ppm = 3.03 mg/m3	PEL = 400 ppm TLV = 400 ppm, ST 500 ppm	1900 ppm	NA	NA	NA	500 ppm	NA	Sorbent Tube, Anasorb CSC, 226-01	NIOSH 1610	0.01 to 0.2 L/min; 0.25-3 L
Hydriodic Acid (Iodine Vapors)	pH Paper	0-14	Y	NA	NA	NA	REL = C 0.1 ppm PEL = C 0.1 ppm	NA	1 ppm	1 ppm	1 ppm	1 ppm	NA	Sorbent Tube, Anasorb 747, 226-80	OSHA ID 212	0.5 L/min; 2.5 L
	Dräger Tube Iodine	0.1-0.6 ppm, 1-5 ppm	Y		NA											
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.6****											
Iodine Crystal	Dräger Tube	0.1-0.6 ppm, 1-5 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	0.1 ppm	0.1 ppm	Sorbent Tube, Anasorb CSC, 226-67	NIOSH 6005	0.5 to 1 L/min; 15-225 L
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.6****											

Table 19 - Clandestine Lab

Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Lithium	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	5.39 eV	NA	NA	NA	NA	NA	NA	NA	3.3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 100-2000 L
Nitric Oxide	UltraRAE PGM-7360**	0.05-10000 ppm	Y	9.27 eV	9.8 lamp, 6	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	Sorbent Tube, Molecular Sieve, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y		NA											
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	Sorbent Tube, Molecular Sieve, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L
	Dräger Tube	0.1-5 ppm, 5-30 ppm+B35:C50	Y													
	Dräger Chip	0.5-25 ppm	Y													
	SPM Flex	0.3-10 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 16											
Phosphine	MultiRAE/AreaRAE PH_3 Sensor	0-20 ppm	Y	9.96 eV	NA	1 ppm = 1.39 mg/m^3	PEL = 0.3 ppm REL = 0.3 ppm, ST 1 ppm TLV = 0.3 ppm, ST 1 ppm	50 ppm	2 ppm*	0.5 ppm*	0.25 ppm*	1 ppm	NA	Sorbent Tube, Silica Gel, 226-165A	NIOSH 6002	0.01-0.2 L/min; 1-16 L
	Dräger Tube	≥0.1-1 ppm	Y													
	Dräger Chip	0.1-2.5 ppm	Y													
	SPM Flex	3-3000 ppb	Y													
	MultiRAE/AreaRAE PID**	0-200 ppm	Y		10.6 lamp, 3.9											
Red Phosphorus	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.49 eV	NA	NA	NA	NA	3.7 mg/m3	0.93 mg/m3	0.47 mg/m3	0.27 mg/m^3	NA	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
Toluene	Dräger Tube	50-80 ppm, 50-300 ppm	Y	8.82 eV	NA	1 ppm = 3.77 mg/m^3	REL = 100 ppm, ST 150 ppm PEL = 200 ppm, C 300 ppm, 500 ppm (10-min. max. peak) TLV = 50 ppm S	500 ppm	67 ppm	67 ppm	67 ppm	67 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01 / Summa Canister/ Tedlar Bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 1-8 L ≤200 mL/min
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.45											
Sodium Hydroxide	pH Paper	0-14	Y	NA	NA	NA	PEL = 2 mg/m3 REL = C 2 mg/m3 TLV = C 2 mg/m3	10 mg/m3	NA	NA	NA	0.5 mg/m3	0.5 mg/m3	Filter, PTFE, w/Support Pad, 1.0um, 37mm, 225-17-01	NIOSH 7401	1-4 L/min; 70-1000 L
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 = 0.2 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	Filter, 37-mm diameter quartz fiber 225-1827	NIOSH 7908	1-5 L/min; 15-2000 L
	pH Paper	0-14	Y													
	SPM Flex	0.005-0.75 ppm	Y													

Table 19 - Clandestine Lab

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Ammonia	AreaRAE NH_3 Sensor	0-100 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	Sorbent Tube, Silica Gel, 226-10-06	NIOSH 6015	0.1-0.2 L/min; 96 L max
	MultiRAE Pro NH_3 Sensor	0-100 ppm	Y													
	Dräger Tube[3]	2-30 ppm	Y													
	Dräger Chip[3]	2-50 ppm	Y													
	SPM Flex	0.01-150 ppm	Y													
	MultiRAE/AreaRAE PID*	0-2000 ppm	Y		10.6 lamp, 10.9 11.7 lamp, 5.7											
Benzene	UltraRAE PGM-7360 (benzene specific mode)**	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA											
	Dräger Chip	0.2-10 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 0.47											
	TVA 2020***	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)											
Methanol	MultiRAE/AreaRAE PID**	0-2000 ppm	Y	10.84 eV	11.7 lamp, 2.5	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	530 ppm	200 ppm	Sorbent Tube, Silica Gel, 226-51	NIOSH 2000	0.02-0.2 L/min; 1-5 L
	MultiRAE/AreaRAE LEL Sensor	0-100% LEL	Y		LEL Sensor, 2.0											

Table 19 - Clandestine Lab

Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Particulate																
Particulate	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 19 - Clandestine Lab

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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/m^3) 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.

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.

Air sampling media products listed are for reference only and not an endorsement for use.

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

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

**PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information. Calibrate TVA 2020 with 100-500 ppm methane for accurate results from 1-10.000 ppm.

***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

****Response on multi-gas meters can give an indication of relative concentrations, but may not be quantitative and for some chemicals, no response is observed.

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
CSC -- coconut shell charcoal
EPA -- U.S. Environmental Protection Agency
ERPG -- emergency response planning guideline
eV -- electron volt
FID -- flame ionization detector
HCl -- hydrocholoric acid
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
MCE -- mixed cellulose ester membrane
mg/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
NH_3 -- ammonia
NIOSH -- National Institute for Occupational Safety and Health
NO -- nitric oxide
NO_2 -- nitrogen dioxide
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PH_3 -- phosphine
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 -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
Vol. -- volume
WISER -- Wireless Information System for Emergency Responders

Table 20 - Plastics 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			PAC-1	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																	
Benzene	UltraRAE PGM-7360 (benzene specific mode)*	0.05-200 ppm	Y	9.24 eV	9.8 lamp, 0.55	1 ppm = 3.19 mg/m^3	PEL = 1 ppm, ST 5 pm REL = 0.1 ppm, ST 1 ppm TLV = 0.5 ppm, ST 2.5 ppm	500 ppm	52 ppm	18 ppm	9 ppm	52 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
	Dräger Tube	0.25-2 ppm, 2-10 ppm	Y		NA											
	Dräger Chip	0.2-10 ppm	Y													
	MultiRAE/AreaRAE PID*	0-2000 ppm	Y		10.6 lamp, 0.47											
	TVA 2020*	0.5-2,000 ppm (PID) 1-10,000 ppm (FID)	Y		10.6 lamp 0.294 (10 ppm) - 0.282 (1000 ppm)											
Styrene	Drager tube	10-200 ppm	Y	8.40 eV	NA	1 ppm = 4.26 mg/m3	PEL = 100 ppm, C 200 ppm, 600 ppm (5 minute max peak in 3 hours) REL = 20 ppm, ST 100 ppm TLV = 10 ppm, ST 40 ppm (15 minutes)	700 ppm	20 ppm	20 ppm	20 ppm	20 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01	NIOSH 1501	≤0.2 L/min; 1-14 L
	Dräger Chip	2-40 ppm	Y													
	MultiRAE/AreaRAE PID*	0-2000 ppm	Y		10.6 lamp, 0.43											
Acids																	
Hydrochloric Acid (Hydrogen Chloride)	AreaRAE HCl Sensor	0-15 ppm	Y	12.74 eV	NA	1 ppm = 1.49 mg/m^3	PEL = C 5 ppm REL = C 5 ppm TLV = C 2 ppm	50 ppm	1.8 ppm	1.8 ppm	1.8 ppm	1.8 ppm	3 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9032	NIOSH 7907	2 L/min; 30-600 L
	Dräger Tube	0.2-3 ppm, 3-20 ppm	Y													
	Dräger Chip	≥1-25 ppm	Y													
	pH Paper	0-14	Y													
	SPM Flex	0.02-20 ppm	Y													
Metals- as particulates																	
Lead	TSI DustTrak II**	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.05 mg/m3 REL = 0.05 mg/m3 TLV = 0.05 mg/m3	100 mg/m3	NA	NA	NA	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX**	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Cadmium	TSI DustTrak II**	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.1 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	0.1 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7048	1-3 L/min; 25-1500 L
	TSI DustTrak DRX**	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Chromium (IV)	TSI DustTrak II***	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	Preloaded Cassette, PVC, GLA-5000, 5.0um, 37mm, 2 Piece, 225-802	NIOSH 7600	1-4 L/min; 8-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													

Table 20 - Plastics 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			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Systemic																
Lithium	MultiRAE/AreaRAE PID*	0-2000 ppm	Y	5.39 eV	NA	NA	NA	NA	NA	NA	NA	3.3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 100-2000 L
Nitric Oxide	UltraRAE PGM-7360*	0.05-10000 ppm	Y	9.27 eV	9.8 lamp, 6	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	Sorbent Tube, Molecular Sieve, 226-40	NIOSH 6014	0.025 L/min; 1.5-6 L
	MultiRAE/AreaRAE NO Sensor	0-250 ppm	Y		NA											
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	Sorbent Tube, Molecular Sieve, 226-40-02	NIOSH 6014	0.025-0.2 L/min; 1.5-6 L
	Dräger Tube	0.1-5 ppm, 5-30 ppm	Y													
	Dräger Chip	0.5-25 ppm	Y													
	SPM Flex	0.3-10 ppm	Y													
	MultiRAE/AreaRAE PID*	0-2000 ppm	Y		10.6 Lamp, 16											
Phosphine	MultiRAE/AreaRAE PH_3 Sensor	0-20 ppm	Y	9.96 eV	NA	1 ppm = 1.39 mg/m^3	PEL = 0.3 ppm REL = 0.3 ppm, ST 1 ppm TLV = 0.3 ppm, ST 1 ppm	50 ppm	2 ppm*	0.5 ppm*	0.25 ppm*	1 ppm	NA	Sorbent Tube, Silica Gel, 226-165A	NIOSH 6002	0.01-0.2 L/min; 1-16 L
	Dräger Tube	≥0.1-1 ppm	Y													
	Dräger Chip	0.1-2.5 ppm	Y													
	SPM Flex	3-3000 ppb	Y													
	MultiRAE/AreaRAE PID*	0-200 ppm	Y		10.6 lamp, 3.9											
Red Phosphorus	MultiRAE/AreaRAE PID*	0-2000 ppm	Y	10.49 eV	NA	NA	NA	NA	3.7 mg/m3	0.93 mg/m3	0.47 mg/m3	0.27 mg/m^3	NA	Sorbent Tube, Anasorb CSC, 226-01/Summa Canister/Tedlar bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 5-30 L ≤200 mL/min
Toluene	Dräger Tube	≥5-1800 ppm	Y	8.82 eV	NA	1 ppm = 3.77 mg/m^3	REL = 100 ppm, ST 150 ppm PEL = 200 ppm, C 300 ppm, 500 ppm (10-min. max. peak) TLV = 50 ppm S	500 ppm	67 ppm	67 ppm	67 ppm	67 ppm	50 ppm	Sorbent Tube, Anasorb CSC, 226-01 / Summa Canister/ Tedlar Bag	NIOSH 1501 TO-15 TO-3	≤0.2 L/min; 1-8 L ≤200 mL/min
	MultiRAE/AreaRAE PID*	0-2000 ppm	Y		10.6 lamp, 0.45											
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	Filter, PTFE, w/Support Pad, 1.0um, 37mm, 225-17-01	NIOSH 7401	1-4 L/min; 70-1000 L
	pH Paper	0-14	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 = 0.2 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	Filter, 37-mm diameter quartz fiber 225-1827	NIOSH 7908	1-5 L/min; 15-2000 L
	pH Paper	0-14	Y													
	SPM Flex	0.005-0.75 ppm	Y													

Table 20 - Plastics Fire

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID LAMP, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
VOCs and Gases (continued)																
Ammonia	AreaRAE NH_3 Sensor	0-100 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	Sorbent Tube, Silica Gel, 226-10-06	NIOSH 6015	0.1-0.2 L/min; 96 L max
	MultiRAE Pro NH_3 Sensor	0-100 ppm	Y													
	Dräger Tube	≥0.25-3 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.01-150 ppm	Y													
	MultiRAE/AreaRAE PID**	0-50 ppm	Y		10.6 lamp, 10.9 11.7 lamp, 5.7											
Methanol	MultiRAE/AreaRAE PID*	0-2000 ppm	Y	10.84 eV	11.7 lamp, 2.5	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	530 ppm	200 ppm	Sorbent Tube, Silica Gel, 226-51	NIOSH 2000	0.02-0.2 L/min; 1-5 L
	MultiRAE/AreaRAE LEL Sensor	0-100% LEL	Y		LEL Sensor, 2.0											
Particulate																
Particulate	TSI DustTrak II**	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX**	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 Nal Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 20 - Plastics Fire

Notes:

DRAFT ONLY. 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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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.

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

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

*PIDs and FIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information and TVA 2020 instruction manual for response factors.

**DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.

Acronyms:

≥ -- greater than or equal to
% -- percent
ACGIH -- American Conference of Governmental Industrial Hygienists
AEGL -- acute exposure guideline levels
Ca -- carcinogen
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
HCl -- hydrocholoric acid
IDLH -- immediately dangerous to life and health
IP -- ionization potential
ISO -- isobutylene
mg/m^3 -- milligrams per cubic meter
µR/hr -- micro Roentgens per hour
NA -- not available/applicable
NA_2CO_3 -- sodium carbonate
NH_3 -- ammonia
NIOSH -- National Institute for Occupational Safety and Health
NO -- nitric oxide
NO_2 -- nitrogen dioxide
OSHA -- Occupational Safety and Health Administration
PAC -- protective action criteria
PEL -- permissible exposure limit (OSHA)
PH_3 -- phosphine
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 -- threshold limit value (ACGIH)
TVA -- toxic vapor analyzer
TWA -- time-weighted average
VOC -- volatile organic compound
Vol. -- volume
WISER -- Wireless Information System for Emergency Responders

Table 21 - Water Quality Monitoring

Instrument Guidance

Parameter	Instrument	Detection Level
pH	YSI 556 MPS	0-14
	Horiba U-50	
Temperature	YSI 556 MPS	-5 to 45°C
	Horiba U-50	-10 to 55°C
Turbidity	Horiba U-50	0-800 NTU
	Hach 2100	0 - 1000 NTU
Conductivity	YSI 556 MPS	0 - 200 mS/cm
	Horiba U-50	0 - 100 mS/cm
Salinity	YSI 556 MPS	0 - 70 ppt
	Horiba U-50	
Total Dissolved Solids (TDS)	YSI 556 MPS	0 - 100 g/L
	Horiba U-50	
Dissolved Oxygen	YSI 556 MPS	0-50 mg/L
	Horiba U-50	
ORP	YSI 556 MPS	-1999 to +1999 mV
	Horiba U-50	-2000 to +2000 mV

Notes:

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

* -- Sensor on the YSI PRODSS is optical

°C -- Degrees Celsius

mg/L -- Milligrams per Liter

mS/cm -- Millisiemens per Centimeter

mV -- Millivolt

NTU -- Nephelometric Turbidity Unit

ORP -- Oxygen Reduction Potential

pH -- Power of Hydrogen

ppt -- Parts per Trillion

Table 22 - Battery Site (Release or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Lithium Ion, Lithium Polymer, and Lithium Metal Batteries (Including Button Cell Variation)																
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min; 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Carbon Dioxide	Dräger Tube	1-20% 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	30,000 ppm	NA	Dräger Diffusion Tube, Carbon Dioxide, 65-20,000 ppm, 800-01381/ Gas Sampling Bag	NIOSH 6603	0.02-0.1 L/min; NA
	Dräger Chip	1000-25,000 ppm	Y													
Hydrofluoric Acid (Hydrogen Fluoride)	AreaRAE HF Sensor	0.5-10 ppm	Y	15.98 eV	NA	1 ppm = 0.82 mg/m^3	PEL = 3 ppm REL = C 3 ppm, ST 6 ppm TLV = C 2 ppm ST, 0.5 ppm	30 ppm	1 ppm	1 ppm	1 ppm	1 ppm	2 ppm	Cartridge – two 37-mm diameter cellulose nitrate, one filter impregnated with NA_2CO_3 225-9031	NIOSH 7906	1-2 L/min; 15-1000 L
	Dräger Tube	0.5-15 ppm, 10-90 ppm	Y													
	pH Paper	0-14	Y													
	SPM Flex	0.4-20 ppm	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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													
Manganese	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 C REL = 1 mg/m^3, 3 mg/m^3 C TLV = 0.02 mg/m^3 (resp)	500 mg/m^3	NA	NA	NA	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 5-67 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Copper	TSI DustTrak II***	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	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7029	1-3 L/min; 50-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Hydrogen	Dräger Tube	0.2-2%, 0.5-3%	Y	15.43 eV	LEL Sensor CF: 1.0	1 ppm = 0.82 mg/m^3	<19.5% O_2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
	MultiRae/AreaRae	0-100% LEL, 0-30% O_2	Y													
	MultiRAE/AreaRAE H_2 Sensor	0-1000 ppm	Y													
Nickel	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3 REL = 0.015 mg/m^3 TLV = 1.5 mg/m^3 (respirable)	10 mg/m^3	NA	NA	NA	4.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300	1-4 L/min; 5-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													

Table 22 - Battery Site (Release or Fire)

Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID CF (ISO)	Conversion	Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
							TWA	IDLH	1-hr	4-hr	8-hr	15-min TWA	1-hr	Media	Method	Flow Rate/ Total Volume
Lithium Ion, Lithium Polymer, and Lithium Metal Batteries (Including Button Cell Variation) [continued]																
Cobalt	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.1 mg/m^3 REL = 0.05 mg/m^3 TLV = 0.02 mg/m^3	20 mg/m^3	NA	NA	NA	0.18 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7027	1-3 L/min; 30-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Carbon Black	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 3.5 mg/m^3 REL = 3.5 mg/m^3 Ca TLV = 3 mg/m^3	1750 mg/m^3	NA	NA	NA	9 mg/m^3	NA	Filter (total) Cyclone + Filter (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Lithium	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.025 mg/m^3 REL = 0.025 mg/m^3 TLV = 0.05 mg/m^3 C	0.5 mg/m^3	NA	NA	NA	0.025 mg/m^3	0.025 mg/m^3	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 100-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Phosphorus Pentoxide	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3; ST 3 mg/m^3 REL = 3 mg/m^3, ST 3 mg/m^3 TLV = 2 mg/m^3	250 mg/m^3	NA	NA	NA	1 mg/m^3	1 mg/m^3	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	OSHA ID 111	2 L/min; 960 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Mercury****	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	NA	PEL = C 0.1 mg/m^3 S (100 µg/m^3) REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m^3) TLV = 0.025 mg/m^3 S (25 µg/m^3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m^3)	0.67 mg/m^3* (670 µg/m^3)	0.33 mg/m^3* (330 µg/m^3)	0.15 mg/m^3 (150 µg/m^3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m3	N													
	Jerome 431X	0.003 to 0.999 mg/m^3	N													
	Jerome J405	0.5-999 µg/m^3	N													
	Jerome 505	0.05-0.500 µg/m^3	N													
	Dräger Tube	0.05-2 mg/m^3	Y													
Alkaline Batteries (Including Button Cell Variation)																
Hydrogen	Dräger Tube	0.2-2%, 0.5-3%	Y	15.43 eV	LEL Sensor CF: 1.0	1 ppm = 0.82 mg/m^3	<19.5% O_2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
	MultiRae/AreaRae	0-100% LEL, 0-30% O_2	Y													
	MultiRAE/AreaRAE H_2 Sensor	0-1000 ppm	Y													
Zinc Oxide	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 (fume), 15 mg/m^3 (total dust), 5 mg/m^3 (resp dust) REL = 5 mg/m^3, 10 mg/m^3 ST (fume); 5 mg/m^3, 15 mg/m^3 C (dust) TLV = 2 mg/m^3 (resp), 10 mg/m^3 ST (resp)	500 mg/m^3	NA	NA	NA	10 mg/m^3	NA	0.8µm PVC filter in open-face cassette, 225-807	NIOSH 7502	1-3 L/min; 10-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													

Table 22 - Battery Site (Release or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID Lamp, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Alkaline Batteries (Including Button Cell Variation) [continued]																
Manganese	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 C REL = 1 mg/m^3, 3 mg/m^3 C TLV = 0.02 mg/m^3 (resp)	500 mg/m^3	NA	NA	NA	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 5-67 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Potassium Hydroxide	NA	NA	NA	NA	NA	NA	REL = 2 mg/m^3 C	NA	NA	NA	NA	0.18 mg/m^3	NA	Filter, 1.0 µm PTFE membrane, 225-1715	NIOSH 7401	1-4 L/min; 70-1000 L
Mercury****	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	NA	PEL = C 0.1 mg/m^3 S (100 µg/m^3) REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m^3) TLV = 0.025 mg/m^3 S (25 µg/m^3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m^3)	0.67 mg/m^3* (670 µg/m^3)	0.33 mg/m^3* (330 µg/m^3)	0.15 mg/m^3 (150 µg/m^3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m^3	N													
	Jerome 431X	0.003 to 0.999 mg/m^3	N													
	Jerome J405	0.5-999 µg/m^3	N													
	Jerome 505	0.05-0.500 µg/m^3	N													
	Dräger Tube	0.05-2 mg/m^3	Y													
Nickel Cadmium Batteries																
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min; 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Carbon Dioxide	Dräger Tube	1-20% 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	30,000 ppm	NA	Dräger Diffusion Tube, Carbon Dioxide, 65-20,000 ppm, 800-01381/ Gas Sampling Bag	NIOSH 6603	0.02-0.1 L/min; NA
	Dräger Chip	1000-25,000 ppm	Y													
Mercury****	Lumex RA-915M	2-30000 ng/m^3	N	NA	NA	NA	PEL = C 0.1 mg/m^3 S (100 µg/m^3) REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m^3) TLV = 0.025 mg/m^3 S (25 µg/m^3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m^3)	0.67 mg/m^3* (670 µg/m^3)	0.33 mg/m^3* (330 µg/m^3)	0.15 mg/m^3 (150 µg/m^3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m^3	N													
	Jerome 431X	0.003 to 0.999 mg/m^3	N													
	Jerome J405	0.5-999 µg/m^3	N													
	Jerome 505	0.05-0.500 µg/m^3	N													
	Dräger Tube	0.05-2 mg/m^3	Y													
Cadmium	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.1 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	0.1 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7048	1-3 L/min; 25-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													

Table 22 - Battery Site (Release or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID Lamp, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Nickel Cadmium Batteries (continued)																
Lead	TSI DustTrak II***	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Potassium Hydroxide	NA	NA	NA	NA	NA	NA	REL = 2 mg/m^3 C	NA	NA	NA	NA	0.18 mg/m^3	NA	Filter, 1.0 µm PTFE membrane, 225-1715	NIOSH 7401	1-4 L/min; 70-1000 L
Nickel	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3 REL = 0.015 mg/m^3 TLV = 1.5 mg/m^3 (respirable)	10 mg/m^3	NA	NA	NA	4.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300	1-4 L/min; 5-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Nickel Metal Hydride Batteries																
Carbon Monoxide	MultiRAE/AreaRAE CO Sensor	0-500 ppm, 0-2000 ppm ext range	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*	75 ppm	200 ppm	Five-layer aluminized gas sampling bag, 262-01	OSHA ID 210	1 L/min; 2-5 L
	Dräger Tube	5- 150 ppm, 100-700 ppm	Y													
	Dräger Chip	5-150 ppm	Y													
Carbon Dioxide	Dräger Tube	1-20% 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	30,000 ppm	NA	Dräger Diffusion Tube, Carbon Dioxide, 65-20,000 ppm, 800-01381/ Gas Sampling Bag	NIOSH 6603	0.02-0.1 L/min; NA
	Dräger Chip	1000-25,000 ppm	Y													
Cobalt	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.1 mg/m^3 REL = 0.05 mg/m^3 TLV = 0.02 mg/m^3	20 mg/m^3	NA	NA	NA	0.18 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7027	1-3 L/min; 30-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Zinc Oxide	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 (fume), 15 mg/m^3 (total dust), 5 mg/m^3 (resp dust) REL = 5 mg/m^3, 10 mg/m^3 ST (fume); 5 mg/m^3, 15 mg/m^3 C (dust) TLV = 2 mg/m^3 (resp), 10 mg/m^3 ST (resp)	500 mg/m^3	NA	NA	NA	10 mg/m^3	NA	0.8µm PVC filter in open-face cassette, 225-807	NIOSH 7502	1-3 L/min; 10-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Sodium Hydroxide	NA	NA	NA	NA	NA	NA	PEL = 2 mg/m^3 C REL = 2 mg/m^3 C TLV = 2 mg/m^3	10 mg/m^3	NA	NA	NA	0.5 mg/m^3	0.5 mg/m^3	Filter, 1.0 µm PTFE membrane, 225-1715	NIOSH 7401	1-4 L/min; 70-1000 L
Potassium Hydroxide	NA	NA	NA	NA	NA	NA	REL = 2 mg/m^3 C	NA	NA	NA	NA	0.18 mg/m^3	NA	Filter, 1.0 µm PTFE membrane, 225-1715	NIOSH 7401	1-4 L/min; 70-1000 L

Table 22 - Battery Site (Release or Fire)

Instrument Guidance							Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID Lamp, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Nickel Metal Hydride Batteries (continued)																
Carbon Black	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 3.5 mg/m^3 REL = 3.5 mg/m^3 Ca TLV = 3 mg/m^3	1750 mg/m^3	NA	NA	NA	9 mg/m^3	NA	Filter (total) Cyclone + Filter (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Nickel	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3 REL = 0.015 mg/m^3 TLV = 1.5 mg/m^3 (respirable)	10 mg/m^3	NA	NA	NA	4.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300	1-4 L/min; 5-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Manganese	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 C REL = 1 mg/m^3, 3 mg/m^3 C TLV = 0.02 mg/m^3 (resp)	500 mg/m^3	NA	NA	NA	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 5-67 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Nickel Zinc Batteries																
Hydrogen	Dräger Tube	0.2-2%, 0.5-3%	Y	15.43 eV	LEL Sensor CF: 1.0	1 ppm = 0.82 mg/m^3	<19.5% O_2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
	MultiRae/AreaRae	0-100% LEL, 0-30% O_2	Y													
	MultiRAE/AreaRAE H_2 Sensor	0-1000 ppm	Y													
Nickel	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3 REL = 0.015 mg/m^3 TLV = 1.5 mg/m^3 (respirable)	10 mg/m^3	NA	NA	NA	4.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300	1-4 L/min; 5-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Zinc Oxide	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 (fume), 15 mg/m^3 (total dust), 5 mg/m^3 (resp dust) REL = 5 mg/m^3, 10 mg/m^3 ST (fume); 5 mg/m^3, 15 mg/m^3 C (dust) TLV = 2 mg/m^3 (resp), 10 mg/m^3 ST (resp)	500 mg/m^3	NA	NA	NA	10 mg/m^3	NA	0.8µm PVC filter in open-face cassette, 225-807	NIOSH 7502	1-3 L/min; 10-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Manganese	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 C REL = 1 mg/m^3, 3 mg/m^3 C TLV = 0.02 mg/m^3 (resp)	500 mg/m^3	NA	NA	NA	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 5-67 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Potassium Hydroxide	NA	NA	NA	NA	NA	NA	REL = 2 mg/m^3 C	NA	NA	NA	NA	NA	NA	Filter, 1.0 µm PTFE membrane, 225-1715	NIOSH 7401	1-4 L/min; 70-1000 L

Table 22 - Battery Site (Release or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID Lamp, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Silver Oxide Button Batteries																
Hydrogen	Dräger Tube	0.2-2%, 0.5-3%	Y	15.43 eV	LEL Sensor CF: 1.0	1 ppm = 0.82 mg/m^3	<19.5% O_2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
	MultiRae/AreaRae	0-100% LEL, 0-30% O2	Y													
	MultiRAE/AreaRAE H_2 Sensor	0-1000 ppm	Y													
Mercury****	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	NA	PEL = C 0.1 mg/m^3 (100 µg/m^3) S REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m3) TLV = 0.025 mg/m^3 S (25 µg/m^3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m^3)	0.67 mg/m^3* (670 µg/m^3)	0.33 mg/m^3* (330 µg/m^3)	0.15 mg/m^3 (150 µg/m^3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m3	N													
	Jerome 431X	0.003 to 0.999 mg/m^3	N													
	Jerome J405	0.5-999 µg/m^3	N													
	Jerome 505	0.05-0.500 µg/m^3	N													
	Dräger Tube	0.05-2 mg/m^3	Y													
Zinc Oxide	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 (fume), 15 mg/m^3 (total dust), 5 mg/m^3 (resp dust) REL = 5 mg/m^3, 10 mg/m^3 ST (fume); 5 mg/m^3, 15 mg/m^3 C (dust) TLV = 2 mg/m^3 (resp), 10 mg/m^3 ST (resp)	500 mg/m^3	NA	NA	NA	10 mg/m^3	NA	0.8µm PVC filter in open-face cassette, 225-807	NIOSH 7502	1-3 L/min; 10-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Manganese	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 C REL = 1 mg/m^3, 3 mg/m^3 C TLV = 0.02 mg/m^3 (resp)	500 mg/m^3	NA	NA	NA	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 5-67 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Silver	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.01 mg/m^3 REL = 0.01 mg/m^3 TLV = 0.1 mg/m^3 (dust, fume)	10 mg/m^3	NA	NA	NA	0.3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 250-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Potassium Hydroxide	NA	NA	NA	NA	NA	NA	REL = 2 mg/m^3 C	NA	NA	NA	NA	0.18 mg/m^3	NA	Filter, 1.0 µm PTFE membrane, 225-1715	NIOSH 7401	1-4 L/min; 70-1000 L

Table 22 - Battery Site (Release or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID Lamp, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Lead Acid Batteries																
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 = 0.2 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	Filter, 37-mm diameter quartz fiber 225-1827	NIOSH 7908	1-5 L/min; 15-2000 L
	pH Paper	0-14	Y													
	SPM Flex	0.005-0.75 ppm	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 = ST 0.25 ppm	100 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.2 ppm	0.3 ppm	Preloaded Cassette, MCE, Coated, Sodium Carbonate, 225-9005	NIOSH 6004	0.5-1.5 L/min; 4-200 L
	Dräger Tube	≥0.1-3 ppm	Y													
	Dräger Chip	≥0.4-10 ppm	Y													
	SPM Flex	0.01-2.5 ppm	Y													
Hydrogen Sulfide	MultiRAE/AreaRAE H_2S Sensor	0-100 ppm, 0-1000 ppm ext. range	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 = 1 ppm, ST 5 ppm	100 ppm	0.51 ppm	0.36 ppm	0.33 ppm	0.51 ppm	0.1 ppm	Sorbent Tube, Silica Gel, For Hydrogen Sulfide, Sulfur Dioxide, 266-177	OSHA 1008 NIOSH 6013	0.05 L/min; 12 L 0.1 to 1.5 L/min (0.2 L/min rec); 1.2-40 L
	Dräger Tube	≥0.2-6 ppm	Y													
	Dräger Chip	≥0.2-5 ppm	Y													
	SPM Flex	0.001-9.999 ppm	Y													
	MultiRAE/AreaRAE PID**	0-2000 ppm	Y		10.6 lamp, 3.3											
Hydrogen	Dräger Tube	0.2-2%, 0.5-3%	Y	15.43 eV	LEL Sensor CF: 1.0	1 ppm = 0.82 mg/m^3	<19.5% O_2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
	MultiRae/AreaRae	0-100% LEL, 0-30% O2	Y													
	MultiRAE/AreaRAE H_2 Sensor	0-1000 ppm	Y													
Arsine	Arsine Dräger Tube	0.05-3 mg/m^3	Y	9.89 eV	10.6 lamp, 1.9	1 ppm = 3.19 mg/m^3	PEL = 0.05 ppm REL = 0.002 mg/m^3 (15 min.) Ca C TLV = 0.005 ppm	3 ppm Ca	0.3 ppm*	0.21 ppm*	0.17 ppm*	0.015 ppm	NA	Solid Sorbent Tube, CSC, 100 mg/50 mg, 226-01	NIOSH 6001	0.01-0.2 L/min; 0.1-10 L
	MulitRAE/AreaRAE PID**	0-2000 ppm	Y													
	SPM Flex	0.5-500 ppb	Y													
Antimony	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 0.5 mg/m^3 REL = 0.5 mg/m^3 TLV = 0.5 mg/m^3	50 mg/m^3	NA	NA	NA	1.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Arsenic (inorganic compounds)	TSI DustTrak II***	0.001-400 mg/m^3	N	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	1.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7900	1-3 L/min; 30-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Tin	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 2 mg/m^3 REL = 2 mg/m^3 TLV = 2 mg/m^3	100 mg/m^3	NA	NA	NA	6 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7301	1-4 L/min; 5-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Lead	TSI DustTrak II***	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	0.15 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300, NIOSH 7301	1-4 L/min; 50-2000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													

Table 22 - Battery Site (Release or Fire)

	Instrument Guidance						Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID Lamp, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Zinc-Air Button Batteries																
Hydrogen	Dräger Tube	0.2-2%, 0.5-3%	Y	15.43 eV	LEL Sensor CF: 1.0	1 ppm = 0.82 mg/m^3	<19.5% O_2 (simple asphyxiant)	NA	NA	NA	NA	NA	NA	Gastec Detector Tube, Hydrogen, 0.5-2% Vol, 810-30	OSHA CSI	NA
	MultiRae/AreaRae	0-100% LEL, 0-30% O_2	Y													
	MultiRAE/AreaRAE H_2 Sensor	0-1000 ppm	Y													
Zinc Oxide	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 5 mg/m^3 (fume), 15 mg/m^3 (total dust), 5 mg/m^3 (resp dust) REL = 5 mg/m^3, 10 mg/m^3 ST (fume); 5 mg/m^3, 15 mg/m^3 C (dust) TLV = 2 mg/m^3 (resp), 10 mg/m^3 ST (resp)	500 mg/m^3	NA	NA	NA	10 mg/m^3	NA	0.8µm PVC filter in open-face cassette, 225-807	NIOSH 7502	1-3 L/min; 10-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Potassium Hydroxide	NA	NA	NA	NA	NA	NA	REL = 2 mg/m^3 C	NA	NA	NA	NA	NA	0.18 mg/m^3	NA	Filter, 1.0 µm PTFE membrane, 225-1715	NIOSH 7401	1-4 L/min; 70-1000 L
Copper	TSI DustTrak II***	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	3 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7029	1-3 L/min; 50-1500 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Nickel	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 1 mg/m^3 REL = 0.015 mg/m^3 TLV = 1.5 mg/m^3 (respirable)	10 mg/m^3	NA	NA	NA	4.5 mg/m^3	NA	Preloaded Cassette, MCE, 0.8um, 37mm, 3 Piece, PRE-BANDED, 225-3-01	NIOSH 7300	1-4 L/min; 5-1000 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Carbon Black	TSI DustTrak II***	0.001-400 mg/m^3	N	NA	NA	NA	PEL = 3.5 mg/m^3 REL = 3.5 mg/m^3 Ca TLV = 3 mg/m^3	1750 mg/m^3	NA	NA	NA	9 mg/m^3	NA	Filter (total) Cyclone + Filter (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Mercury****	Lumex RA-915M	2-30,000 ng/m^3	N	NA	NA	NA	PEL = C 0.1 mg/m^3 (100 µg/m^3) S REL = 0.05 mg/m^3 S (vapor) (50 µg/m^3), C 0.1 mg/m^3 (other) (100 µg/m^3) TLV = 0.025 mg/m^3 S (25 µg/m^3)	10 mg/m^3 (10,000 µg/m^3)	1.7 mg/m^3* (1,700 µg/m^3)	0.67 mg/m^3* (670 µg/m^3)	0.33 mg/m^3* (330 µg/m^3)	0.15 mg/m^3 (150 µg/m^3)	NA	Sorbent Tube, Anasorb C300, 226-17-1A	NIOSH 6009	0.15-0.25 L/min; 2-100 L
	Lumex RA-915 Light	100-3,000,000 ng/m^3	N													
	Jerome 431X	0.003 to 0.999 mg/m^3	N													
	Jerome J405	0.5-999 µg/m^3	N													
	Jerome 505	0.05-0.500 µg/m^3	N													
	Dräger Tube	0.05-2 mg/m^3	Y													

Table 22 - Battery Site (Release or Fire)

Instrument Guidance							Regulatory Guidance							Reference		
							Occupational Action Levels		AEGL-1			PAC-1	ERPG-1	Air Sampling		
Target Compound[1]	Instrument	Detection Level	Intrinsically Safe (Y/N)	IP	PID Lamp, CF (ISO)	Conversion	TWA	IDLH	1-hr	4-hr	8-hr	1-hr	1-hr	Media	Method	Flow Rate/ Total Volume
Particulate																
Particulate	TSI DustTrak II***	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 (respirable)	NIOSH 0500 (total) NIOSH 0600 (respirable)	1-2 L/min (total); 7-133 L 1.7-2.5 L/min (respirable); 20-400 L
	TSI DustTrak DRX***	0.001-150 mg/m^3	N													
	Pocket Pump TOUCH	NA	Y													
	Aircon-2	NA	N													
Radiation[2]																
Radiation	Model 192 Micro R Exposure Rate Meter	0-5,000 µR/hr	N	NA	NA	NA	10 µR/hr	NA	NA	NA	NA	NA	NA	RADeCO Filter Paper (2")	RSSOP 209/501	α = 2500 ft^3 β/Y = 1250 ft^3
	Ludlum Model 2241-2 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241-3 w/ 44-9 Pancake Probe	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Ludlum Model 2241 w/ 43-90 Alpha Scintillator	0-9,999 R/hr or 999,000 cpm	N				300 cpm									
	Model 2241 w/ Model 44-10 NaI Detector	0-9,999 R/hr or 999,000 cpm	N				300 cpm									

Table 22 - Battery Site (Release or Fire)

Notes:
DRAFT ONLY. 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. Target compound informaiton was based on generic SDSs. Specific SDSs should be conslulted if possible.

[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. Additional equipment includes Fluke 451B, SAM 940 RIID, Thermo Scientific EPD Mk2, RADeCO Model H-810, Ludlum model 3030, Ludlum model 239-1F floor monitor, Ludlum model 43-68 gas proportional detector, Ludlum model 133-2 compensated GM detector, Ludlum model 15 neutron probe, and Saphymo/Genitron gamma tracer and base station.

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.
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

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.skcinc.com/	SKC, Inc. website
TN-114/TN-106	RAE system information
Dräger-Tube & CMS-Handbook 18th Edition	Dräger tube information

Electric vehicle batteries are typically lithium ion and lithium polymer. Electric vehicle batteries may also be nickel cadmium, nickel metal hydride, and lead acid.

*AEGL-2 - There is no AEGL-1 for this compound.
**PIDs are non-specific detectors and cannot differentiate one VOC from another, even with CFs applied. See RAE PID Correction factor guidance document TN-106 for more information.
***DustTrak DRX and DustTrak II are non-specific detectors and cannot differentiate one particulate from another.
****Mercury may be found in some button cell batteries.

Acronyms:

≥ – greater than or equal to
< -- less than
% – percent
ACGIH – American Conference of Governmental Industrial Hygienists
AEGL – acute exposure guideline levels
C -- ceiling
Ca – carcinogen
CDC – Centers for Disease Control and Prevention
CF – conversion factor
CO – carbon monoxide
cpm – counts per minute
CSC -- coconut shell charcoal
EPA – U.S. Environmental Protection Agency
ERPG – emergency response planning guideline
eV – electron volt
HF -- hydrogen fluoride
IDLH – immediately dangerous to life and health
IP – ionization potential
ISO – isobutylene
L -- liters
LEL -- lower explosive limit
L/min -- liters per minute
MCE -- mixed cellulose ester membrane
mg/m3 – milligrams per cubic meter
mm -- millimeter
NA_2CO_3 -- sodium carbonate
ng/m^3 -- nanograms per cubic meter
NA – not available/applicable
NIOSH – National Institute for Occupational Safety and Health
O_2 -- oxygen
OSHA – Occupational Safety and Health Administration
PAC – protective action criteria
PEL – permissible exposure limit (OSHA)
PID – photoionization detector
ppm – parts per million
PTFE -- polytetrafluoroethylene
PVC -- polyvinyl chloride
R/hr – Roentgens per hour
REL – recommended exposure limit (NIOSH)
S -- skin notation (compound may be absorbed through the skin)
SO_2 -- sulfur dioxide
SPM – single-point monitor
SSHASP – site-specific health and safety plan
ST -- short term
TEEL – temporary emergency exposure limit
TLV – threshold limit value (ACGIH)
TWA – time-weighted average
µg/m^3 – micrograms per cubic meter
µm -- micrometer
µR/hr – micro Roentgens per hour
VOC -- volatile organic compound
Vol. – volume
WISER – Wireless Information System for Emergency Responders

Attachment A
Hazard Evaluation Flow Chart for Unknowns

Hazard Evaluation Flow Chart for Unknowns

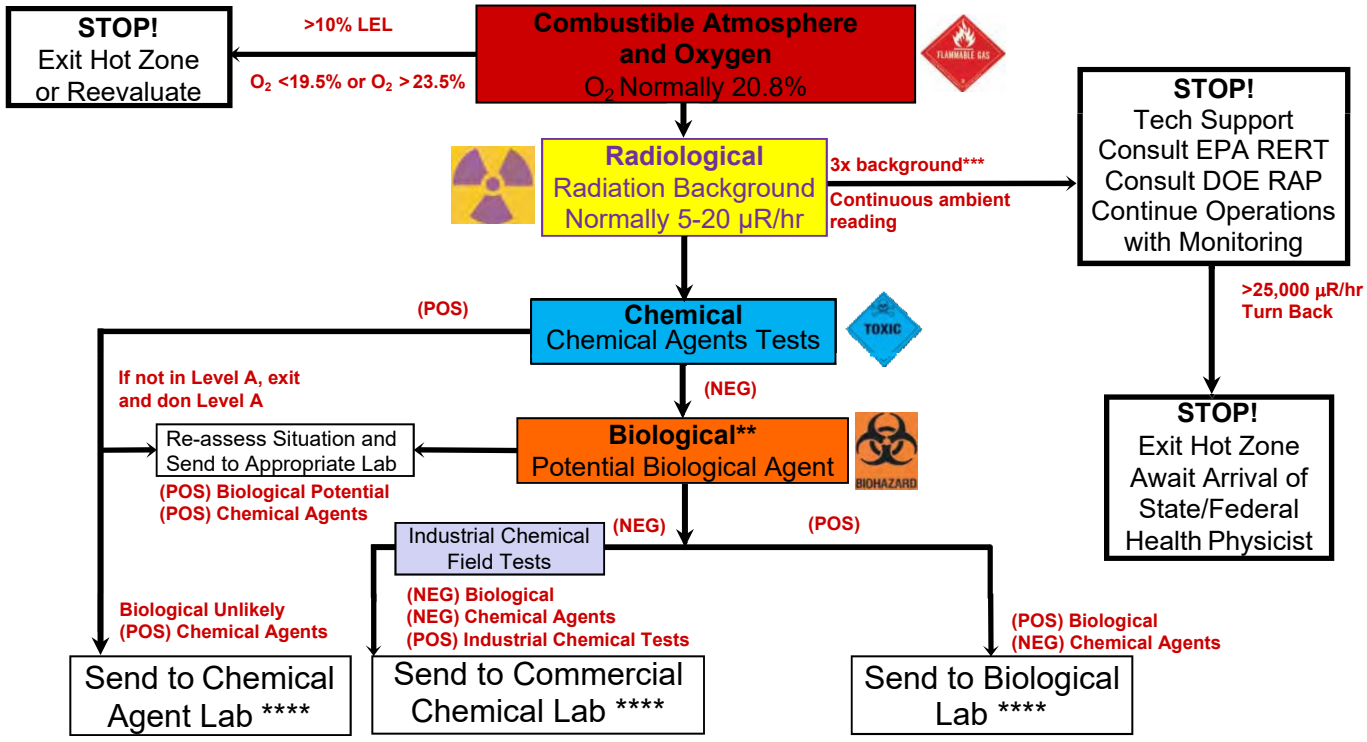
Early Considerations:
Collect intelligence, document signs and symptoms of victims, evaluate scene and situation, potential explosives should be evaluated by the local bomb squad, cordon off area, isolate, evacuate, disable HVAC, seal doors and cracks, delineate hot zone (wind direction and intensity), 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)

Team enters hot zone

Air	Liquid/Solid
1st Entry: Multi-Gas Monitor with PID* (MultiRAE); Radiation Meter (Gamma); Ratemeter with Pancake Probe; FID; AP2C; AP4C; M256 Kit; Chemical Agent Detector Strips; digital camera	**1st Entry:** Multi-Gas Monitor with PID* (MultiRAE); 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); SAM940; identiFINDER; Ratemeter with Pancake Probe; SPM; Lumex MVA ***Collect Air Samples As Appropriate***	**2nd Entry:** Dräger tubes/chips; Multi-Gas Monitor with PID (MultiRAE); SAM940; identiFINDER; Ratemeter with Pancake Probe; Lumex MVA ***Collect Liquid/Solid Samples As Appropriate***
Additional Monitoring: Particulate Monitor (DustTrak DRX); AreaRAE; TAGA; ASPECT	**Additional Monitoring:** Raman Spectrometer (Ahura FD) HAZMAT ID FTIR; Industrial Chemical Field Tests



*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.