



Standard Guide for Analytical Testing of Substances of Very High Concern in Materials and Products¹

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1. Scope

1.1 This guide contains a list of potential test methods for the analysis of Substances of Very High Concern (SVHC) as designated by ECHA, the European Chemicals Agency. Information on the test methods cited is publicly available and is drawn from a variety of sources. The guide is intended to assist in the selection of test methods that are applicable for the SVHCs identified.

1.2 The specific SVHCs covered within this guide are compiled from the ECHA Candidate List of Substances of Very High Concern. This list is also referred to as the REACH Candidate List.

1.3 This guide specifically addresses methods for the analysis of SVHCs in products. It is not intended to cover the many and varied analysis challenges associated in the manufacturing environment.

1.4 Limitations:

1.4.1 This guide is intended to provide a compilation of available test methods for the SVHCs listed on the ECHA Candidate list and is not intended to be exhaustive. The test methods within this guide are not the only ones available for any specific substances and this guide does not recommend any specific test method.

1.4.2 Test methods for specific substances at the detection limits required for REACH reporting are not always available. In some cases, it is necessary to deduce the quantity of substance present through the analysis and quantification of its elements. Although this approach is routinely used some degree of uncertainty exists in the final result due to the reduced specificity of the test method.

1.4.3 Although this guide is intended to be updated on a periodic basis to capture new developments in the field, there is no assurance that the information provided is the most current.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

D1257 Specification for High-Gravity Glycerin

D1385 Test Method for Hydrazine in Water

D1971 Practices for Digestion of Water Samples for Determination of Metals by Flame Atomic Absorption, Graphite Furnace Atomic Absorption, Plasma Emission Spectroscopy, or Plasma Mass Spectrometry

D3335 Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectroscopy

D3545 Test Method for Alcohol Content and Purity of Acetate Esters by Gas Chromatography

D4309 Practice for Sample Digestion Using Closed Vessel Microwave Heating Technique for the Determination of Total Metals in Water

D5831 Test Method for Screening Fuels in Soils

D7065 Test Method for Determination of Nonylphenol, Bisphenol A, *p*-tert-Octylphenol, Nonylphenol Monoethoxylate and Nonylphenol Diethoxylate in Environmental Waters by Gas Chromatography Mass Spectrometry

D7485 Test Method for Determination of Nonylphenol, *p*-tert-Octylphenol, Nonylphenol Monoethoxylate and Nonylphenol Diethoxylate in Environmental Waters by Liquid Chromatography/Tandem Mass Spectrometry

E1621 Guide for X-Ray Emission Spectrometric Analysis

F2576 Terminology Relating to Declarable Substances in Materials

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 *European Commission*:³

Article 57 of the European Union Regulation #1907/2006

2.3 *International Electrotechnical Commission TC₁₁*:⁴

IEC 62321 *Electrotechnical Products – Determination of Levels of Six Regulated Substances (Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated Biphenyls, Polybrominated Diphenyl Ethers)*

2.4 *Joint Industry Guide (JIG)*:⁵

JIG-101 *Material Composition Declaration for Electrotechnical Products*. Ed 4.0, 2011

3. Terminology

3.1 *Definitions*:

3.1.1 Terms and definitions related to declarable substances in materials may be found in Terminology **F2576**.

3.1.2 Terms and definitions in the guide not found in Terminology **F2576** are found in a common dictionary or other reference documents such as the ASTM Dictionary of Engineering Science & Technology.⁶

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *article*—“an object which during production is given a special shape, surface or design which determines its function to a greater degree than its chemical composition” as defined in Article 3(3) of the REACH Regulation.

3.2.2 *brominated flame retardant*—a group of brominated organic compounds that are used to inhibit initiation of a fire.

3.2.3 *Joint Industry Guide*—An industry standard of the Electric Industries Alliance that “*establishes the relevant substances as well as reporting thresholds that the industry agrees should govern material content disclosures.*”⁵

3.2.4 *phthalates*—also known as *phthalate esters*, are esters of phthalic acid primarily used as a plasticizer for polyvinyl chloride or as solvents for many different types of consumer products.

3.2.5 *plasticizer*—any of a group of substances used in plastics and other materials to control viscosity, flexibility or softness of the finished product.

3.2.6 *Substances of Very High Concern (SVHC)*—substances that have hazards of serious consequences and meet the criteria for carcinogenic, mutagenic and reproductive toxic substances of category 1 and 2.

3.2.6.1 *Discussion*—SVHC can be persistent, bioaccumulative and toxic (PBT) substances or very persistent and very bioaccumulative (VPvB) substances. Other substances giving rise to an equivalent level of concern as potential SVHC include endocrine disruptors.

3.3 *Acronyms*:

3.3.1 **AAS**—Atomic Absorption Spectrometry

3.3.2 **AED**—Atomic Emission Detection

3.3.3 **AES**—Atomic Emission Spectrometry

3.3.4 **AFS**—Atomic Fluorescence Spectrometry

3.3.5 **BFR**—Brominated Flame Retardant

3.3.6 **CAS**—Chemical Abstract Services

3.3.7 **CMR**—Carcinogenic, Mutagenic and Toxic to Reproduction

3.3.8 **CPSC**—United States Consumer Product Safety Commission

3.3.9 **DMF**—Dimethylformamide

3.3.10 **ECD**—Electron Capture Detection

3.3.11 **ECHA**—European Chemicals Agency

3.3.12 **ECNI**—Electron Capture Negative Ion

3.3.13 **EEE**—Electrical and Electronic Equipment

3.3.14 **EIA**—Electronic Industries Alliance

3.3.15 **EPA**—United States Environmental Protection Agency

3.3.16 **EU**—European Union

3.3.17 **FID**—Flame Ionization Detection

3.3.18 **FPD**—Flame Photometric Detection

3.3.19 **GC-MS**—Gas Chromatography-Mass Spectrometry

3.3.20 **GFAA**—Graphite Furnace Atomic Absorption Spectrometry

3.3.21 **HAFID**—Hydrogen Atmosphere Flame Ionization Detection

3.3.22 **HFAA**—Heptafluorobutyric acid anhydride

3.3.23 **HIPS**—High Impact Polystyrene

3.3.24 **HPLC**—High Performance (or Pressure) Liquid Chromatography

3.3.25 **ICP-MS**—Inductively Coupled Plasma – Mass Spectrometry

3.3.26 **ICP-OES**—Inductively Coupled Plasma – Optical Emission Spectrometry

3.3.27 **IR**—Infrared Spectrometry

3.3.28 **LC-MS-MS**—Liquid Chromatography-Tandem

3.3.29 **MSP**—Microspectrophotometer

3.3.30 **NIOSH**—United States National Institute for Occupational Health and Safety

3.3.31 **PAH**—Polycyclic Aromatic Hydrocarbon

3.3.32 **PTFE**—Polytetrafluoroethylene (Teflon)

3.3.33 **PVC**—Polyvinyl Chloride

3.3.34 **REACH**—Registration, Evaluation and Authorization of Chemicals

3.3.35 **RoHS**—Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

3.3.36 **UV-VIS**—UltraViolet-Visible Spectrometry

3.3.37 **XRF**—X-ray Fluorescence Spectrometry

³ Europese Commissie, B-1049, Brussels, Belgium, http://ec.europa.eu/index_en.htm.

⁴ Available from International Electrotechnical Commission (IEC), 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, <http://www.iec.ch>.

⁵ Available from the Consumer Electronics Association, 1919 S. Eads St. Arlington, VA 22202, <http://www.ce.org>

⁶ ASTM Dictionary of Engineering Science & Technology, 10th Edition. Available from www.astm.org.

4. Summary of Guide

4.1 This guide provides a list of test methods for the determination of the Substances of Very High Concern as identified in the REACH Candidate list. Screening methods are discussed in [Appendix X2](#).

4.2 This guide provides identifiers for each substance such as chemical name, synonyms, chemical formulas, CAS and EU numbers.

4.3 Common uses for each of the substances are identified.

5. Significance and Use

5.1 The REACH Candidate list classifies substances as SVHCs thus making them subject to possible authorization. Compliance to the REACH regulation requires that any identified SVHC be present at a concentration of less than 0.1 % (w/w) of the total article weight to avoid triggering a reporting obligation. This guide is intended to assist in the identification of available test methods for quantitative analysis of the substance(s) of interest.

5.2 When possible, industry accepted standard test methods are cited. However, industry vetted test methods are not available for all of the substances contained in the REACH Candidate List. Thus, some caution and due diligence must be exercised when applying some of the methods listed in this guide.

5.3 In some cases, test methods for the identification and quantification of a specific substance are not available. An example would include CoCl_2 . Methods currently in practice involve the individual determination of Co and Cl concentrations and use other sources of information or chemical judgment to assign the expected CoCl_2 concentration. This approach obviously has its limitations and pitfalls and must be used judiciously.

5.4 Under the REACH regulation, EU manufacturers, importers or distributors of articles containing more than 0.1 % (w/w) of a substance that the Agency has listed as being an SVHC shall provide their customers with the name of the substance and information allowing the safe use of the article. Producers and distributors of articles containing SVHC shall also supply the same information to consumers, upon request. In situations where this information is not readily available from the supply chain it is incumbent upon the supplier to collect this information through actual chemical analysis or other means. This guide is intended to assist in the selection of appropriate test methods in the event that chemical analysis is required.

6. Substance List and Uses

6.1 The substances listed in [Table 1](#) were derived from the ECHA SVHC Candidate List published in October 2008. Any substances that have been subsequently added after October 2008 are not included.

6.2 The CAS or EU numbers are unique identifiers for the substance. It is possible for a particular substance to have one or more commonly used names.

6.3 Common uses of the substance help to identify in which products or materials these substance is likely to be found. Note that the list of common uses is not exhaustive.

7. SVHC Test Methods

7.1 This guide is not intended to be exhaustive in the identification of available test methods. The intent is to provide guidance and some examples of available test methods relevant to the required analysis. Some of the SVHCs do not have industry standard test methods associated with them. Literature citations of these non-standard methods are meant to be for information only.

7.2 Standard test methods do not exist for all of the SVHCs listed. Therefore, the test methods cited for those substances must be validated for analytical accuracy before use in regulatory compliance demonstration. Moreover, when a method is applied outside of its intended scope, validation of the altered method is required. Considerations such as sample matrix, analytical requirements, etc. for the intended analysis will determine its applicability. All deviations from the published method must be clearly noted.

NOTE 1—If a standardized method is used beyond the stated scope, that addition must be validated. All deviations from published methods must be documented.

7.3 In many cases, test methods that are specific for a particular substance have not been developed. Therefore, the approach to quantitative analysis is not straightforward. A combination of test methods and the use of logical assumptions are required. These assumptions shall be clearly articulated because they will determine the limitations of the approach.

7.4 Screening methods can be utilized to determine whether a detectable amount of a substance is present. In many situations the application of a screening process can obviate the need to perform full quantitative analysis. See [Appendix X2](#) for more information on screening methodologies.

7.5 In some cases, sample preparation methods are dependent upon the physical state of the sample to be analyzed. For many of the test methods, several sample preparation references are cited when applicable.

7.6 In some cases, limitations in the sample preparation method cited in [Appendix X1.2](#) can produce a sample for analysis that is non-optimal. Incomplete extraction, incomplete digestion, loss of analyte, etc. often require adjustments to the sample preparation methods to obtain the desired analytical result. At a minimum the limitations in the sample preparation method shall be accounted for, when possible, in the calculation of the analytical result. Additionally, if these adjustments to the method do not produce a satisfactory sample for analysis, it may be necessary to develop an alternative method. Validation of the sample preparation method will thus be required.

7.7 Detection limits for the test methods are given when available and for reference only. It is necessary when reporting analytical results that they conform to the definition given by the reporting requirement.



TABLE 1 SVHC Substances and Their Common Uses

Substance Name	Synonym	CAS Number	EU Number	Chemical Formula	Common Uses
4,4'-Diaminodiphenylmethane	4,4'-Methylene-dianiline, MDA	101-77-9	202-974-4	$C_{13}H_{14}N_2$	Converted to methylenediphenyl diisocyanate (MDI). MDI used for polyurethane production. Other uses include: (1) hardener for epoxy resins and adhesives, (2) basic ingredient of colorant, and (3) intermediate for high-performance polymer.
5-tert-Butyl-2,4,6-Trinitro-m-Xylene	Musk Xylene (2,4,6-Trinitro-1,3-dimethyl-5-tert-butylbenzene)	81-15-2	201-329-4	$C_{12}H_{15}N_3O_6$	Used as a fragrant particularly for consumer cosmetic products.
Alkanes, C10-13, chloro	Short Chain Chlorinated Paraffins (SCCP)	85535-84-8	287-476-5	$C_xH_{(2x-y+2)}Cl_y$ where $x=10-13$ and $y=1-13$	May act as a secondary plasticizer or flame retardant in PVC. Other uses include: (1) metal working lubricant, (2) rubber parts, (3) paints, (4) sealant, (5) leather work, and (6) fiber.
Anthracene	Paranaphthalene	120-12-7	204-371-1	$C_{14}H_{10}$	An intermediate in the production of dyes; used in the manufacture of pyrotechnic products.
Benzyl butyl phthalate	Phthalic acid, benzyl ester	85-68-7	201-622-7	$C_{19}H_{20}O_4$	Plasticizer in flooring material such as PVC foam. Other uses are as a plasticizer in traffic cones, food conveyor belts, artificial leather, etc.
Bis(2-ethylhexyl)phthalate	Diethylphthalate	117-81-7	204-211-0	$C_{24}H_{38}O_4$	Commonly used as a plasticizer in manufacturing of articles made of PVC, resins, rubbers, packaging materials, some paper products, and various medical devices, including the blood bags. It can also be found in some hydraulic fluids or dielectric fluids in capacitors. It is often found in coatings, pigments, textiles, or used as a solvent in light sticks.
Bis (tributyltin) oxide	Distannoxane, hexabutyl-	56-35-9	200-268-0	$C_{24}H_{54}OSn_2$	Primarily used as a biocide for boats, mildew proofing for leather work.
Cobalt dichloride	Cobaltous Chloride	7646-79-9	231-589-4	$CoCl_2$	This substance can be used for (1) humidity indicator, (2) absorbent of ammonia gas, (3) gas mask, (4) production for vitamin B ₁₂ , (5) trace amount of nutrient factor for food, (6) trace amount of element for nitric-acid pesticides, (7) solvent in purifying magnesium. Additionally, it may be used for packaging.
Diarsenic pentaoxide	Diarsenic Pentoxide	1303-28-2	215-116-9	As_2O_5	This substance can be used for (1) colorants, (2) metal refining, (3) special glass production, and (4) antiseptic agent for wood.
Diarsenic trioxide	Arsenic Trioxide	1327-53-3	215-481-4	As_2O_3	This substance can be used for (1) decolorants for glasses and enamel, (2) purifying and oxidizing agent in production of special glasses and lead crystal, (3) antiseptic agent for wood, and (4) medicine for leukemia.
Dibutyl phthalate	1,2-Benzenedicarboxylic acid di-n-butyl ester	84-74-2	201-557-4	$C_{16}H_{22}O_4$	Common plasticizer used in various polymers to keep crystals from forming. It is also used in paints, pigments, or printing inks as an adhesive agent. It is soluble in various organic solvents. This property allows it to be used as fixatives in perfumes or as an ectoparasiticide.
Hexabromocyclododecane	Cyclododecane, hexabromo-isomers	25637-99-4	247-148-4	$C_{12}H_{18}Br_6$	Used as a brominated flame retardant for polystyrene materials, for example, HIPS case material and packaging.
Lead hydrogen arsenate	Lead Acid Arsenate	7784-40-9	232-064-2	$(AsO_4H)Pb$	Insecticide or pesticide
Sodium dichromate dihydrate	Sodium Dichromate	7789-12-0	234-190-3	$Na_2Cr_2O_7 \cdot 2H_2O$	Used for: (1) production of other chromium compounds, (2) production of inorganic chromate pigments, (3) preservative supplement, finishing of metal plating, (4) production of vitamin K.
Triethyl arsenate	Arsenic acid Triethyl Ester	15606-95-8	427-700-2	$(C_2H_5O)_3AsO$	Used for integrated circuit manufacturing as an intermediate for n-type doping of semiconductors.
2,4-Dinitrotoluene	1-methyl-2,4-dinitrobenzene	121-14-2	204-450-0	$C_7H_6N_2O_4$	2,4-dinitrotoluene is used in the production of toluene diisocyanate, which is used for the manufacture of flexible polyurethane foams. The substance is also used as gelatinizing-plasticizing agent for the manufacture of explosive mixtures (for example, for airbags in cars).
Aluminosilicate Refractory Ceramic Fibres	VITREOUS	142844-00-6			Refractory ceramic fibres are used for high-temperature insulation, almost exclusively in industrial applications (insulation of industrial furnaces and equipment, equipment for the automotive and aircraft/aerospace industry) and in fire protection (buildings and industrial process equipment).
Anthracene oil	Anthracene Phenanthrene Carbazole	90640-80-5	292-602-7	$C_{14}H_{10}$ $C_{12}H_8N$	The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnaces, as components in bunker fuel, for impregnating, sealing and corrosion protection.



Anthracene oil, anthracene paste	Anthracene Phenanthrene Carbazole	90640-81-6	292-603-2	$C_{14}H_{10}$ $C_{12}H_9N$	The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnaces, as components in bunker fuel, for impregnating, sealing and corrosion protection.
Anthracene oil, anthracene paste, anthracene fraction	Anthracene Phenanthrene Carbazole	91995-15-2	295-275-9	$C_{14}H_{10}$ $C_{12}H_9N$	The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnaces, as components in bunker fuel, for impregnating, sealing and corrosion protection.
Anthracene oil, anthracene paste, distn. lights	Anthracene Phenanthrene Carbazole	91995-17-4	295-278-5	$C_{14}H_{10}$ $C_{12}H_9N$	The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnaces, as components in bunker fuel, for impregnating, sealing and corrosion protection.
Anthracene oil, anthracene-low	Anthracene Phenanthrene Carbazole	90640-82-7	292-604-8	$C_{14}H_{10}$ $C_{12}H_9N$	The substances are mainly used in the manufacture of other substances such as anthracene and carbon black. They may also be used as reducing agents in blast furnaces, as components in bunker fuel, for impregnating, sealing and corrosion protection.
Diisobutyl phthalate	Bis(2-methylpropyl) benzene-1,2-dicarboxylate	84-69-5	201-553-2	$C_{16}H_{22}O_4$	Diisobutyl phthalate is used as plasticiser for nitrocellulose, cellulose ether, polyacrylate and polyacetate dispersions, and as a gelling aid in combination with other plasticisers, which are widely used for plastics, lacquers, adhesives, explosive material and nail polish.
Lead chromate	Lead(2+) chromate	7758-97-6	231-846-0	$CrH_2O_4 \cdot Pb$	Lead chromate is used for manufacturing pigments and dyes, as a pigment or coating agent in industrial and maritime paint products or for embalming/restoring of art products. Further potential uses include as detergents and bleaches, photosensitive materials and for the manufacture of pyrotechnic powder.
Lead chromate molybdate sulphate red (C.I. Pigment Red 104)	Lead(2+) chromate lead(2+) sulfate lead(2+) molybdate	12656-85-8	235-759-9	$CrH_2O_4 \cdot Pb$ $H_2O_4S \cdot Pb$ $PbMoO_4$	Lead chromate molybdate sulphate red (C.I. Pigment Red 104) is used as a colouring, painting and coating agent in sectors such as the rubber, plastic and paints, coatings and varnishes industries. Applications comprise the production of agricultural equipment, vehicles and aircraft as well as road and airstrip painting.
Lead sulfochromate yellow (C.I. Pigment Yellow 34)	Lead(2+) chromate lead(2+) sulfate	1344-37-2	215-693-7	$CrH_2O_4 \cdot Pb$ $H_2O_4S \cdot Pb$	Lead sulfochromate yellow (C.I. Pigment Yellow 34) is used as a colouring, painting and coating agent in sectors such as the rubber, plastic and paints, coatings and varnishes industries. Applications comprise the production of agricultural equipment, vehicles and aircraft as well as road and airstrip painting. The substance is further used for camouflage or ammunition marking in the defence area.
Pitch, coal tar, high temperature	anode pitch, binder pitch, clay pigeon binder, electrode pitch, hard pitch, impregnating pitch, soft pitch, vacuum pitch	65996-93-2	266-028-2	not applicable	Pitch, coal tar, high temperature is mainly used in the production of electrodes for industrial applications. Smaller volumes are dedicated to specific uses such as heavy duty corrosion protection, special purpose paving, manufacture of other substances and the production of clay targets.
Tris(2-chloroethyl)phosphate		115-96-8	204-118-5	$C_3H_{12}Cl_3O_4P$	Tris(2-chloroethyl)phosphate is mainly used as an additive plasticiser and viscosity regulator with flame-retarding properties for acrylic resins, polyurethane, polyvinyl chloride and other polymers. Other fields of application are adhesives, coatings, flame-resistant paints and varnishes. The main industrial branches to use TCEP are the furniture, the textile and the building industry.
Zirconia Aluminosilicate Refractory Ceramic Fibres					Refractory ceramic fibres are used for high-temperature insulation, almost exclusively in industrial applications (insulation of industrial furnaces and equipment, equipment for the automotive and aircraft/aerospace industry) and in fire protection (buildings and industrial process equipment).
Acrylamide	Prop-2-enamide	79-06-1	201-173-7	C_3H_5NO	Acrylamide is almost exclusively used for the synthesis of polyacrylamides, which are used in various applications, in particular in waste water treatment and paper processing. Minor uses of acrylamide comprise the preparation of polyacrylamide gels for research purposes and as grouting agents in civil engineering.



Ammonium dichromate	Diammonium dichromate, ammonium bichromate, ammonium chromate, chromic acid [H ₂ Cr ₂ O ₇] diammonium salt, diammonium dichromate, dichromic acid diammonium salt	7789-09-5	232-143-1	Cr ₂ H ₂ O ₇ ·2H ₃ N	Ammonium dichromate is mainly used as an oxidising agent. Other known uses are in the manufacture of photosensitive screens and as mordant in the manufacture of textiles. Minor uses seem to comprise metal treatment and laboratory analytical agent.
Boric acid		10043-35-3 11113-50-1	233-139-2 234-343-4	BH ₃ O ₃	Boric acid is widely used on account of its consistency-influencing, flame-retarding, antiseptic and preservative properties. It is a component of detergents and cleaners, adhesives, toys, industrial fluids, brake fluids, glass, ceramics, flame retardants, paints, disinfectants, cosmetics, food additives, fertilisers, insecticides and other products.
Disodium tetraborate, anhydrous	Disodium tetraborate decahydrate, Disodium tetraborate anhydrous, Disodium tetraborate pentahydrate, borax decahydrate, boric acid, disodium salt, borax pentahydrate	1303-96-4 1330-43-4 12179-04-3	215-540-4	Na ₂ B ₄ O ₇ ·10H ₂ O Na ₂ B ₄ O ₇ Na ₂ B ₄ O ₇ ·5H ₂ O	Disodium tetraborate and tetraboron disodium heptaoxide form the same compounds in aqueous solutions. Uses include a multitude of applications, for example, in detergents and cleaners, in glass and glass fibres, ceramics, industrial fluids, metallurgy, adhesives, flame retardants, personal care products, biocides, fertilisers.
Potassium chromate	Dipotassium chromate, Bipotassium chromate, Dipotassium monochromate, Bipotassium monochromate, Neutral potassium chromate, Potassium chromate (VI), Chromate of potash (potass), Chromic acid dipotassium salt	7789-00-6	232-140-5	K ₂ CrO ₄	Potassium chromate is used as a corrosion inhibitor for treatment and coating of metals, for manufacture of reagents, chemicals and textiles, as a colouring agent in ceramics, in the manufacture of pigments/inks and in the laboratory as analytical agent.
Potassium dichromate	Chromic acid [H ₂ Cr ₂ O ₇] dipotassium salt, dichromic acid dipotassium salt, dipotassium bichromate, dipotassium dichromate, Lopezzite, potassium bichromate, potassium dichromate[VI], dipotassium dichromium hepta-oxide	7778-50-9	231-906-6	K ₂ Cr ₂ O ₇	Potassium dichromate is used for chrome metal manufacturing and as corrosion inhibitor for treatment and coating of metals. It is further used as textile mordant, as laboratory analytical agent, for cleaning of laboratory glassware, in the manufacture of other reagents and as oxidising agent in photolithography.
Sodium chromate	Disodium chromate, Sodium monochromate, Disodium chromium tetraoxide	7775-11-3	231-889-5	Na ₂ CrO ₄	Sodium chromate is mainly used as an intermediate in the manufacture of other chromium compounds as well as a laboratory analytical agent, but this use is limited. Other potential uses are mentioned in the literature but whether they occur in the EU is not clear.
Tetraboron disodium heptaoxide, hydrate		12267-73-1	235-541-3	B ₄ Na ₂ O ₇ ·x H ₂ O	Disodium tetraborate and tetraboron disodium heptaoxide form the same compounds in aqueous solutions. Uses include a multitude of applications, for example, in detergents and cleaners, in glass and glass fibres, ceramics, industrial fluids, metallurgy, adhesives, flame retardants, personal care products, biocides, fertilisers.
Trichloroethylene	Acetylene trichloride, Ethinyl trichloride, Trichloroethene, TRI, TRIC, 1-Chloro-2,2-dichloroethylene, 1,1,2-Trichloroethylene, Trilene, Triklone®, Trimar. Industrial abbreviations include trichloroethylene, trichlor, Trike, Tricky and trichloroethylene.	79-01-6	201-167-4	C ₂ H Cl ₃	Trichloroethylene is mainly used as intermediate in the manufacture of chlorinated and fluorinated organic compounds. Other uses are for cleaning and degreasing of metal parts or as solvent in adhesives.
Chromium trioxide	Trioxochromium	1333-82-0	215-607-8	CrO ₃	Formulation of mixtures containing chromium trioxide, which are mainly used for example, metal finishing/surface treatment or in much smaller amounts as catalysts containing chromium trioxide.



Acids generated from chromium trioxide and their oligomers	Dichromic acid ($\text{H}_2\text{Cr}_2\text{O}_7$), hydroxy-(hydroxy(dioxo)chromio)oxy-dioxochromium, Chromic acid (H_2CrO_4), dihydroxy(dioxo)chromium Sulfuric acid, cobalt(2+) salt (1:1),	13530-68-2 7738-94-5	236-881-5 231-801-5	$\text{Cr}_2\text{H}_2\text{O}_7$ CrH_2O_4	Chromic acid, dichromic acid and oligomers of chromic and dichromic acid are spontaneously generated products of the reaction of chromic trioxide with water. Refer to the uses for chromium trioxide.
Cobalt (II) sulphate		10124-43-3	233-334-2	$\text{CoH}_2\text{O}_4\text{S}$	Mainly used in the production of other chemicals. Further applications may include manufacture of catalysts and driers, surface treatments (such as electroplating), corrosion prevention, production of pigments, decolourising (in glass, pottery), batteries, animal food supplement, soil fertilizer, and others.
Cobalt (II) dinitrate		10141-05-6	233-402-1	CoN_2O_6	Mainly used in the production of other chemicals and the manufacture of catalysts. Further applications may include surface treatment and batteries.
Cobalt (II) carbonate		513-79-1	208-169-4	CoCO_3	Mainly used in the manufacture of catalysts. Minor uses may include feed additive, production of other chemicals, production of pigments, and adhesion (in ground coat frit).
Cobalt (II) diacetate	Cobalt di(acetate)	71-48-7	200-755-8	$\text{C}_4\text{H}_6\text{CoO}_4$	Mainly used in the manufacture of catalysts. Minor uses may include production of other chemicals, surface treatment, alloys, production of pigments, dyes, rubber adhesion, and feed additive.
2-Methoxyethanol	ethylene glycol monomethyl ether, EGME; Ethanol, 2-methoxy-	109-86-4	203-713-7	$\text{C}_3\text{H}_8\text{O}_2$	Mainly used as solvent, chemical intermediate and additive for fuels.
2-Ethoxyethanol	ethylene glycol monoethyl ether; EGEE; Ethanol, 2-ethoxy-	110-80-5	203-804-1	$\text{C}_4\text{H}_{10}\text{O}_2$	Mainly used as solvent and chemical intermediate.
2-ethoxyethyl acetate	Ethanol, 2-ethoxy-, acetate, Ethylglycol acetate; ethylene glycol mono ethyl ether acetate; 2-EEA; acetic acid, 2-ethoxyethyl ester; ethoxyethanol acetate	111-15-9	203-839-2	$\text{C}_6\text{H}_{12}\text{O}_3$	As solvent in coatings and in the chemical industry, intermediate in the manufacture of cyanoacrylate adhesives.
Strontium chromate	Chromic acid (H_2CrO_4), strontium salt (1:1), Chromium diatodioxo-strontium salt (1:1), C.I. Pigment Yellow 32, Deep Lemon Yellow, Strontium chromate (VI), Strontium Yellow	7789-06-2	232-142-6	SrCrO_4	As corrosion inhibitor in coating mixtures used in the aeronautic / aerospace sector, in the coil coating sector of steel and aluminium and in the vehicle coating sector.
1,2-Benzenedicarboxylic acid, di-C7-11 branched and linear alkyl esters	Di-C ₇₋₁₁ -(linear and branched)-alkyl phthalate, Dialkyl phthalate (C ₇₋₁₁) branched and linear phthalate ester; 711P; D711P; Di-711-phthalate; Dialkyl(C ₇₋₁₁ -branched and linear) phthalate (DHNUP); Di(heptyl, nonyl, undecyl) phthalate (mixed isomers); Phthalic acid, dialkyl (C ₇₋₁₁) ester; Santicizer 711	68515-42-4	271-084-6	$\text{C}_{22}\text{H}_{34}\text{O}_4$ - $\text{C}_{30}\text{H}_{50}\text{O}_4$	As plasticiser in PVC, foam, adhesives and coatings.
Hydrazine	H ₂ O; H ₂ O (fuel); Levoxine; Nitrogen hydride(N ₂ H ₄);Oxytreat 35	7803-57-8 302-01-2 10217-52-4	206-114-9	H_4N_2	As intermediate in the manufacture of hydrazine derivatives, as a monomer in polymerisations, as a corrosion inhibitor in water treatment and for metal reduction and refining of chemicals. It is also used as a propellant for aerospace vehicles and as fuel in military (emergency) power units.



1-methyl-2-pyrrolidone	2-Pyrrolidinone, 1-methyl-, 1-Methylpyrrolidin-2-one, 1-Methyl-2-pyrrolidinone 1-Methyl-5-pyrrolidinone 1-Methylazacyclopentan-2-one 1-Methylpyrrolidone AgsoIEx 1 M-Pyrol Microposit 2001 N 0131 N-Methyl- α -pyrrolidinone N-Methyl- α -pyrrolidone N-Methyl- γ -butyrolactam N-Methyl-2-ketopyrrolidine N-Methyl-2-pyrrolidinone N-Methyl-2-pyrrolidone N-Methylbutyrolactam N-Methylpyrrolidone NMP NSC 4594 Pharmasolve Pyrol M SL 1332	872-50-4	212-828-1	C ₅ H ₉ NO	As solvent in coatings, cleaning products, for electronic equipment manufacture, as well as in semiconductor industry, petrochemical processing, pharmaceuticals and agrochemicals.
1,2,3-trichloropropane	Propane, 1,2,3-trichloro-, Allyl trichloride; Glycerol trichlorohydrin; Glyceryl trichlorohydrin; NSC 35403; Trichlorohydrin; C ₆ -8-(branched)-Alkyl benzene-1,2-dicarboxylate, C ₆ -8-(branched)-Alkyl phthalate, Diisooheptyl phthalate, DHP Chromic acid (H ₂ CrO ₄), Chromium(3+) salt (3:2), Dichromium(3+) trichromate, Chromic chromate, Chromium (III) chromate, Dichromium Trischromate, Accomet C; other trade names are confidential	96-18-4	202-486-1	C ₃ H ₅ Cl ₃	Intermediate in the manufacture of chlorinated solvents and agricultural products. It is also used as monomer. In the past, it was used as solvent, paint and varnish remover and as degreasing agent.
1,2-Benzenedicarboxylic acid, di-C6-8-branched alkyl esters, C7-rich	Trichlorohydrin; C ₆ -8-(branched)-Alkyl benzene-1,2-dicarboxylate, C ₆ -8-(branched)-Alkyl phthalate, Diisooheptyl phthalate, DHP Chromic acid (H ₂ CrO ₄), Chromium(3+) salt (3:2), Dichromium(3+) trichromate, Chromic chromate, Chromium (III) chromate, Dichromium Trischromate, Accomet C; other trade names are confidential	71888-89-6	276-158-1		As plasticiser in PVC and in sealants, coatings and potentially printing inks.
Dichromium tris(chromate)	Chromic acid (H ₂ CrO ₄), Chromium(3+) salt (3:2), Dichromium(3+) trichromate, Chromic chromate, Chromium (III) chromate, Dichromium Trischromate, Accomet C; other trade names are confidential	24613-89-6	246-356-2	Cr ₅ O ₁₂ CrH ₂ O ₄ .2/3Cr	In mixtures for metal surface treatment in the aeronautic/aerospace, steel, and aluminium coating industries.
Potassium hydroxyoctaoxodizincatedichromate		11103-86-9	234-329-8		Aeronautic/ aerospace coating, steel and aluminium coil coating, and vehicle coating.
Pentazinc chromate octahydroxide	Zinc chromate hydroxide (Zn ₅ (CrO ₄)(OH) ₈), Zinc tetraoxochromate, Zinc tetroxy chromate, Zinc chromate, hydroxide, Basic zinc chromate, Zinc chromate, Trizinc, dioxido(dioxo)chromium dihydroxide	49663-84-5	256-418-0	CrH ₈ O ₁₂ Zn ₅	Vehicle coating and aeronautic / aerospace coating.
Formaldehyde, oligomeric reaction products with aniline (technical MDA)	Formaldehyde, polymer with benzenamine, polymeric MDA3, PMDA, MDA, technical grade, crude MDA	25214-70-4	500-036-1	(C ₆ H ₇ N.CH ₂ O) _x	Manufacture of other substances. Minor uses are as ion exchange resins in nuclear power plants, as hardener for epoxy resins.
Bis(2-methoxyethyl) phthalate	1,2-Benzenedicarboxylic acid, 1,2-bis(2-methoxyethyl) ester, Di(methoxyethyl) phthalate, Bis(methoxyglycol) phthalate	117-82-8	204-212-6	C ₁₄ H ₁₈ O ₆	Plasticiser in polymeric materials and paints, lacquers and varnishes, including printing inks.
2-Methoxyaniline; o-Anisidine	Benzenamine, 2-methoxy-, 2-methoxybenzenamine	90-04-0	201-963-1	C ₇ H ₉ NO	Manufacture of dyes for tattooing and coloration of paper, polymers and aluminium foil.



4-(1,1,3,3-Tetramethylbutyl)phenol, (4-tert-Octyl)phenol	4-(2,4,4-trimethylpentan-2-yl)phenol, Phenol, 4-(1,1,3,3-tetramethylbutyl)-	140-66-9	205-426-2	$C_{14}H_{22}O$	Manufacture of polymer preparations and of ethoxylate surfactants. Also used as a component in adhesives, coatings, inks and rubber articles.
1,2-Dichloroethane	Ethane, 1,2-dichloro-, Ethylene dichloride, dichloroethylene, 1,2-DCE, 1,2-EDC	107-06-2	203-458-1	$C_2H_4Cl_2$	Manufacture of other substances. Minor uses as solvent in chemical and pharmaceutical industries.
Bis(2-methoxyethyl) ether	Ethane, 1,1'-oxybis[2-methoxy-, methoxyethoxy]ethane, Diglyme, DEGDME, Diethyleneglycoldimethylether, Dimethyldiglycol, 2-(2-methoxyethoxy)-1-methoxyethane, 2,5,8-Trioxanonane, Di(2-methoxyethyl) ether, Dimethyl carbitol, Ether, bis(2-methoxyethyl), 1,1'-Oxybis[2-methoxyethane], Methyl diglyme, (CAS registry numbers still in use: 70-992-86-8, 54631-70-8, 142939-39-7 although deleted in CAS, registry)	111-96-6	203-924-4	$C_8H_{14}O_3$	Used primarily as a reaction solvent or process chemical in a wide variety of applications. Also used as solvent for battery electrolytes, and possibly in sealants, adhesives, fuels and automotive care products.
Arsenic acid	Arsenic acid (H_3AsO_4), arsenic acid, trihydrodioxidoarsenic acid (IUPAC 2005), Orthoarsenic acid	7778-39-4	231-901-9	AsH_3O_4	Mainly used to remove gas bubbles from ceramic glass melt (fining agent) and in production of laminated printed circuit boards. Also used in the manufacture of semiconductors and as laboratory agent.
Calcium arsenate	Arsenic acid (H_3AsO_4), calcium salt (2:3), Tricalcium(2+) diarsenate, Arsenic acid calcium diarsenate, calcium orthoarsenate; tricalcium arsenate	7778-44-1	231-904-5	$As_2Ca_3O_8$	Present in complex raw materials that are used mainly for copper and lead refining. Also used to precipitate nickel from the molten metal and to manufacture diarsenic trioxide.
Trilead diarsenate	Arsenic acid (H_3AsO_4), lead salt (2:3), Trilead (2+) diarsenate,	3687-31-8	222-979-5	$As_2O_8Pb_3$	Present in complex raw materials for manufacture of copper, lead and a range of precious metals.
N,N-dimethylacetamide (DMAC)	Lead (II) arsenate, lead arsenate Acetamide, N,N-dimethyl-, Acetdimethylamide, DMA, DMAA, DMAc, Dimethylamide acetate, N,N-	127-19-5	204-826-4	C_4H_9NO	Used as solvent, mainly in the manufacture of various substances and in the production of fibres for clothing. Also used as reagent, and in products such as industrial coatings, insulation paper, polyimide films, paint strippers and ink removers.
2,2'-Dichloro-4,4'-methylenedianiline (MOCA)	Dimethylethanamide 4,4'-methylenebis[2-chloroaniline], Benzenamine, 4,4'-methylenebis[2-chloro-, Bisamine A, 2,2'-Dichloro-4,4'-methylenedianiline, 3,3'-Dichloro-4,4'-diaminodiphenylmethane, Bis(4-amino-3-chlorophenyl)methane	101-14-4	202-918-9	$C_{13}H_{12}Cl_2N_2$	Mainly used as curing agent in resins and in the production of polymer articles and also for manufacture of other substances.
Phenolphthalein	1(3H)-Isobenzofuranone, 3,3-bis(4-hydroxyphenyl)-, 3,3-Bis(4-hydroxyphenyl)-2-benzofuran-1(3H)-one; 3,3-Bis(p-hydroxyphenyl)phthalide; 3,3-Bis(4-hydroxyphenyl)phthalide; 3,3-Bis(4-hydroxyphenyl)-1(3H)-isobenzofuranone	77-09-8	201-004-7	$C_{20}H_{14}O_4$	Mainly used as laboratory agent (pH indicator solutions). Minor uses are in pharmaceutical preparations and in some special applications.
Lead azide Lead diazide	Lead azide ($Pb(N_3)_2$); Lead(2+) diazide	13424-46-9	236-542-1	N_6Pb	Mainly used as initiator or booster in detonators for both civilian and military uses and as initiator in pyrotechnic devices.



Lead styphnate	lead 2,4,6-trinitro-m-phenylene dioxide; 1,3-Benzenediol, 2,4,6-trinitro-, lead(2+) salt (1:1); Lead(2+) 2,4,6-trinitrobenzene-1,3-diolate; 2,4-Dioxa-3-plumbabicyclo[3.3.1]nona-1(9),5,7-triene; 3,3-dihydro-6,8,9-trinitro-, Lead, [styphnato(2-)]-; Resorcinol, 2,4,6-trinitro-, lead(2+) salt (1:1); Lead styphnate; Lead tricinat; trinitroresorcinate; Tricinat Phenol, 2,4,6-trinitro-, lead(2+) salt (2:1); Lead(2+) bis(2,4,6-trinitrophenolate); Lead, bis(picryloxy)-; Phenol, 2,4,6-trinitro-, lead(2+) salt; Picric acid, lead(2+) salt; Lead(II) picrate	15245-44-0	239-290-0	$C_6H_4N_3O_8Pb$	Mainly used as a primer for small calibre and rifle ammunition. Other common uses are in ammunition pyrotechnics, powder actuated devices and detonators for civilian use.
Lead dipicrate	2,5,8,11-tetraoxadodecane; Triglyme; EGDME Triethylene glycol dimethyl ether; Ansul Ether 161; DMTG; Ethane, 1,2-bis(2-methoxyethoxy)-; Glyme 4; Hisolve MTM; Methyltriglyme; NSC 66400	6477-64-1	229-335-2	$C_{12}H_4N_6O_{14}Pb$	The substance is an explosive like lead diazide and lead styphnate.
1,2-bis(2-Methoxyethoxy)ethane (TEGDME; triglyme)	Ethane, 1,2-dimethoxy-, EGDME; Ethylene glycol dimethyl ether; 1,2-Dimethoxyethane; 1,2-Ethanediol, dimethyl ether; 2,5-Dioxahexane; DME; DME (glycol ether); Dimethyl Cellosolve; Ethylene dimethyl ether; Glycol dimethyl ether; Glyme; Hisolve MMM; Monoethylene glycol dimethyl ether; Monoglyme; NSC 60542; α,β -Dimethoxyethane.	112-49-2	203-977-3	$C_8H_{18}O_4$	Triglyme is used as an inert solvent for grignard-, reduction- and alkylation-reactions. Reactions involving alkali metals can be carried out in triglyme and alkali metal dispersions in triglyme are used for etching of Teflon and Fluoropolymers. Triglyme is also used as an inert solvent for reduction reactions using Sodium borohydride and used as a solvent to carry out methylation reactions using dimethyl carbonate (and other dialkyl carbonates). Triglyme is also used as part of absorbing liquids in the industrial cleaning of gases. Triglyme has been reported to be used in Brake fluids.
1,2-Dimethoxyethane; ethylene glycol dimethyl ether (EGDME)	Ethane, 1,2-dimethoxy-, EGDME; Ethylene glycol dimethyl ether; 1,2-Dimethoxyethane; 1,2-Ethanediol, dimethyl ether; 2,5-Dioxahexane; DME; DME (glycol ether); Dimethyl Cellosolve; Ethylene dimethyl ether; Glycol dimethyl ether; Glyme; Hisolve MMM; Monoethylene glycol dimethyl ether; Monoglyme; NSC 60542; α,β -Dimethoxyethane.	110-71-4	203-794-9	$C_4H_{10}O_2$	EGDME is used as a solvent or processing aid in the manufacture or formulation of industrial chemicals. The large majority of the EGDME sold by the producer is used as a site limited processing aid for industrial chemical manufacture.
Ammoniumpentadecafluorotanoate (APFO)	APFO	3825-26-1	223-320-4	$C_8H_4NF_{15}NO_2$	PFOA is used as a group name for PFOA and its salts, and PFOA is mainly produced and used as its ammonium salt, ammoniumpentadecafluorotanoate (APFO, CAS Number: 3825-26-1). However, the perfluorooctanoate anion is the molecule of primary interest. APFO and PFOA are sometimes used interchangeably as both PFO-anion and PFOA (neutral species) exist in solution.



C.I. Basic Blue 26 ([4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]met hylenecyclohexa-2,5-dien- 1-ylidene]dimethylammonium chloride)	Methanaminium, N-[[4-[[4- (dimethylamino)phenyl][4- (phenylamino)-1- naphthalenyl]methylene]-2,5- cyclohexadien-1-ylidene]-N- methyl-, chloride (1:1); 4-[[4- (Dimethylamino)phenyl][4- (phenylamino)naphthalen-1- yl]methylene]-N,N- dimethylcyclohexa-2,5-dien-1- iminium Chloride; C.I. Basic Blue 26; Methanaminium, N-[[4-[[4- (dimethylamino)phenyl][4- (phenylamino)-1- naphthalenyl]methylene]-2,5- cyclohexadien-1-ylidene]-N- methyl-, chloride; Victoria Blue B; ADC Victoria Blue B; Aizen Victoria Blue BH; BTK Victoria Blue; Basazol C Blue 57; Basic Blue; 26; Basic Blue B; Basic Victoria Blue B; Basonyl Blue 640; Basonyl Blue 644; Basovict Victoria Blue; C-WR Blue 8; C.I. 44045; Calcozine Blue B; Conbasic Blue AK; Dycosbasic Victoria Blue B; Flexo Blue 630; Flexo Blue 640; Hecto Blue B; Hidaco Victoria Blue B; Libbase Victoria Blue LB; Lowacryl Blue 26; Mitsui Victoria Blue B; Ravi Victoria Blue ;Tertrophene Blue; Victoria Blue; Victoria Blue 2B; Victoria Blue B 353; Victoria Blue B chloride; Victoria Blue BA; Victoria Blue BH; Victoria Blue BN; Victoria Blue BN Cl 44045; Victoria Blue BP; Victoria Blue BS; Victoria Blue BSA; Victoria Blue BX; Victoria Blue FB; Victoria Pure Blue B; Victoria Pure Blue BC	2580-56-5	219-943-6	C ₃₃ H ₃₂ ClN ₃	Basic Blue 26 is used in inks, dyes, paints, and pigments. Among potential uses registered by companies in the Colour Index (2012)7, for products (dyestuff) containing Basic Blue 26, are in printing inks (according to Gessner and Mayer, 2000, melted in oleic or stearic acid), spirit inks, and pigments. According to Denmal et al. (2010), blue and black ball point pen inks may contain Basic Blue 26; with around 80% of blue and black ball point pen inks containing "Basic Violet 3 and its homologues".
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C.I. Basic Violet 3	...[4-[4,4'-bis(dimethylamino)benzhydrylidene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride; Methanaminium, N-[4-bis[4-(dimethylamino)phenyl]methylene]-2,5-cyclohexadien-1-ylidene]-N-methyl-, chloride(1:1); 4-[Bis[4-(dimethylamino)phenyl]methylidene]-N,N-dimethylcyclohexa-2,5-dien-1-ylidene; Chloride; Basic Violet 3; Crystal Violet Technical; Crystal Violet USP; Gentersal; Gentian violet; Gentian Violet B; Gentiavern; Genticiid; Gentoletten; Hecto Violet R; Hectograph Violet SR; Hexamethyl violet; Hexamethyl-p-rosaniline chloride; Hexamethylpararosaniline chloride	548-62-9	208-953-6	C ₂₅ H ₃₀ ClN ₃	The main uses of C.I. Basic Violet 3 are as a dye in ink applied in cartridges for printers and in ball pens and as dyestuff for paper colouring. Minor dyestuff uses include carbon papers (where dyestuff is suspended in wax and applied to a thin impregnated paper), staining of dried flowers/plants (dried plants dyed by immersion in a hot water solution of the dyestuff) and as a marker (i.e. where dyestuff is used to improve the visibility of a liquid). Furthermore, C.I. Basic Violet 3 is used in microbial and clinical laboratories (for example, as stain to distinguish gram negative from gram positive bacteria) in presumably thousands of laboratories and teaching institutions around Europe.
C.I. Solvent Blue 4;(α,α-bis[4-(dimethylamino)phenyl]-4-(phenylamino)naphthalene-1-methanol);	[4-(Dimet; hylamino)-5,8-dihydronaphthalen-1-yl][bis[4-(dimethylamino)phenyl]]methanol; Victoria Blue B; Base B Baso Blue 645; Aizen Victoria Blue B Base; Brilliant Oil Blue B Base; C.I. 44045B; Fast Oil Blue B Base; Victoria Blue B Base; - Victoria Blue BA Base; Victoria Blue BDP Base; Victoria Blue Base; Victoria Blue Base B; Victoria Blue Base FB; Waxoline Victoria Blue B	6786-83-0	229-851-8	C ₃₃ H ₃₃ N ₃ O	The main use of the substance is in the production of inks.
C.I. Solvent Violet 8;(4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol)	Benzenemethanol, α,α-bis[4-(dimethylamino)phenyl]-4-(methylamino)-; Bis[4-(dimethylamino)phenyl][4-(methylamino)phenyl]methanol;	561-41-1	209-218-2	C ₂₄ H ₂₉ N ₃ O	Uses of 4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol are as formulation and production of writing inks.
Di-n-pentyl phthalate	Boron oxide (B ₂ O ₃); diboron trioxide	131-18-0	205-017-9	Undetermined	Undetermined
Diboron trioxide, boric oxide		1303-86-2	215-125-8	B ₂ O ₃	Undetermined
Diisopentylphthalate		605-50-5	210-088-4	Undetermined	Undetermined
Distillates (coal tar), heavy oils		90640-86-1	292-607-4	Undetermined	Undetermined
Distillates (coal tar), heavy oils, pyrene fraction		91995-42-5	295-304-5	Undetermined	Undetermined
Distillates (coal tar), pitch, pyrene fraction		91995-52-7	295-313-4	Undetermined	Undetermined
Formamide		75-12-7	200-842-0	CH ₃ NO	Although formamide is not registered for consumer use it was measured in toys like wooden toys (Danish EPA, 2005) and foam puzzle mats as well as in fitness and exercise mats which are made of ethylene vinyl acetate (EVA).
Further Arsenic compounds					Undetermined

Lead(II) bis(methanesulfonate)	Methanesulfonic acid, lead(2+) salt (2:1); Methanesulfonic acid, lead(2+) salt; Lead methane sulphonate; Lead salt FP (trade name); Methanesulfonic acid, lead(2+) salt; Lead Methane Sulfate; Methanesulfonic acid, lead(II) salt; Lead methyl sulfonate	17570-76-2	401-750-5	C ₂ H ₆ O ₆ Pb S ₂	Methanesulfonic acid-based plating technology is the dominant electrolytic plating process for high-speed reel-to-reel processing of electronic components.
Michler's Base;(N,N,N',N'-tetramethyl-4,4'-methylenedianiline)	Benzenamine, 4,4'-methylenebis[N,N-dimethyl-; 4,4'-dimethylaniline]; Aniline, 4,4'-methylenebis[N,N-dimethyl- (6Cl,7Cl,8Cl)]; Aniline, p,p'-methylenedi- (4Cl); 4,4'-(Dimethylamino)diphenylmethane; 4,4'-Bis(dimethylamino)diphenylmethane; 4,4'-Bis(dimethylaminophenyl)methane; 4,4'-Methylenebis[N,N-dimethylaniline]; 4,4'-Methylenebis[N,N-dimethylbenzenamine]; 4,4'-Tetramethyldiaminodiphenylmethane; Arnold's base; Bis[4-(N,N-dimethylamino)phenyl]methane; Bis[4-(dimethylamino)phenyl]methane; Bis[p-(N,N-dimethylamino)phenyl]methane; Bis[p-(dimethylamino)phenyl]methane; Michler's Base; Michler's hydride; Michler's methane; N,N,N',N'-tetramethyl-4,4'-methylenedianiline; N,N,N',N'-tetramethyl-4,4'-diaminodiphenylmethane; N,N,N',N'-Tetramethyl-p,p'-diaminodiphenylmethane; NSC 36782; NSC 4892; NSC 9029; Reduced Michler's ketone; Tetrabase; Tetramethyldiaminodiphenylmethane; p,p'-Bis(dimethylamino)diphenylmethane; p,p'-Tetramethyldiaminodiphenylmethane	101-61-1	202-959-2	C ₁₇ H ₂₂ N ₂	Used as chemical intermediate in the manufacture of dyes and pigments, also used as chemical intermediate in the manufacture of its hydrochloric salt. The latter is used as an analytical reagent for the determination of lead.



Michler's Ketone; (4,4'-bis(dimethylamino)benzophenone)	90-94-8	202-027-5	$C_{17}H_{20}N_2O$	Michler's ketone is an important intermediate in the manufacture of triphenylmethane dyes.
Methanone, bis[4-(dimethylamino)phenyl]-; bis[4-(dimethylamino)phenyl]methanone; Benzophenone, 4,4'-bis(dimethylamino)- (6Cl,8Cl); 4,4'-Bis(N,N-dimethylamino)benzophenone; 4,4'-Bis(dimethylamino)benzophenone; 4,4'-Tetramethyldiaminobenzophenone; Bis(4-dimethylaminophenyl) ketone; Bis[4-(dimethylamino)phenyl]methanone; Bis(p-(N,N-dimethylamino)phenyl) ketone; DABP; Di(p-dimethylamino)benzophenone; Michler's ketone; N,N,N',N'-Tetramethyl-4,4'-diaminobenzophenone; NSC 9602; Nisso Cure MABP; S 112; S 112 (ketone); p,p'-Bis(dimethylamino)benzophenone; p,p'-Tetramethyldiaminobenzophenone	335-67-1	206-397-9	$C_8HF_{15}O_2$ (PFOA)	PFOA is used in a variety of commercial applications as refrigerants, surfactants and polymers, and as components of pharmaceuticals, fire retardants, lubricants, adhesives, paints, cosmetics, paper coatings, and insecticides.
Perfluorooctanic acid (PFOA)				Undetermined
Residues (coal tar), pitch distn.	92061-94-4	295-507-9		



TGIC (1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione)	1,3,5-Triazine-2,4,6-(1H,3H,5H)-trione, 1,3,5-tris(2-oxiranylmethyl)- (a combination of α and β isomers of TGIC); 1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazine-2,4,6-trione (a combination of α and β -isomers); triglycidyl isocyanurate; TGIC; 1,3,5-triglycidyl isocyanurate; 1,3,5-triglycidyl-s-triazinetriene; 1,3,5-tris(2,3-epoxypropyl)-s-triazine-2,4,6-(1H,3H,5H)-; trione; tris(2,3-epoxypropyl)isocyanurate; 1,3,5-Triglycidyl-s-triazine-2,4,6-trione; 1,3,5-Triglycidylhexahydro-1,3,5-triazine-2,4,6-trione; 1,3,5-Triglycidylisocyanuric acid; 1,3,5-Tris(2,3-epoxypropyl) isocyanurate; 1,3,5-Tris(oxiran-2-ylmethyl)-1,3,5-triazine-2,4,6-trione; 1,3,5-Tris(oxiranylmethyl)-1,3,5-triazine-2,4,6-trione; Glycidyl isocyanurate; N,N'-Triglycidyl isocyanurate; NSC 269934; PTGIC; TGT; Triglycidyl isocyanurate; Tris(2,3-epoxypropyl) isocyanurate; Tris(epoxypropyl) isocyanurate; TEPIC; Araldite PT 810; TK 10622	$C_{12}H_{15}N_3O_6$	219-514-3	2451-62-9	59653-74-6	423-400-0	TGIC is an epoxy compound that is used as a hardener in resins and coatings. The main use is in polyester powder coatings for metal finishing.
β -TGIC; (1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione)	1,3,5-Triazine-2,4,6-(1H,3H,5H)-trione, 1,3,5-tris[(2R)-2-oxiranylmethyl]-, rel-; reaction mass of 1,3,5-tris[(2R)-oxiran-2-ylmethyl]-1,3,5-triazine-2,4,6-trione and 1,3,5-tris[(2S)-oxiran-2-ylmethyl]1,3,5-triazine-2,4,6-trione; triglycidyl isocyanurate; TGIC; 1,3,5-triglycidyl isocyanurate; 1,3,5-triglycidyl-s-triazinetriene; 1,3,5-tris(2,3-epoxypropyl)-s-triazine-2,4,6-(1H,3H,5H)-trione; tris(2,3-epoxypropyl)isocyanurate; β -Triglycidyl isocyanates; NSC 296964; TEPIC-H	$C_{12}H_{15}N_3O_6$					TGIC is an epoxy compound that is used as a hardener in resins and coatings. The main use is in polyester powder coatings for metal finishing.

7.8 Under certain circumstances it is advisable to employ external technical consulting services if the analysis being addressed is beyond the expertise of internal resources. There exist a number of laboratories that specialize in analysis of regulated substances for a fee.

lead hydrogen arsenate; MDA; musk xylene; phthalates; REACH; short chain chlorinated paraffins; sodium dichromate; Substances of Very High Concern; tributyltin oxide; triethyl arsenate

8. Keywords

8.1 anthracene; arsenic oxide; brominated flame retardants; candidate list; cobalt dichloride; hexabromocyclododecane;

TABLE 2 Test Method(s) for 4, 4'-Diaminodiphenylmethane

Chemical Formula	C ₁₃ H ₁₄ N ₂
Test Method	United States Department of Labor – OSHA Organic Method #57
Description	This method is applicable to samples in air matrix. Analysis is performed by analyzing for the heptafluorobutyric acid anhydride (HFAA) derivative of C ₁₃ H ₁₄ N ₂ by gas chromatography using an electron capture detector.
Technique	GC-ECD
Sample Prep Method	Air extraction using sulfuric acid treated glass fiber filters. Derivatization of C ₁₃ H ₁₄ N ₂ with HFAA. Extraction with toluene.
Analyte	HFAA derivative of C ₁₃ H ₁₄ N ₂ in toluene.
Detection	Electron capture detection of the HFAA derivative of C ₁₃ H ₁₄ N ₂
Detection Limit	8.1 ng/sample (10 ppt or 81 ng/m ³ of air) for overall procedure; 3.2 pg/injection for analytical procedure.
Range	Not provided

TABLE 3 Test Method(s) for Anthracene

Chemical Formula	C ₁₄ H ₁₀
Test Method	EPA Method 8310
Description	EPA Method 8310 is used to determine the concentration of certain polynuclear aromatic hydrocarbons (PAH) in ground water and wastes.
Technique	HPLC
Sample Prep Method	EPA Method 3540 or 3550 for solid samples
Analyte	C ₁₄ H ₁₀ extracted into an appropriate solvent
Detection	Ultraviolet (UV) – Fluorescence
Detection Limit	0.66 µg/L
Range	Not provided
Test Method	EPA Method 8270D
Description	EPA Method 8270D is used to determine the concentration of semi-volatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples
Technique	GC-MS
Sample Prep Method	EPA Method 3535, 3542 and 3561
Analyte	C ₁₄ H ₁₀ extracted into an appropriate solvent
Detection	Mass spectrometry – primary ion at m/z 178
Detection Limit	10 µg/L
Range	Not provided
Test Method	EPA Method 8100
Description	EPA Method 8100 is used to determine the concentration of certain polynuclear aromatic hydrocarbons
Technique	GC-FID
Sample Prep Method	EPA Method 3540 or 3550 for solid samples
Analyte	C ₁₄ H ₁₀ extracted into an appropriate solvent
Detection	Flame ionization
Detection Limit	1 µg/L
Range	Not provided

TABLE 4 Test Method(s) for Arsenic Pentoxide

Chemical Formula	As ₂ O ₅
Analytical Approach	No test method is known for detecting As ₂ O ₅ directly. Elemental Arsenic is detected and calculated as if all of the As is from As ₂ O ₅ .
Test Method	EPA Method 7010
Description	Metals in solution may be readily determined by graphite furnace atomic absorption spectrophotometry. The method is simple, quick, and applicable to a large number of metals in environmental samples including, but not limited to, water, domestic and industrial wastes, extracts, soils, sludges and sediments.
Technique	GFAA
Sample Prep Method	Acid digestion. Reference: EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 .
Analyte	As (elemental)
Detection	Absorption at 193.7 nm
Detection Limit	1 µg/L
Range	Not provided
Caveats	Aluminum may interfere depending upon background correction method. Worst case scenario attributes that all the As has reacted with O. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than this worst case.
Test Method	EPA Method 6020
Description	This method is of wide applicability for analysis of a variety of elements in different types of matrices using Inductively Couple Plasma/Mass Spectrometry.
Technique	ICP-MS
Sample Prep Method	EPS Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils
Analyte	As (elemental)
Detection	Mass spectrometry of primary ion at m/z 75
Detection Limit	0.01 µg/L
Range	0.1 µg/L to 1000 µg/L
Caveats	Worst case scenario attributes that all the As has reacted with O. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than this worst case.
Test Method	NIOSH Manual of Analytical Methods, Method 7901
Description	This method was developed for particulate arsenic compounds
Technique	GFAA
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 , ASTM Practice D4309 . Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Absorption at 193.7 nm
Detection Limit	0.06 µg
Range	0.3 µg to 13 µg
Caveats	Aluminum may interfere depending upon background correction method. Worst case scenario attributes that all the As has reacted with O. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than this worst case.

TABLE 5 Test Method(s) for Arsenic Trioxide

Chemical Formula	As ₂ O ₃
Analytical Approach	No test method is known for detecting As ₂ O ₃ directly. Elemental Arsenic is detected and calculated as if all of the As is from As ₂ O ₃ .
Test Method	EPA Method 7010
Description	Metals in solution may be readily determined by graphite furnace atomic absorption spectrophotometry. The method is simple, quick, and applicable to a large number of metals in environmental samples including, but not limited to, ground water, domestic and industrial wastes, extracts, soils, sludges, sediments, and similar wastes.
Technique	GFAA
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 . Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Absorption at 193.7 nm
Detection Limit	1 µg/L
Range	Not provided
Caveats	Aluminum may interfere depending upon background correction method. Worst case scenario attributes that all the As has reacted with O. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than this worst case.
Test Method	EPA Method 6020
Description	This method is of wide applicability for analysis of a variety of elements in different types of matrices using Inductively Couple Plasma/Mass Spectrometry.
Technique	ICP-MS
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 .
Analyte	As (elemental)
Detection	Mass spectrometry of primary ion at m/z 75
Detection Limit	0.01 µg/L
Range	0.1 µg/L to 1000 µg/L
Caveats	Worst case scenario attributes that all the As has reacted with O. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than this worst case.
Test Method	NIOSH Manual of Analytical Methods, Method 7901
Description	This method was developed for particulate arsenic compounds. Metals in solution may be readily determined by graphite furnace atomic absorption spectrophotometry. The method is simple, quick, and applicable to a large number of metals in environmental samples. With the exception of the analysis for dissolved constituents, all samples require digestion prior to analysis. Analysis for dissolved elements does not require digestion if the sample has been filtered and then acidified.
Technique	GFAA
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 . Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Absorption at 193.7 nm
Detection Limit	0.06 µg per sample
Range	0.3 µg to 13 µg per sample

TABLE 6 Test Method(s) for Benzylbutyl Phthalate

Chemical Formula	C ₁₉ H ₂₀ O ₄
Test Method	EPA Method 8270D
Description	EPA Method 8270D is used to determine the concentration of semivolatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples
Technique	GC-MS
Sample Prep Method	EPA Method 3510, 3520, 3540 and 3550
Analyte	C ₁₉ H ₂₀ O ₄
Detection	Mass spectrometry – ion at m/z 91, 149 and 206
Detection Limit	10 µg/L
Range	Not provided
Test Method	CPSC-CH-C,001-09.3
Description	This method is used by the U.S. Consumer Product Safety Commission for the analysis of phthalates in child care items and toys.
Technique	GC-MS
Sample Prep Method	Initial polymer solubilization with tetrahydrofuran, followed by polymer precipitation with hexane, and addition of internal standard Benzyl Benzoate solution to filtrate for analysis. Alternative extraction methods are referenced.
Analyte	C ₁₉ H ₂₀ O ₄
Detection	Mass spectrometry – ion at m/z 91, 149 and 206, abundance ratio 27, 149:206
Detection Limit	≤0.01 % µg/L(w/w)
Range	Prescreen with IR for phthalate content 10 % or greater. Dilute analyte accordingly.



TABLE 7 Test Method(s) for Bis (2-ethylhexyl) Phthalate

Chemical Formula	C ₂₄ H ₃₈ O ₄
Test Method	EPA Method 8270D
Description	EPA Method 8270D is used to determine the concentration of semivolatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples
Technique	GC-MS
Sample Prep Method	EPA Method 3510, 3520, 3540 and 3550
Analyte	C ₂₄ H ₃₈ O ₄
Detection	Mass spectrometry – ion at m/z 149, 167 and 279
Detection Limit	10 µg/L
Range	Not provided
Test Method	CPSC-CH-C,001-09.3
Description	This method is used by the U.S. Consumer Product Safety Commission for the analysis of phthalates in child care items and toys.
Technique	GC-MS
Sample Prep Method	Initial polymer solubilization with tetrahydrofuran, followed by polymer precipitation with hexane, and addition of internal standard Benzyl Benzoate solution to filtrate for analysis. Alternative extraction methods are referenced.
Analyte	C ₂₄ H ₃₈ O ₄
Detection	Mass spectrometry – ion at m/z 149, 167 and 279, abundance ratio 10, 149:279
Detection Limit	≤0.01 wt %
Range	Prescreen with IR for phthalate content 10 % or greater. Dilute analyte accordingly. GC/MS analysis for phthalate content <10 %.

TABLE 8 Test Method(s) for Bis (tributyltin) Oxide

Chemical Formula	C ₂₄ H ₅₄ OSn ₂
Analytical Approach	Test directly for bis (tributyltin) oxide
Test Method	ISO 17353-2004
Description	This method is used to detect organotin compounds in water after solvent extraction and analysis by GC-MS or other detection methods.
Technique	GC-MS; also AED (atomic emission detection), FPD (flame photometric detection) and other types of detection systems are applicable.
Sample Prep Method	Organotin compounds in water are alkylated with sodium tetraethylborate. Extraction of the tetrasubstituted organotin compound in hexane followed by cleanup with silica is performed. After concentration the extract is analyzed in the GC-MS.
Analyte	Tributylmonoethyl tin
Detection	Mass spectrometry of the tributylmonoethyl tin; mass clusters at m/z 291/289, 263/261 and 179/177
Detection Limit	Not provided
Range	10 ng/L to 1000 ng/L
Test Method	Journal of Pharmaceutical and Biomedical Analysis, 19(3-4), pp. 327-333, 1999
Description	This method uses liquid extraction and on-line hydride conversion to determine bis(tributyltin) oxide in substances using GC/MS.
Technique	GC-MS
Sample Prep Method	Conversion of the tributyltin oxide to its chloride with hydrochloric acid. The chloride is extracted with hexane and concentrated. The tributyltin chloride is converted into the hydride using sodium borohydride in the injection port of the GC.
Analyte	C ₂₄ H ₅₄ OSn ₂
Detection	Mass spectrometry of tributyltin hydride fragments in the range of 165 to 185 amu
Detection Limit	1 ppm
Range	Not provided
Test Method	Journal of Chromatographic Science, Vol. 23, May, 1985, pp. 209-213
Description	Detection of organotins after gas chromatography by flame ionization-quenching uses a HAFI detector with GC. The HAFID is a hydrogen atmosphere FID. The big difference between FID and HAFID is that HAFID uses hydrogen and a silane doping agent. HAFID is sensitive to organometallics and not hydrocarbons while the opposite is true for FID.
Technique	GC-HAFID
Sample Prep Method	Extract with several small aliquots of acetone, centrifuging and filtering the combined extracts to eliminate any solid material, and diluting to 100 mL with acetone.
Analyte	C ₂₄ H ₅₄ OSn ₂
Detection	Retention time of a standard and calibration curve.
Detection Limit	0.5 x 10 ⁻¹² g
Range	0.5 x 10 ⁻¹² g to 1 x 10 ⁻⁹ g

TABLE 9 Test Method(s) for Cobalt Dichloride

Chemical Formula	CoCl ₂
Analytical Approach	No test method is known for detecting CoCl ₂ directly. Screen for cobalt and chlorine separately.
Testing Approach	Screen for Cobalt and Chlorine separately.
Strategy	A common screening method uses X-ray fluorescence. See Appendix X2 . Chlorine and cobalt are detected separately. A calculation is performed to see if a worst case would trigger further action. Worst case associates all the chlorine and cobalt with each other to form CoCl ₂ . When the measured concentration exceeds the stoichiometric trigger value then cobalt and chlorine analysis should be done by a quantitative method.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF; ASTM Guide E1621 ; ASTM Guide D5831 . Reference IEC 62321.
Sample Prep Method	Sample must be homogeneous. Reference ASTM Guide D1257 ; IEC 62321. See Appendix X1.2 .
Caveats	Worst case scenario attributes that all the Co has reacted with Cl or all the Cl has reacted with Co. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than the worst case.
Test Approach	EPA Method 9056A: Determination of Inorganic Anions by Ion Chromatography
Description	Standard test method for determination of inorganic anions such as chloride, fluoride, bromide, nitrate, nitrite in aqueous solutions. Prepare the solid sample by incorporating the halogens into an aqueous solution. Use ion chromatography to identify and quantify the chloride concentration.
Technique	Ion chromatography, use EPA Method 9056A or similar as guidance.
Sample Prep Method	Solid is combusted with oxygen, the halogenated compounds are absorbed in a bicarbonate solution. Bicarbonate solution is used for analysis. Use EPA Method 5050 Bomb Preparation Method for Solid Waste or similar as guidance.
Analyte	Chlorine
Detection	Conductivity cell
Detection Limit	20 µg/L
Range	By proper dilution, samples with >500 ppm chloride can be analyzed.
Caveats	Worst case scenario attributes that all the Co has reacted with Cl or all the Cl has reacted with Co. Knowledge of the system, either from manufacturer or other sources, is required to assume less than the worst case.
Test Approach	ASTM Test Method D3335
Description	Dissolve the sample by acid digestion, or similar, then analyze for cobalt by atomic absorption spectrometry. Follow the standard additions method for cobalt by AAS since chlorine may interfere.
Technique	AAS. Use ASTM Test Method D3335-85a (2009), or similar as guidance.
Sample Prep Method	Acid digestion. Reference: ASTM Practices D1971 ; ASTM Practice D4309 . Similar standardized methods for AAS sample preparation may be used.
Analyte	Cobalt
Detection	240.7 nm
Detection Limit	1 mg/kg
Range	50 – 2000 mg/kg. Higher levels of Co could be determined by this test method, provided that appropriate dilutions and adjustments in specimen size and reagent quantities are made.
Caveats	Interferences may occur due to organic acids such as formate and acetate. Cobalt and chlorine need to be analyzed separately. Worst case scenario attributes that all the Co has reacted with Cl or all the Cl has reacted with Co. Knowledge of the system, either from manufacturer or other sources, is required to assume less than the worst case.

TABLE 10 Test Method(s) for Dibutyl Phthalate

Chemical Formula	C ₁₆ H ₂₂ O ₄
Testing Method	EPA Method 8270D
Description	EPA Method 8270D is used to determine the concentration of semivolatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples
Technique	GC-MS
Sample Prep Method	EPA Method 3510, 3520, 3540 and 3550
Analyte	C ₁₆ H ₂₂ O ₄
Detection	Mass spectrometry – primary ion at m/z 149; secondary ions at 150 and 104
Detection Limit	10 µg/L
Range	Not provided
Test Method	CPSC-CH-C,001-09.3
Description	This method is used by the U.S. Consumer Product Safety Commission for the analysis of phthalates in child care items and toys.
Technique	GC-MS
Sample Prep Method	Initial polymer solubilization with tetrahydrofuran, followed by polymer precipitation with hexane, and addition of internal standard Benzyl Benzoate solution to filtrate for analysis. Alternative extraction methods are referenced.
Analyte	C ₁₆ H ₂₂ O ₄
Detection	Mass spectrometry - ion at m/z 149, 167, 205, 223, abundance ratio 4, 149:223.
Detection Limit	≤0.1 % (w/w)
Range	Prescreen with IR for phthalate content 10 % or greater. Dilute analyte accordingly. GC/MS analysis for phthalate content <10 %.

TABLE 11 Test Method(s) for Lead Hydrogen Arsenate

Chemical Formula	(AsO ₄ H)Pb
Analytical Approach	No test method is known for detecting (AsO ₄ H)Pb directly. Elemental Arsenic or lead is detected and calculated as if all of the As or Pb is from (AsO ₄ H)Pb.
Test Method	EPA Method 7010
Description	Metals in solution may be readily determined by graphite furnace atomic absorption spectrophotometry. The method is simple, quick, and applicable to a large number of metals in environmental samples including, but not limited to, ground water, domestic and industrial wastes, extracts, soils, sludges, sediments, and similar wastes. With the exception of the analyses for dissolved constituents, all samples require digestion prior to analysis. Analysis for dissolved elements does not require digestion if the sample has been filtered and then acidified.
Technique	GFAA
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 ; US EPA Method 3050B Acid Digestion of Sediments, Sludges, and Soils. Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Absorption at 193.7 nm
Detection Limit	1 µg/L
Range	Not provided
Caveats	Worst case scenario attributes that all the As has reacted to from (AsO ₄ H)Pb. Knowledge of the system, either from manufacturer or other sources, is required to assume less than the worst case.
Test Method	EPA Method 6020
Description	This method is of wide applicability for analysis of a variety of elements in different types of matrices using Inductively Couple Plasma/Mass Spectrometry.
Technique	ICP-MS
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 ; US EPA Method 3050B Acid Digestion of Sediments, Sludges, and Soils. Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Mass spectrometry of primary ion at m/z 75
Detection Limit	0.01 µg/L
Range	0.1 - 1000 µg/L
Caveats	Worst case scenario attributes that all the As has reacted to from (AsO ₄ H)Pb. Knowledge of the system, either from manufacturer or other sources, is required to assume less than the worst case.
Test Method	NIOSH Manual of Analytical Methods, Method 7901
Description	This method was developed for particulate arsenic compounds.
Technique	GFAA
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 ; US EPA Method 3050B Acid Digestion of Sediments, Sludges, and Soils. Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Absorption at 193.7 nm
Detection Limit	0.06 µg per sample
Range	0.3 µg to 13 µg per sample
Caveats	Worst case scenario attributes that all the As has reacted to from (AsO ₄ H)Pb. Knowledge of the system, either from manufacturer or other sources, is required to assume less than the worst case.
Test Method	IEC 62321
Description	Method for determining lead in electronic products using several different analytical approaches.
Technique	ICP-OES, ICP-MS and AAS
Sample Prep Method	Acid digestion, see IEC 62321 for details
Analyte	Pb (elemental)
Detection	Absorption at 283.3 and 217.0 nm.
Detection Limit	<10 mg/kg
Range	Not provided
Caveats	Worst case scenario attributes that all the Pb has reacted to from (AsO ₄ H)Pb. Knowledge of the system, either from manufacturer or other sources, is required to assume less than the worst case.



TABLE 12 Test Method(s) for 5-tert-Butyl-2,4,6-Trinitro-m-Xylene (Musk Xylene)

Chemical Formula	$C_{12}H_{15}O_6$
Test Method	Journal of chromatography. B, Biomedical sciences and applications, 693, 71-78, 1997
Description	This method was initially developed for the analysis of Musk xylene in human blood samples.
Technique	GC-ECD
Sample Prep Method	Solid phase extraction using a silica gel column and elution with petroleum benzene. See test method reference for details.
Analyte	$C_{12}H_{15}O_6$
Detection	Electron capture detection
Detection Limit	0.1 µg/L of plasma
Range	Not provided
Test Method	Chemosphere 29(3), 477-84, 1994
Description	This method was developed for the analysis of Musk xylene in human blood samples.
Technique	GC-MS with negative chemical ionization.
Sample Prep Method	Extraction of blood plasma using n-hexane. The extract was further processed using a silica gel column. Elution of the compounds of interest was accomplished using dichloromethane.
Analyte	$C_{12}H_{15}O_6$
Detection	Mass spectrometry - primary $[M]^-$ at 297 and $[M-30]^-$ at 267
Detection Limit	50 fg absolute
Range	Not provided

TABLE 13 Test Method(s) for Sodium Dichromate

Chemical Formula	$Na_2Cr_2O_7$
Analytical Approach	No test method is known for detecting $Na_2Cr_2O_7$ directly. To calculate a hypothetical maximum of $Na_2Cr_2O_7$, elemental chromium is detected and calculated as if all of the Cr is from $Na_2Cr_2O_7$.
Test Method	EPA Method 7196A/IEC 62321
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.



TABLE 14 Test Method(s) for Triethyl Arsenate

Chemical Formula	(C ₂ H ₅ O) ₃ AsO
Test Method	EPA Method 7010
Description	This method involves analysis by graphite furnace atomic absorption spectrophotometry and was developed primarily for environmental samples. This technique is only capable of detecting elemental arsenic and not its compounds.
Technique	GFAA
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 ; US EPA Method 3050B Acid Digestion of Sediments, Sludges, and Soils. Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Absorption at 193.7 nm
Detection Limit	1 µg/L
Range	Not provided
Test Method	EPA Method 6020
Description	This method is of wide applicability for analysis of a variety of elements in different types of matrices using Inductively Couple Plasma/Mass Spectrometry.
Technique	ICP-MS
Sample Prep Method	Digestion is required for all samples with the exception of those where the As is dissolved. A matrix modifier shall be added to all digestates prior to analysis to minimize volatilization losses during drying and ashing. Reference: US EPA Method 3051A, Microwave assisted digestion of sediments, sludges, soils and oils; ASTM Practices D1971 ; ASTM Practice D4309 ; US EPA Method 3050B Acid Digestion of Sediments, Sludges, and Soils. Similar standardized methods for AAS sample preparation may be used.
Analyte	As (elemental)
Detection	Mass spectrometry of primary ion at m/z 75
Detection Limit	0.01 µg/L
Range	0.01 µl/L to 1000 µl/L

TABLE 15 Test Method(s) for Hexabromocyclododecane

Chemical Formula	C ₁₂ H ₁₈ Br ₆
Test Method	Screen for Br
Strategy	A common screening method uses X-Ray fluorescence. See Appendix X2 . A calculation is performed to see if a worst case would trigger further action. When the measured concentration exceeds the trigger value then hexabromocyclododecane analysis should be done by a quantitative method.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF, reference IEC 62321 or EPA SW-846 Method 6200.
Sample Prep Method	Sample needs to be homogeneous. See Appendix X1.2 .
Caveats	Worst case scenario attributes that the Br is associated with the hexabromocyclododecane. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than the worst case.
Test Method	Analytical Sciences, 22, 469-474, 2006
Description	Method to determine the concentrations of the three diastereoisomers (α, β, γ) of HBCDD in water and sediments.
Technique	LC-MS
Sample Prep Method	Solid phase extraction or solvent extraction using CH ₂ Cl ₂
Analyte	C ₁₂ H ₁₈ Br ₆
Detection	Mass spectrometry - primary ion at m/z 640.6 [M-H] ⁻
Detection Limit	Not provided
Range	Not provided

TABLE 16 Test Method(s) for Short Chain Chlorinated Paraffins

Chemical Formula	$C_xH_{(2x-y+2)}Cl_y$ where $x = 10-13$ and $y = 1-13$
Testing Approach	Screen for Chlorine
Strategy	A common screening method uses X-Ray fluorescence. See Appendix X2 . A calculation is performed to see if a worst case would trigger further action. When the measured concentration exceeds the trigger value then short chain chlorinated paraffin analysis should be done by a quantitative method.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF, reference IEC 62321 or EPA SW-846 Method 6200.
Sample Prep Method	Sample needs to be homogeneous. See Appendix X1.2 .
Caveats	Worst case scenario attributes that the CI is associated with short chain chlorinated paraffin. Knowledge of the system, either from manufacturer, engineering knowledge or other sources, is required to assume less than the worst case.
Test Method	Chemosphere 58 (2005), 253-262
Description	This method was developed primarily for analysis of sediment samples.
Technique	Short column GC with electron capture negative ion mass spectrometry (ECNI)
Sample Prep Method	Soxhlet extraction with dichloromethane. Evaporation to near dryness followed by addition of n-hexane and sulfuric acid digestion. Hexane fraction evaporation to near dryness followed by activated copper addition. Final sample purification is carried out with packed silica column chromatography with selected solvents, followed by semi-prep GPC. The desired sample portion is isolated, dried, and dissolved in n-hexane for GC analysis.
Analyte	$C_xH_{(2x-y+2)}Cl_y$ where $x=10-13$ and $y=1-13$
Detection	Various ion masses (m/z) were monitored for quantitative analysis. For C_{10} : 313/349/383/417 C_{11} : 329/361/395/431/465 C_{12} : 341/375/409/445/477 C_{13} : 389/424/457/491
Detection Limit	0.5 ng/g
Range	Not provided
Test Method	Journal of Chromatography A, 984, (2003), 1-8
Description	This method was developed for analysis of short chain chlorinated paraffins in water samples
Technique	GC-ECD
Sample Prep Method	Solid phase micro-extraction using fibers of various compositions for example, polydimethylsiloxane, polyacrylate and others.
Analyte	$C_xH_{(2x-y+2)}Cl_y$ where $x=10-13$ and $y=1-13$
Detection	Electron capture
Detection Limit	0.3 µg/L
Range	Not provided

TABLE 17 Test Method(s) for 2,4-Dinitrotoluene

Chemical Formula	$C_7H_6N_2O_4$
Test Method	EPA Method 8095
Description	This method may be used to determine the concentrations 2,4-dinitrotoluene in water and soil using capillary column gas chromatography with an electron capture detector (GC-ECD).
Technique	GC-ECD
Sample Prep Method	Soxhlet extraction using EPA Method 3540
Analyte	2,4-Dinitrotoluene
Detection	retention time in capillary column
Detection Limit	0.003 to 0.5 µg/L
Range	0.03 to 5 µg/L
Test Method	EPA Method 8515
Description	The method is performed using an extract of a sample. The sample is treated with color-change reagents and is read in a spectrophotometer. The colorimetric nature of the test is based on the visual detection of the reaction product that is formed when polynitroaromatic compounds react with acetone by ketone substitution in the presence of base.
Technique	UV-Vis spectrometer capable of measuring at 540 nm
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	Polynitroaromatic compounds
Detection	UV-Vis at 540 nm
Detection Limit	0.7 mg/kg
Range	1 to 30 mg/kg

TABLE 18 Test Method(s) for Aluminosilicate Refractory Ceramic Fibres

Chemical Formula	Man-made amorphous fiber of Al_2O_3 and SiO_2 in variable concentrations with alkaline oxide and alkali earth oxide ($\text{Na}_2\text{O}+\text{K}_2\text{O}+\text{CaO}+\text{MgO}+\text{BaO}$) content less or equal to 18 % by weight.
Analytical Approach	No test method is known for detecting Aluminosilicate refractory ceramic fibres directly. Aluminosilicate refractory ceramic fibres belong to the group of the refractory ceramic fibres. A complete chemical identification is not possible. The fibres are either blown or spun from molten clay (kaolin), or, molten alumina and silica mixtures (roughly 50% each). The diameters of fibres produced are usually between 1-3 microns or micrometers ($1\mu\text{m} = 0.001\text{ mm}$). Raw forms usually look like a white or gray fibrous material supplied in bulk fibre, or blanket form. They can also be part of solid products such as cast refractories used as insulation for furnaces. The silica part of the final product is not crystalline silica, rather the silica molecule has been combined with the alumina to form an aluminosilicate. After use in high temperature applications the silicate may be transformed into crystalline silica (cristobalite) if the temperature is high enough (greater than 1000°C). Both physical and chemical properties must be considered for identification.
Test Method	ASTM D5831, EPA Method 6200
Description	Refractory ceramic fibres containing zirconium oxide as one of the main starting materials do not have the same CAS number, therefore are not on the SVHC list. Quantifying the zirconium aluminum and silicon content by XRF can quickly determine the fibre type. Other oxides like potassium oxide (< 0.01 %), sodium oxide (0.5 %), magnesium oxide (< 0.1 %), calcium oxide (< 0.1 %), titanium oxide (2 %), zirconium oxide (0.1 %), iron oxide (1 %) and chromium oxide (< 0.03 %) are sometimes incorporated to change the fibre properties. Quantification of metals to calculate their oxide contents, or quantifying the metal oxide by XRF will confirm if the content of the alkaline and alkaline earth oxides is lower than 1 %, and if a content of $\text{Na}_2\text{O}+\text{K}_2\text{O}+\text{CaO}+\text{MgO}+\text{BaO}$ less or equal to 18 % by weight. Thus the classification for these substances in this CAS number can be fulfilled.
Technique	XRF
Sample Prep Method	Ensure representative, homogeneous and with an even surface, for example, pressing a pellet or briquette
Analyte	Al, Si, Zr, K, Na, Ca, Mg, Ba, or their oxides
Detection	Quantification of targeted metal or metal oxide to calculate their composition.
Detection Limit	100 to 200 mg/kg

TABLE 19 Test Method(s) for Anthracene Oil

Chemical Formula	$\text{C}_{14}\text{H}_{10}\text{C}_{12}\text{H}_9\text{N}$
Test Method	Various including: German ZEK01.4-08 “Testing and Validation of Polycyclic Aromatic Hydrocarbons (PAH) in the course of GS-Mark Certification” (Polymers), US EPA Method “Polynuclear Aromatic Hydrocarbons” (610 Municipal and Industrial Wastewater, 625 Municipal and Industrial Wastewater, 8100 Solid Waste, 8310 Ground Water and Wastes) and US EPA Method “Semivolatile Organic Compounds” (8270 Solid Waste, Soils, Air Sampling Media and Water Samples).
Description	Anthracene oil and paste are coal tar distillation product substances of variable composition. They are characterized by a high content of polycyclic aromatic hydrocarbons (PAHs) including anthracene, phenanthrene and fluorene as well as other heterocyclic compounds. While there are no published consensus standard test methods for anthracene oil or paste or their distillation fractions, common methods for the determination of PAH's could be validated for each matrix under evaluation for their indirect determination.
Technique	Multiple including HPLC, GC-FID & GC-MS
Sample Prep Method	Various solvent extraction methods including: soxhlet, ultrasonic and kaderna-danish (See US EPA Method 3500, 3510, 3520, 3540/3541, 3550, 3580).
Analyte	PAH's including anthracene, phenanthrene and fluorene.
Detection	Various including ultraviolet, fluorescence, flame ionization and mass spectrometry.
Detection Limit	The following detection limits can be anticipated: <0.2 mg/kg for individual PAH's in solid matrices, <1.0 $\mu\text{g/l}$ for individual PAH's in solution
Range	Unknown Usable method range should be established during validation with sample matrix similar to actual samples.

TABLE 20 Test Method(s) for Anthracene Oil, Anthracene Paste

Chemical Formula	$C_{14}H_{10}C_{12}H_9N$
Test Method	Various including: German ZEK01.4-08 “Testing and Validation of Polycyclic Aromatic Hydrocarbons (PAH) in the course of GS-Mark Certification” (Polymers), US EPA Method “Polynuclear Aromatic Hydrocarbons” (610 Municipal and Industrial Wastewater, 625 Municipal and Industrial Wastewater, 8100 Solid Waste, 8310 Ground Water and Wastes) and US EPA Method “Semivolatile Organic Compounds” (8270 Solid Waste, Soils, Air Sampling Media and Water Samples).
Description	Anthracene oil and paste are coal tar distillation product substances of variable composition. They are characterized by a high content of polycyclic aromatic hydrocarbons (PAHs) including anthracene, phenanthrene and fluorene as well as other heterocyclic compounds. While there are no published consensus standard test methods for anthracene oil or paste or their distillation fractions, common methods for the determination of PAH's could be validated for each matrix under evaluation for their indirect determination.
Technique	Multiple including HPLC, GC-FID & GC-MS
Sample Prep Method	Various solvent extraction methods including: soxhlet, ultrasonic and kaderna-danish (See US EPA Method 3500, 3510, 3520, 3540/3541, 3550, 3580).
Analyte	PAH's including anthracene, phenanthrene and fluorene.
Detection	Various including ultraviolet, fluorescence, flame ionization and mass spectrometry.
Detection Limit	The following detection limits can be anticipated: <0.2 mg/kg for individual PAH's in solid matrices, <1.0 µg/l for individual PAH's in solution
Range	Unknown Usable method range should be established during validation with sample matrix similar to actual samples.

TABLE 21 Test Method(s) for Anthracene Oil, Anthracene Paste, Anthracene Fraction

Chemical Formula	$C_{14}H_{10}C_{12}H_9N$
Test Method	Various including: German ZEK01.4-08 “Testing and Validation of Polycyclic Aromatic Hydrocarbons (PAH) in the course of GS-Mark Certification” (Polymers), US EPA Method “Polynuclear Aromatic Hydrocarbons” (610 Municipal and Industrial Wastewater, 625 Municipal and Industrial Wastewater, 8100 Solid Waste, 8310 Ground Water and Wastes) and US EPA Method “Semivolatile Organic Compounds” (8270 Solid Waste, Soils, Air Sampling Media and Water Samples).
Description	Anthracene oil and paste are coal tar distillation product substances of variable composition. They are characterized by a high content of polycyclic aromatic hydrocarbons (PAHs) including anthracene, phenanthrene and fluorene as well as other heterocyclic compounds. While there are no published consensus standard test methods for anthracene oil or paste or their distillation fractions, common methods for the determination of PAH's could be validated for each matrix under evaluation for their indirect determination.
Technique	Multiple including HPLC, GC-FID & GC-MS
Sample Prep Method	Various solvent extraction methods including: soxhlet, ultrasonic and kaderna-danish (See US EPA Method 3500, 3510, 3520, 3540/3541, 3550, 3580).
Analyte	PAH's including anthracene, phenanthrene and fluorene.
Detection	Various including ultraviolet, fluorescence, flame ionization and mass spectrometry.
Detection Limit	The following detection limits can be anticipated: <0.2 mg/kg for individual PAH's in solid matrices, <1.0 µg/l for individual PAH's in solution
Range	Unknown Usable method range should be established during validation with sample matrix similar to actual samples.

TABLE 22 Test Method(s) for Anthracene Oil, Anthracene Paste, Distn. Lights

Chemical Formula	$C_{14}H_{10}C_{12}H_9N$
Test Method	Various including: German ZEK01.4-08 “Testing and Validation of Polycyclic Aromatic Hydrocarbons (PAH) in the course of GS-Mark Certification” (Polymers), US EPA Method “Polynuclear Aromatic Hydrocarbons” (610 Municipal and Industrial Wastewater, 625 Municipal and Industrial Wastewater, 8100 Solid Waste, 8310 Ground Water and Wastes) and US EPA Method “Semivolatile Organic Compounds” (8270 Solid Waste, Soils, Air Sampling Media and Water Samples).
Description	Anthracene oil and paste are coal tar distillation product substances of variable composition. They are characterized by a high content of polycyclic aromatic hydrocarbons (PAHs) including anthracene, phenanthrene and fluorene as well as other heterocyclic compounds. While there are no published consensus standard test methods for anthracene oil or paste or their distillation fractions, common methods for the determination of PAH's could be validated for each matrix under evaluation for their indirect determination.
Technique	Multiple including HPLC, GC-FID & GC-MS
Sample Prep Method	Various solvent extraction methods including: soxhlet, ultrasonic and kaderna-danish (See US EPA Method 3500, 3510, 3520, 3540/3541, 3550, 3580).
Analyte	PAH's including anthracene, phenanthrene and fluorene.
Detection	Various including ultraviolet, fluorescence, flame ionization and mass spectrometry.
Detection Limit	The following detection limits can be anticipated: <0.2 mg/kg for individual PAH's in solid matrices, <1.0 µg/l for individual PAH's in solution
Range	Unknown Usable method range should be established during validation with sample matrix similar to actual samples.

TABLE 23 Test Method(s) for Anthracene Oil, Anthracene-low

Chemical Formula	$C_{14}H_{10}C_{12}H_9N$
Test Method	Various including: German ZEK01.4-08 “Testing and Validation of Polycyclic Aromatic Hydrocarbons (PAH) in the course of GS-Mark Certification” (Polymers), US EPA Method “Polynuclear Aromatic Hydrocarbons” (610 Municipal and Industrial Wastewater, 625 Municipal and Industrial Wastewater, 8100 Solid Waste, 8310 Ground Water and Wastes) and US EPA Method “Semivolatile Organic Compounds” (8270 Solid Waste, Soils, Air Sampling Media and Water Samples).
Description	Anthracene oil and paste are coal tar distillation product substances of variable composition. They are characterized by a high content of polycyclic aromatic hydrocarbons (PAHs) including anthracene, phenanthrene and fluorene as well as other heterocyclic compounds. While there are no published consensus standard test methods for anthracene oil or paste or their distillation fractions, common methods for the determination of PAH's could be validated for each matrix under evaluation for their indirect determination.
Technique	Multiple including HPLC, GC-FID & GC-MS
Sample Prep Method	Various solvent extraction methods including: soxhlet, ultrasonic and kaderna-danish (See US EPA Method 3500, 3510, 3520, 3540/3541, 3550, 3580).
Analyte	PAH's including anthracene, phenanthrene and fluorene.
Detection	Various including ultraviolet, fluorescence, flame ionization and mass spectrometry.
Detection Limit	The following detection limits can be anticipated: <0.2 mg/kg for individual PAH's in solid matrices, <1.0 µg/l for individual PAH's in solution
Range	Unknown Usable method range should be established during validation with sample matrix similar to actual samples.

TABLE 24 Test Method(s) for Diisobutyl Phthalate

Chemical Formula	$C_{16}H_{22}O_4$
Test Method	EN 14372:2004
Description	A sample of polymer is extracted and the extracted phthalates are then run through a gas chromatograph. This method has not been validated for this analyte.
Technique	GC-MS
Sample Prep Method	2 g of the article is obtained for analysis. The sample is extracted in a Soxhlet extraction apparatus with diethyl ether for 6 h.
Analyte	Diisobutyl phthalate
Detection	Mass spectrometry
Detection Limit	0.2 mg/kg
Range	0.2 mg/kg – 10 mg/kg

TABLE 25 Test Method(s) for Lead Chromate

Chemical Formula	CrH_2O_4Pb
Analytical Approach	Standard test method does not exist for CrH_2O_4Pb . Therefore, the test method cited for CrH_2O_4Pb must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

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TABLE 26 Test Method(s) for Lead Chromate Molybdate Sulphate Red (C.I. Pigment Red 104)

Chemical Formula	$Pb(Cr,S,Mo)O_4$
Analytical Approach	No test method is known for detecting $Pb(Cr,S,Mo)O_4$ directly. To calculate a hypothetical maximum of $Pb(Cr,S,Mo)O_4$, chromium (VI) ion is detected and calculated as if all of the Cr(VI) is from $Pb(Cr,S,Mo)O_4$.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 27 Test Method(s) for Lead Sulfochromate Yellow (C.I. Pigment Yellow 34)

Chemical Formula	$PbCrO_4 + PbSO_4$
Analytical Approach	No test method is known for detecting $PbCrO_4 + PbSO_4$ directly. To calculate a hypothetical maximum of $PbCrO_4 + PbSO_4$, chromium (VI) ion is detected and calculated as if all of the Cr(VI) is from $PbCrO_4 + PbSO_4$.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 28 Test Method(s) for Pitch, Coal Tar, High Temperature

Chemical Formula	Not Applicable. Few effect data has existed specifically on CTP(ht) and the associated coal tar pitch volatiles (CTPV). The risk assessment is largely based on data on PAHs, especially on benzo(a)pyrene (B(a)P), in coal tar, creosote and other related products. When coal tar pitch is heated, coal tar pitch volatiles (CTPV) are released, most of them being PAHs. Because the composition of CTP(ht) is variable and no single representative composition/data exist, this is an acceptable approach. PAHs are the most relevant components in terms of toxicity; there are most data on B(a)P and it serves as a relevant indicator (in addition to references in the RAR, Spinelli et al., 2006, Friesen et al., 2008).
Test Method	EPA Method 8270D, The expanded scan for PAHs [828] (a modified EPA Method 8270 including alkyl homologues and lower detection limits)
Description	This method is used to determine the concentration of semi volatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 3510, EPA Method 3520, EPA Method 5041, EPA Method 3540, EPA Method 3550, EPA Method 3580.
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Gas chromatography retention time and mass spectrometry – primary ion and confirmation ion.
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte
Test Method	EPA Method 8310
Description	This method is used to determine the concentration of certain polynuclear aromatic hydrocarbons in ground water and wastes.
Technique	HPLC
Sample Prep Method	Extraction with methylenechloride followed by exchange to acetonitrile
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Liquid chromatography retention time and ultraviolet spectrum
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte

TABLE 29 Test Method(s) for Tris(2-chloroethyl)phosphate (TCEP)

Chemical Formula	$C_6H_{12}Cl_3O_4P$
Test Method	Health Canada C-38
Description	Soxhlet extraction of TCEP in polyurethane and related materials in toluene followed by rotovap concentration and GC-MS
Technique	GC-MS
Sample Prep Method	1 g of sample is extracted in 250 mL toluene using a soxhlet apparatus and concentrated to < 10 mL in a rotovap following extraction. TCEP is then determined by GC-MS using 4,4'-Dibromooctafluorobiphenyl as an internal standard
Analyte	TCEP. Quantifier ion: 249. Qualifier ions 205/143/63
Detection	GC-MS using 4,4'-Dibromooctafluorobiphenyl as an internal standard. TCEP Quantifier ion: 249. Qualifier ions 205/143/63
Detection Limit	200 mg/kg.
Range	Not provided.
Test Method	Analytical Sciences, Vol 19 pp. 1617-1620, December 2003
Description	Polyurethane foam is dissolved in sulfuric acid to release TCEP. TCEP is determined by GC-Flame Photometric Detection
Technique	GC-Flame Photometric Detection
Sample Prep Method	Polyurethane foam is dissolved in sulfuric acid. Water is added to separate out dissolved polyurethane. pH is adjusted, sodium chloride added, and TCEP extracted with toluene. Toluene solution is concentrated.
Analyte	TCEP
Detection	GC with Flame Photometric Detection
Detection Limit	0.6 µg/g for 0.05 g sample
Range	Not provided
Test Method	USGS NWQL O-1433-01
Description	TCEP in wastewater is determined by polystyrene-divinylbenzene solid phase extraction followed by GC-MS
Technique	GC-MS
Sample Prep Method	Water samples are filtered to remove particulates, then extracted in solid phase extraction columns containing polystyrene-divinylbenzene. Sorbed TCEP is eluted with a mixture of dichloromethane and ethyl ether and the solution then concentrated.
Analyte	TCEP
Detection	GC-MS, quantitation ion m/z 249, confirmation ions m/z 251 and 205, phenanthrene-d ₁₀ internal standard
Detection Limit	0.08 µg/L
Range	Not provided

TABLE 30 Test Method(s) for Zirconia Aluminosilicate Refractory Ceramic Fibres (5)

Chemical Formula	SiO ₂ Al ₂ O ₃ Fe ₂ O ₃ TiO ₂ MnO CaO Na ₂ O K ₂ O Cr ₂ O ₃ ZrO ₂ P ₂ O ₅
Test Method	ISO 21587-3
Description	This method is used for the identification of the presence of refractory ceramic fibers.
Technique	This method uses ICP-AES spectroscopy or FAA spectrometry for the identification of elements associated with these fibers.
Sample Prep Method	Acid digestion
Analyte	Silicon Aluminum Iron Titanium Manganese Calcium Magnesium Sodium Potassium Chromium Zirconium Phosphorus
Detection	Elemental ratios are used to establish the presence of the fibers which have a fixed chemical formula. Another sample is ashed and the residue examined under microscope for fibers matching the regulated fibers in width and length.
Detection Limit	Matrix dependent
Range	0.1 mg/L - 60 mg/L

TABLE 31 Test Method(s) for Acrylamide

Chemical Formula	C ₃ H ₅ NO
Test Method	EPA Method 8032A
Description	This method is used to detect acrylamide in aqueous matrices after bromination of the double bond and extraction with ethyl acetate.
Technique	GC-ECD (electron capture detection). GC-MS may be used for compound confirmation.
Sample Prep Method	Acrylamide in water is brominated with KBr / HBr. Reaction product (2,3-dibromopropionamide) is extracted with ethyl acetate. Florosil column is used to remove interferences and impurities from KBr. Eluate from florisil column injected into GC-ECD
Analyte	Acrylamide following bromination to 2,3-dibromopropionamide
Detection	GC-ECD using dimethyl phthalate as internal standard
Detection Limit	0.032 µg/L
Range	Method found to be linear over range 0-5 µg/L of acrylamide monomer
Test Method	Journal of Food and Drug Analysis, Vol. 17, No. 3, 2009, Pages 190-197
Description	Acrylamide in food is determined using solid phase extraction followed by LC-MS-MS
Technique	LC-MS-MS
Sample Prep Method	Food is pulverized in a food processor, mixed with water, homogenized and centrifuged. Sample is cleaned using solid phase extraction.
Analyte	Acrylamide
Detection	LC-MS-MS using ¹³ C ₃ acrylamide as internal standard
Detection Limit	3 µg/kg
Range	Linear calibration curve between 5 and 1000 µg/L acrylamide in water

TABLE 32 Test Method(s) for Ammonium Dichromate

Chemical Formula	$(\text{NH}_4)_2\text{Cr}_2\text{O}_7$
Analytical Approach	No test method is known for detecting $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ directly. To calculate a hypothetical maximum of $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$, chromium (VI) ion is detected and calculated as if all of the Cr(VI) is from $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$. The test method cited for $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 33 Test Method(s) for Boric Acid

Chemical Formula	BH_3O_3
Analytical Approach	No test method is known for detecting BH_3O_3 directly. To calculate a hypothetical maximum of BH_3O_3 , elemental boron is detected and calculated as if all of the boron is from BH_3O_3 . The test method cited for BH_3O_3 must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive devices.
Technique	ICP-OES
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	B
Detection	Atomic emission at 249.679 nm
Detection Limit	4 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 34 Test Method(s) for Disodium Tetraborate, Anhydrous

Chemical Formula	$\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$; $\text{Na}_2\text{B}_4\text{O}_7$; $\text{Na}_2\text{B}_4\text{O}_7 \cdot 5\text{H}_2\text{O}$
Analytical Approach	No test method is known for detecting borates directly. To calculate a hypothetical maximum of borate, elemental boron is detected and calculated as if all of the boron is from $\text{Na}_2\text{B}_4\text{O}_7$. The test method cited for $\text{Na}_2\text{B}_4\text{O}_7$ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive detectors.
Technique	ICP-OES
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	B
Detection	Atomic emission at 249.679 nm
Detection Limit	4 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 35 Test Method(s) for Potassium Chromate

Chemical Formula	K_2CrO_4
Analytical Approach	Standard test method does not exist for K_2CrO_4 . Therefore, the test method cited for K_2CrO_4 must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter.
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 36 Test Method(s) for Potassium Dichromate

Chemical Formula	$K_2Cr_2O_7$
Analytical Approach	Standard test method does not exist for $K_2Cr_2O_7$. Therefore, the test method cited for $K_2Cr_2O_7$ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter.
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 37 Test Method(s) for Sodium Chromate

Chemical Formula	Na_2CrO_4
Analytical Approach	Standard test method does not exist for Na_2CrO_4 . Therefore, the test method cited for Na_2CrO_4 must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter.
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 38 Test Method(s) for Tetraboron Disodium Heptaoxide, Hydrate

Chemical Formula	$B_4Na_2O_7 \cdot x H_2O$
Analytical Approach	No test method is known for detecting borates directly. To calculate a hypothetical maximum of borate, elemental boron is detected and calculated as if all of the boron is from $B_4Na_2O_7 \cdot H_2O$.
Test Method	EPA Method 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive detectors.
Technique	ICP-OES
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	B
Detection	Atomic emission at 249.679 nm
Detection Limit	4 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 39 Test Method(s) for Trichloroethylene

Chemical Formula	C_2HCl_3
Test Method	EPA Method 8260
Description	The volatile compounds are introduced into the GC-MS by injecting the sample extract into a gas chromatograph (GC) equipped with a capillary column. The GC column is temperature-programmed to separate the analytes, which are then detected with a mass spectrometer (MS) connected to the gas chromatograph. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard using an appropriate calibration curve for the intended application.
Technique	GC-MS
Sample Prep Method	EPA Method 5035
Analyte	Trichloroethylene
Detection	Retention time from GC, m/z of 95, 97, 130 and 132 in MS
Detection Limit	Approximately 0.14 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 40 Test Method(s) for Chromium Trioxide

Chemical Formula	CrO_3
Analytical Approach	Standard test method does not exist for CrO_3 . Therefore, the test method cited for CrO_3 must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter.
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 41 Test Method(s) for Acids Generated from Chromium Trioxide and their Oligomers

Chemical Formula	Cr ₂ H ₂ O ₇ CrH ₂ O ₄
Analytical Approach	Standard test method does not exist for H ₂ Cr ₂ O ₇ /H ₂ CrO ₄ . Therefore, the test method cited for H ₂ Cr ₂ O ₇ /H ₂ CrO ₄ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm. UV-Vis or colorimeter with 540 nm filter.
Technique	EPA Method 3060A, Alkaline Digestion
Sample Prep Method	Cr(VI)
Analyte	Absorption at 540 nm
Detection	30 µg/L
Detection Limit	0.5 mg/L to 50 mg/L
Range	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.
Caveat	

TABLE 42 Method(s) for Cobalt (II) Sulphate

Chemical Formula	CoSO ₄
Analytical Approach	No test method is known for detecting CoSO ₄ directly.
Test Method	Screen for Cobalt using EPA Method 6200 or ASTM E1621
Description	A common screening method uses X-ray fluorescence. See Appendix X2 . Calculation is performed to see if a worst case would trigger further action. Worst case associates all of the cobalt as CoSO ₄ . When the measured concentration exceeds the stoichiometric trigger value then cobalt and sulphate analysis should be done by a quantitative method.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF; ASTM Guide E1621 ; ASTM Guide D5831 . Reference IEC 62321.
Sample Prep Method	Sample must be homogeneous. Reference ASTM Guide D1257 ; IEC 62321. See Appendix X1.2 .
Analyte	Co
Detection	When a sample is irradiated with X rays, the source X rays may undergo either scattering or absorption by sample atoms. This latter process is known as the photoelectric effect. When an atom absorbs the source X rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of X rays characteristic of the given atom. The emission of X rays, in this manner, is termed X-ray fluorescence.
Detection Limit	60 mg/Kg
Range	Unknown

TABLE 43 Test Method(s) for Cobalt (II) Dinitrate

Chemical Formula	CoN ₂ O ₆
Analytical Approach	No test method is known for detecting CoN ₂ O ₆ directly.
Test Method	Screen for Cobalt using EPA Method 6200 or 1621
Description	A common screening method uses X-ray fluorescence. See Appendix X2 . Calculation is performed to see if a worst case would trigger further action. Worst case associates all of the cobalt as CoN ₂ O ₆ . When the measured concentration exceeds the stoichiometric trigger value then cobalt and nitrate analysis should be done by a quantitative method.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF; ASTM Guide E1621 ; ASTM Guide D5831 . Reference IEC 62321.
Sample Prep Method	Sample must be homogeneous. Reference ASTM Guide D1257 ; IEC 62321. See X1.2 .
Analyte	Co
Detection	When a sample is irradiated with X rays, the source X rays may undergo either scattering or absorption by sample atoms. This latter process is known as the photoelectric effect. When an atom absorbs the source X rays, incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of X rays characteristic of the given atom. The emission of X rays, in this manner, is termed X-ray fluorescence.
Detection Limit	60 mg/Kg
Range	Unknown

TABLE 44 Test Method(s) for Cobalt (II) Carbonate

Chemical Formula	CoCO ₃
Analytical Approach	No test method is known for detecting CoCO ₃ directly.
Test Method	Screen for Cobalt using EPA Method 6200 or 1621
Description	A common screening method uses X-ray fluorescence. See Appendix X2 . Calculation is performed to see if a worst case would trigger further action. Worst case associates all of the cobalt as CoCO ₃ . When the measured concentration exceeds the stoichiometric trigger value then cobalt and carbonate analysis should be done by a quantitative method.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF; ASTM Guide E1621 ; ASTM Guide D5831 . Reference IEC 62321.
Sample Prep Method	Sample must be homogeneous. Reference ASTM Guide D1257 ; IEC 62321. See X1.2 .
Analyte	Co
Detection	When a sample is irradiated with X rays, the source X rays may undergo either scattering or absorption by sample atoms. This latter process is known as the photoelectric effect. When an atom absorbs the source X rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of X rays characteristic of the given atom. The emission of X rays, in this manner, is termed X-ray fluorescence.
Detection Limit	60 mg/Kg
Range	Unknown

TABLE 45 Test Method(s) for Cobalt (II) Diacetate

Chemical Formula	C ₄ H ₆ CoO ₄
Analytical Approach	No test method is known for detecting C ₄ H ₆ CoO ₄ directly.
Test Method	Screen for Cobalt using EPA Method 6200 or 1621
Description	A common screening method uses X-ray fluorescence. See Appendix X2 . Calculation is performed to see if a worst case would trigger further action. Worst case associates all of the cobalt as C ₄ H ₆ CoO ₄ . When the measured concentration exceeds the stoichiometric trigger value then cobalt and acetate analysis should be done by a quantitative method.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF; ASTM Guide E1621 ; ASTM Guide D5831 . Reference IEC 62321.
Sample Prep Method	Sample must be homogeneous. Reference ASTM Guide D1257 ; IEC 62321. See X1.2 .
Analyte	Co
Detection	When a sample is irradiated with X rays, the source X rays may undergo either scattering or absorption by sample atoms. This latter process is known as the photoelectric effect. When an atom absorbs the source X rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of X rays characteristic of the given atom. The emission of X rays, in this manner, is termed X-ray fluorescence.
Detection Limit	60 mg/Kg
Range	Unknown

TABLE 46 Test Method(s) for 2-Methoxyethanol

Chemical Formula	C ₃ H ₈ O ₂
Test Method	EPA Method 1671
Description	This method is used to determine certain non-purgeable volatile organic pollutants that are specific to the pharmaceutical manufacturing industry in waters, soils, and municipal sludges by direct aqueous gas chromatography injection and detection by a flame ionization detector
Technique	GC-FID
Sample Prep Method	The percent solids content of the sample is determined, followed by internal standard(s) addition, sonication, and centrifuge.
Analyte	2-Methoxyethanol
Detection	Chromatogram retention time, calibration, and internal standard is used for identification and quantification of analyte.
Detection Limit	20 mg/L
Range	Not provided

TABLE 47 Test Method(s) for 2-Ethoxyethanol

Chemical Formula	C ₄ H ₁₀ O ₂
Analytical Approach	2-Ethoxyethanol is similar to and in the boiling range of the volatile organic compounds listed in EPA Method 8260B
Test Method	EPA Method 8260B
Description	This method is used to determine volatile organic compounds in a variety of matrices by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 5032, EPA Method 5035, EPA Method 5041, EPA Method 3585, EPA Method 5021, EPA Method 8260
Analyte	1,2-Dichloroethane
Detection	Mass spectrometry – primary ion at m/z = 31 and 59; confirmation ion at m/z = 45 and 72
Detection Limit	Not provided
Range	Not provided

TABLE 48 Test Method(s) for 2-Ethoxyethyl Acetate

Chemical Formula	C ₆ H ₁₂ O ₃
Test Method	ASTM D3545-06,
Description	This method covers the determination by gas chromatography of the ester content and the corresponding alcohol content of acetate esters, including 2-ethoxyethyl acetate.
Technique	GC-FID
Sample Prep Method	Sample preparation from matrix is not specified in the method. Various methods recommended in EPC Method 8260B can be referenced.
Analyte	2-Ethoxyethyl acetate
Detection	Not provided
Detection Limit	Not provided
Analytical Approach	2-Ethoxyethyl acetate is similar to and in the boiling range of the volatile organic compounds listed in EPA Method 8260B. ASTM D3545-06 specified condition can be used for GC.
Test Method	EPA Method 8260B
Description	EPA Method 8260B is used to determine volatile organic compounds in a variety of matrices by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 5032, EPA Method 5035, EPA Method 5041, EPA Method 3585, EPA Method 5021, EPA Method 8260
Analyte	2-Ethoxyethyl acetate
Detection	Mass spectrometry – primary ion at m/z = 43; confirmation ion at m/z = 31, 59, and 72; minor ion at m/z = 87.
Detection Limit	Not provided
Range	Not provided

TABLE 49 Test Method(s) for Strontium Chromate

Chemical Formula	SrCrO ₄
Analytical Approach	Standard test method does not exist for SrCrO ₄ . Therefore, the test method cited for SrCrO ₄ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter.
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 50 Test Method(s) for 1,2-Benzenedicarboxylic Acid, di-C7-11 Branched and Linear Alkyl Esters

Chemical Formula	C ₂₂ H ₃₄ O ₄ –C ₃₀ H ₅₀ O ₄
Test Method	EN 14372:2004
Description	A sample of polymer is extracted and the extracted phthalates are then run through a gas chromatograph. This method has not been validated for this analyte.
Technique	Soxhlet extraction
Sample Prep Method	2 g of the article is obtained for analysis. The sample is extracted in a Soxhlet extraction apparatus with diethyl ether for 6 h.
Analyte	1,2-benzenedicarboxylic acid
Detection	Mass spectrometry
Detection Limit	0.2 mg/kg
Range	0.2 mg/kg – 10 mg/kg

TABLE 51 Test Method(s) for Hydrazine

Chemical Formula	H ₄ N ₂
Test Method	ASTM Test Method D1385
Description	A solution of p-dimethylaminobenzaldehyde in methyl alcohol and hydrochloric acid is added to hydrazine in diluted hydrochloric acid solution to form a yellow color of p-dimethylaminobenzalazine. The yellow color formed is proportional to the hydrazine present.
Technique	UV-Vis
Sample Prep Method	Sample to be acidified with concentrated hydrochloric acid
Analyte	Hydrazine
Detection	Hydrazine reacts with p-dimethylaminobenzaldehyde to form a yellow complex. Measurements are taken at 458 nm using a 50 mm cell
Detection Limit	5.0 ppb
Range	5.0-200 ppb
Caveat	Method scoped for water samples such as boiler feeds and well water. Method should be validated with sample matrix similar to actual samples.

TABLE 52 Test Method(s) for 1-methyl-2-pyrrolidone

Chemical Formula	C ₅ H ₉ NO
Test Method	Acta Poloniae Pharmaceutic – Drug Research
Description	Sample is dissolved in DMF to form 5 % solution, then analyzed by GC-FID
Technique	GC-FID.
Sample Prep Method	Dissolve sample in DMF to produce 5% solution. Use ultrasonic bath to clarify.
Analyte	1-methyl-2-pyrrolidone
Detection	GC-FID using dimethyl phthalate as internal standard. Detect by retention time.
Detection Limit	2.2 mg/L
Range	Linearity reported between 7.5 and 638 mg/L
Test Method	US FDA Method 21cfr 500 subpart F
Description	Bovine liver is extracted with methanol followed by acetonitrile and measured using LC-MS-MS
Technique	LC-MS-MS
Sample Prep Method	Bovine liver samples are processed in a blender with dry ice, extracted with methanol followed by acetonitrile. Extract is centrifuged and diluted with acetonitrile.
Analyte	1-methyl-2-pyrrolidone
Detection	LC-MS-MS using d ₉ -1-methyl-2-pyrrolidone internal standard using ion transition 100→58 for quantitation
Detection Limit	Not provided
Range	8-20 µg/g

TABLE 53 Test Method(s) for 1,2,3-Trichloropropane

Chemical Formula	$C_3H_5Cl_3$
Test Method	EPA Method 504.1
Description	This method is used to determine specific compounds in finished drinking water and groundwater by micro extraction and gas chromatography.
Technique	GC-ECD
Sample Prep Method	Hexane extraction.
Analyte	1,2,3-Trichloropropane
Detection	Chromatogram retention time and calibration is used for identification and quantification of analyte.
Detection Limit	0.02 µg/L
Range	0.03-200 µg/L
Test Method	EPA Method 8260B
Description	This method is used to determine volatile organic compounds in a variety of matrices by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 5032, EPA Method 5035, EPA Method 5041, EPA Method 3585, EPA Method 5021, EPA Method 8260
Analyte	1,2,3-Trichloropropane
Detection	Mass spectrometry – primary ion at $m/z = 75$; confirmation ion at $m/z = 77$
Detection Limit	5 µg/kg (wet weight) for soil/sediment samples, 0.5 mg/kg (wet weight) for wastes, and 5 µg/L for ground water
Range	Not provided

TABLE 54 Test Method(s) for 1,2-Benzenedicarboxylic Acid, di-C6-8-branched alkyl esters, C₇-rich

Chemical Formula	$C_{22}H_{34}O_4$
Test Method	EN 14372:2004
Description	A sample of polymer is extracted and the extracted phthalates are then run through a gas chromatograph. This method has not been validated for this analyte.
Technique	GC-MS
Sample Prep Method	2 g of the article is obtained for analysis. The sample is extracted in a Soxhlet extraction apparatus with diethyl ether for 6 h.
Analyte	1,2-benzenedicarboxylic acid esters
Detection	Mass spectrometry
Detection Limit	0.2 mg/kg
Range	0.2 mg/kg – 10 mg/kg

TABLE 55 Test Method(s) for Dichromium Tris(chromate)

Chemical Formula	Cr_5O_{12} $CrH_2O_4 \cdot 2/3Cr$
Analytical Approach	Standard test method does not exist for $Cr_2(CrO_4)_3$. Therefore, the test method cited for $Cr_2(CrO_4)_3$ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm.
Technique	UV-Vis or colorimeter with 540 nm filter.
Sample Prep Method	EPA Method 3060A, Alkaline Digestion
Analyte	Cr(VI)
Detection	Absorption at 540 nm
Detection Limit	30 µg/L
Range	0.5 mg/L to 50 mg/L
Caveat	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.

TABLE 56 Test Method(s) for Potassium Hydroxyoctaoxodizincatedi-chromate

Chemical Formula	$KZn_2(CrO_4)_2(OH)$
Analytical Approach	Standard test method does not exist for $KZn_2(CrO_4)_2(OH)$. Therefore, the test method cited for $KZn_2(CrO_4)_2(OH)$ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm. UV-Vis or colorimeter with 540 nm filter.
Technique	EPA Method 3060A, Alkaline Digestion
Sample Prep Method	Cr(VI)
Analyte	Absorption at 540 nm
Detection	30 µg/L
Detection Limit	0.5 mg/L to 50 mg/L
Range	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.
Caveat	

TABLE 57 Test Method(s) for Pentazinc Chromate Octahydroxide

Chemical Formula	$Zn_5CrH_8O_{12}$
Analytical Approach	Standard test method does not exist for $Zn_5(CrO_4)(OH)_8$. Therefore, the test method cited for $Zn_5(CrO_4)(OH)_8$ must be validated for analytical accuracy before use in regulatory compliance demonstration.
Test Method	EPA Method 7196A
Description	Dissolved hexavalent chromium may be determined colorimetrically by reaction with diphenylcarbazide in acid solution. A red-violet color of unknown composition is produced. The reaction is very sensitive, the absorbancy index per gram atom of chromium being about 40,000 at 540 nm. Addition of an excess of diphenylcarbazide yields the red-violet product, and its absorbance is measured photometrically at 540 nm. UV-Vis or colorimeter with 540 nm filter.
Technique	EPA Method 3060A, Alkaline Digestion
Sample Prep Method	Cr(VI)
Analyte	Absorption at 540 nm
Detection	30 µg/L
Detection Limit	0.5 mg/L to 50 mg/L
Range	The chromium reaction with diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the chromium concentration is relatively low. Hexavalent molybdenum and mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for chromium at the specified pH. Concentrations of up to 200 mg/L of molybdenum and mercury can be tolerated. Vanadium (V) interferes strongly, but concentrations up to 10 times that of chromium will not cause trouble. Iron can interfere as well but is less likely.
Caveat	

TABLE 58 Test Method(s) for Formaldehyde, Oligomeric Reaction Products with Aniline (technical MDA)

Chemical Formula	$(C_6H_7N.CH_2O)_x$
Test Method	EPA Method 8131
Description	The semivolatile compounds are introduced into the GC by injecting the sample extract into a gas chromatograph (GC) equipped with a capillary column. The GC column is temperature-programmed to separate the analytes, which are then detected with a detector connected to the gas chromatograph. Quantitation is accomplished by comparing the response of a major peak area relative to an internal standard using an appropriate calibration curve for the intended application.
Technique	GC-MS
Sample Prep Method	Soxhlet extraction or similar.
Analyte	$(C_6H_7N.CH_2O)_x$
Detection	GC retention time and m/z from MSD. Use standard to determine proper m/z.
Detection Limit	Approximately 5 µg/L
Range	Unknown

TABLE 59 Test Method(s) for Bis(2-methoxyethyl) Phthalate

Chemical Formula	C ₁₄ H ₁₈ O ₆
Test Method	EN 14372:2004
Description	A sample of polymer is extracted and the extracted phthalates are then run through a gas chromatograph. This method has not been validated for this analyte.
Technique	GC-MS
Sample Prep Method	2 g of the article is obtained for analysis. The sample is extracted in a Soxhlet extraction apparatus with diethyl ether for 6 h.
Analyte	Bis(2-methoxyethyl) phthalate
Detection	Mass spectrometry
Detection Limit	0.2 mg/kg
Range	0.2 mg/kg – 10 mg/kg

TABLE 60 Test Method(s) for 2-Methoxyaniline; o-Anisidine

Chemical Formula	C ₇ H ₉ NO
Test Method	EN 14362-1
Description	This method can be used to determine the concentration of o-Anisidine in natural, synthetic and blended textiles using gas chromatography with a mass spectrometer detector.
Technique	GC-MS
Sample Prep Method	The sample is subjected to a reducing agent followed by a separation and extraction procedure. The extract is introduced into the GC-MS by injecting the sample extract into a gas chromatograph (GC) equipped with a capillary column. The GC column is temperature-programmed to separate the analytes, which are then detected with a mass spectrometer (MS) connected to the gas chromatograph. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard using an appropriate calibration curve for the intended application.
Analyte	o-Anisidine
Detection	Retention time from GC, m/z of 123, 108, 80 and 53 in mass spectrometer
Detection Limit	5 mg/kg
Range	5 mg/kg to 60 mg/kg
Test Method	EN 17234
Description	This method can be used to determine the concentration of o-Anisidine in leather using gas chromatography with a mass spectrometer detector.
Technique	GC-MS
Sample Prep Method	The sample is degreased and then subjected to a reducing agent followed by a separation and extraction procedure. The extract is introduced into the GC-MS by injecting the sample extract into a gas chromatograph (GC) equipped with a capillary column. The GC column is temperature-programmed to separate the analytes, which are then detected with a mass spectrometer (MS) connected to the gas chromatograph. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard using an appropriate calibration curve for the intended application.
Analyte	o-Anisidine
Detection	Retention time from GC, m/z of 123, 108, 80 and 53 in mass spectrometer
Detection Limit	5 mg/kg
Range	5 mg/kg to 60 mg/kg

TABLE 61 Test Method(s) for 4-(1,1,3,3-Tetramethylbutyl)phenol, (4-tert-Octylphenol)

Chemical Formula	C ₁₄ H ₂₂ O
Test Method	ASTM D7485-09
Description	This test method is used to determine the quantity of Octylphenol and related compounds extracted from water utilizing solid phase extraction after separation by liquid chromatography and detection by tandem mass spectrometry.
Technique	LC-MS-MS
Sample Prep Method	Solid phase extraction at pH 2 using concentrated hydrochloric acid.
Analyte	Octylphenol
Detection	Tandem mass spectrometry with single reaction monitoring; mass transition 205.2 >133
Detection Limit	24 ng/L
Range	100-2000 ng/L
Test Method	ASTM D7065-11
Description	This test method is used to determine the quantity of Octylphenol and related compounds that are partitioned into organic solvent, separated using gas chromatography and detected with mass selective detection.
Technique	GC-MS
Sample Prep Method	Continuous liquid-liquid extraction at pH 2 using methylene chloride.
Analyte	Octylphenol
Detection	Mass spectrometry – primary ion at m/z =135; confirmation ions at m/z = 107, 91
Detection Limit	0.2 µg/L
Range	1.0-16.0 µg/L

TABLE 62 Test Method(s) for 1,2-Dichloroethane

Chemical Formula	C ₂ H ₄ Cl ₂
Test Method	EPA Method 524.2
Description	This is a general purpose method for the identification and simultaneous measurement of purgeable volatile organic compounds in surface water, ground water, and drinking water in any stage of treatment by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Inert gas purge and absorbent trap, then heated and back flushed for analysis
Analyte	1,2-Dichloroethane
Detection	Mass spectrometry – primary ion at m/z =62; confirmation ion at m/z = 98
Detection Limit	0.02 µg/L
Range	0.02-200 µg/L for wide-bore thick-film capillary column, 0.02-20 µg/L for narrow-bore thin-film capillary column.
Test Method	EPA Method 8260B
Description	This method is used to determine volatile organic compounds in a variety of matrices by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 5032, EPA Method 5035, EPA Method 5041, EPA Method 3585, EPA Method 5021, EPA Method 8260
Analyte	1,2-Dichloroethane
Detection	Mass spectrometry – primary ion at m/z =62; confirmation ion at m/z = 98
Detection Limit	5 µg/kg (wet weight) for soil/sediment samples, 0.5 mg/kg(wet weight) for wastes, and 5 µg/L for ground water
Range	Not provided

TABLE 63 Test Method(s) for Bis(2-methoxyethyl) Ether

Chemical Formula	C ₆ H ₁₄ O ₃
Analytical Approach	Bis(2-methoxyethyl) ether is similar to and in the boiling range of the volatile organic compounds listed in EPA Method 8260B
Test Method	EPA Method 8260B
Description	This method is used to determine volatile organic compounds in a variety of matrices by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 5032, EPA Method 5035, EPA Method 5041, EPA Method 3585, EPA Method 5021, EPA Method 8260
Analyte	Bis(2-methoxyethyl) ether
Detection	Mass spectrometry – primary ion at m/z = 59; confirmation ion at m/z = 45 ; secondary conformation ion at m/z= 89
Detection Limit	Not provided
Range	Not provided

TABLE 64 Test Method(s) for Arsenic Acid

Chemical Formula	AsH ₃ O ₄
Analytical Approach	No test method is known for detecting arsenic acid directly. To calculate a hypothetical maximum of arsenic acid, elemental arsenic is detected and calculated as if all of the arsenic is from AsH ₃ O ₄ .
Test Method	EPA 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive detectors.
Technique	ICP-OES
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	Arsenic
Detection	Atomic Emission at 193.696 nm
Detection Limit	35 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 65 Test Method(s) for Calcium Arsenate

Chemical Formula	As ₂ Ca ₃ O ₈
Analytical Approach	No test method is known for detecting calcium arsenate directly. To calculate a hypothetical maximum of calcium arsenate, elemental calcium is detected and calculated as if all of the calcium is from As ₂ Ca ₃ O ₈
Test Method	EPA 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive detectors.
Technique	ICP-OES
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	Calcium
Detection	Atomic Emission at 317.933 nm
Detection Limit	6.7 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 66 Test Method(s) for Trilead Diarsenate

Chemical Formula	As ₂ O ₈ Pb ₃
Analytical Approach	No test method is known for detecting trileaddiarsenate directly. To calculate a hypothetical maximum of trilead diarsenate, elemental lead is detected and calculated as if all of the lead is from As ₂ O ₈ Pb ₃
Test Method	EPA 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive detectors.
Technique	ICP-OES
Sample Prep Method	EPA Method 3052, Microwave assisted acid digestion
Analyte	Lead
Detection	Atomic Emission at 220.353 nm
Detection Limit	28 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 67 Test Method(s) for N,N-dimethylacetamide (DMAC)

Chemical Formula	C ₄ H ₉ NO
Test Method	NIOSH Manual of Analytical Method 2004
Description	The semivolatile compounds are introduced into the GC by injecting the sample extract into a gas chromatograph (GC) equipped with a capillary column. The GC column is temperature-programmed to separate the analytes, which are then detected with a flame ionization detector (FID) connected to the gas chromatograph. Quantitation is accomplished by comparing the response of a major peak area relative to an internal standard using an appropriate calibration curve for the intended application.
Technique	GC-FID
Sample Prep Method	Solid sorbent tubes
Analyte	C ₄ H ₉ NO
Detection	Retention time from GC.
Detection Limit	0.05 mg
Range	0.5-4 mg/sample

TABLE 68 Test Method(s) for 2,2'-Dichloro-4,4'-methylenedianiline (MOCA)

Chemical Formula	$C_{13}H_{12}Cl_2N_2$
Test Method	EPA Method 8270
Description	The semivolatile compounds are introduced into the GC/MS by injecting the sample extract into a gas chromatograph (GC) equipped with a narrow-bore fused-silica capillary column. The GC column is temperature-programmed to separate the analytes, which are then detected with a mass spectrometer (MS) connected to the gas chromatograph. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard using an appropriate calibration curve for the intended application.
Technique	GC-MS
Sample Prep Method	EPA Method 3541, Automated Soxhlet Extraction
Analyte	$C_{13}H_{12}Cl_2N_2$
Detection	Retention time from GC, m/z of 231 266,268,140,195 in mass spectrometer
Detection Limit	Approx. 50 ng
Range	Unknown

TABLE 69 Test Method(s) for Phenolphthalein

Chemical Formula	$C_{20}H_{14}O_4$
Analytical Approach	Phenolphthalein is a pH indicator with four molecular forms, presenting different colors according to its surrounding pH value in the solution. It is solid up to 260°C. Extraction with alcohol followed by solvent evaporation isolates the solid. Buffer solutions in specific pH ranges will identify the color change ranges characteristic to phenolphthalein.
Test Method	“Practical chemistry” J. Lambert and T.A. Muir, 3rd. Ed. Heineman, London.
Description	Buffer solutions are prepared in specific pH ranges, followed by addition to the substance. Observation of specific colors present at specific pH range provides identification of the substance.
Technique	pH color indicator
Sample Prep Method	Ethanol extraction, evaporate to dry or near dry, ready for pH buffer solution test.
Analyte	Phenolphthalein
Detection	Orange at pH<0, colorless at pH=0-8.2, pink to fuchsia at pH=8.2-12.0, colorless at pH>12.0
Detection Limit	Not provided
Range	Not provided

TABLE 70 Test Method(s) for Lead Azide

Chemical Formula	$Pb(N_3)_2$
Analytical Approach	No test method was located for determining lead azide directly. Methods below are for the determination of azide ion. Lead can be determined separately and lead azide from the lower of the two concentrations
Test Method	Analyst 122, 315-319, 1997
Description	This method is used to detect azide in environmental samples by sequential injection amperometry. A microporous gas permeable membrane in a gas diffusion unit separates azide from other anions that can be oxidized.
Technique	Sequential injection amperometry
Sample Prep Method	Azide passes from an aqueous donor stream to a stopped flow acceptor stream through a PTFE membrane in a gas diffusion cell.
Analyte	Azide ion.
Detection	Amperometric oxidation of azide to nitrogen gas according to $N_3 \rightarrow 3/2 N_2 + e^-$
Detection Limit	24.6 µg/L.
Range	Linear to 0.5 µg/mL. Nonlinear to 20 µg/mL
Test Method	OSHA Method ID-211
Description	Airborne azides (NaN_3 or HN_3) are collected, desorbed in a weak sodium carbonate/bicarbonate buffer solution. Resultant N_3^- ion is analyzed by ion chromatography with UV detector at 210 nm.
Technique	Ion Chromatography with UV detection at 210 nm
Sample Prep Method	NaN_3 and HN_3 are collected in air and desorbed from filters using a sodium carbonate/bicarbonate solution that also serves as eluent.
Analyte	HN_3
Detection	UV absorption at 210 nm.
Detection Limit	3.47 µg/L azide in solution corresponding to 0.001 ppm HN_3 or 0.004 mg/m ³ NaN_3 for a 5-L air volume
Range	This method was validated over the concentration range of 0.057 to 0.263 ppm as HN_3 .

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TABLE 71 Test Method(s) for Lead Styphnate

Chemical Formula	$C_6H_3N_3O_8Pb$
Analytical Approach	No test method is known for detecting $C_6H_3N_3O_8Pb$ directly.
Test Method	Screen for Lead
Description	A common screening method uses X-ray fluorescence. See Appendix X2 . Calculation is performed to see if a worst case would trigger further action. Worst case associates all of the lead as $C_6H_3N_3O_8Pb$.
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF; ASTM Guide E1621 ; ASTM Guide D5831 . Reference IEC 62321.
Sample Prep Method	Sample must be homogeneous. Reference ASTM Guide D1257 ; IEC 62321. See X1.2 .
Analyte	Pb
Detection	When a sample is irradiated with X rays, the source X rays may undergo either scattering or absorption by sample atoms. This latter process is known as the photoelectric effect. When an atom absorbs the source X rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of X rays characteristic of the given atom. The emission of X rays, in this manner, is termed X-ray fluorescence.
Detection Limit	60 mg/Kg
Range	Unknown

TABLE 72 Test Method(s) for Lead Dipicrate

Chemical Formula	$C_{12}H_4N_6O_{14}Pb$
Analytical Approach	No test method was located for determining lead dipicrate directly. The method below is for the determination of picrate/picric acid
Test Method	USGS Method O-3112-83
Description	Picric acid is extracted from water or water-suspended sediment with methylene chloride. Extract is concentrated and measured using HPLC with UV detection.
Technique	HPLC with dual wavelength UV detection
Sample Prep Method	HCl and NaCl are added to water followed by extraction with methylene chloride. Extract is concentrated prior to HPLC.
Analyte	Picric acid
Detection	HPLC with UV detection
Detection Limit	2 µg/L
Range	Not provided

TABLE 73 Test Method(s) for 1,2-Bis(2-methoxyethoxy)ethane (TEGDME; triglyme)

Chemical Formula	$C_8H_{18}O_4$
Analytical Approach	1,2-Bis(2-methoxyethoxy)ethane is similar to and in the boiling range of the volatile organic compounds listed in EPA Method 8260B
Test Method	EPA Method 8260B
Description	This method is used to determine volatile organic compounds in a variety of matrices by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 5032, EPA Method 5035, EPA Method 5041, EPA Method 3585, EPA Method 5021, EPA Method 8260
Analyte	1,2-Bis(2-methoxyethoxy)ethane
Detection	Mass spectrometry – primary ion at $m/z = 59$; confirmation ion at $m/z = 45$; secondary conformation ion at $m/z = 29, 89, 103, 133$
Detection Limit	Not provided
Range	Not provided

TABLE 74 Test Method(s) for 1,2-Dimethoxyethane; Ethylene Glycol Dimethyl Ether (EGDME)

Chemical Formula	C ₄ H ₁₀ O ₂
Analytical Approach	1,2-Dimethoxyethane is similar to and in the boiling range of the volatile organic compounds listed in EPA Method 8260B
Test Method	EPA Method 8260B
Description	This method is used to determine volatile organic compounds in a variety of matrices by gas chromatography and mass spectrometry.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 5032, EPA Method 5035, EPA Method 5041, EPA Method 3585, EPA Method 5021, EPA Method 8260
Analyte	1,2-Dimethoxyethane
Detection	Mass spectrometry – primary ion at m/z = 45; confirmation ion at m/z = 29,60, 90
Detection Limit	Not provided
Range	Not provided

TABLE 75 Test Method(s) for Ammoniumpentadecafluorooctanoate (APFO)

Chemical Formula	C ₈ H ₄ NF ₁₅ NO ₂
Test Method	CEN/TS 15968
Description	The compounds are introduced into the LC-MS by injecting the sample extract into a liquid chromatograph (LC) equipped with a C18 column. The LC column is temperature programmed to separate the analytes, which are then detected with a mass spectrometer (MS) connected to the liquid chromatograph. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an appropriate calibration curve for the intended application.
Technique	LC-tandemMS or LC-qMS
Sample Prep Method	CEN/TS 15968
Analyte	Ammoniumpentadecafluorooctanoate (APFO)
Detection	Retention time from LC-MS, m/Z of 413 and 369 in MS
Detection Limit	Unknown
Range	0.5 µg/L to 50 µg/L in extract

TABLE 76 Test Method(s) for C.I. Basic Blue 26 ([4-[[4-anilino-1-naphthyl][4-(dimethylamino)phenyl]methylene]cyclohexa-2,5-dien-1-ylidene]dimethylammonium chloride)

Chemical Formula	C ₃₃ H ₃₂ CIN ₃
Test Method	Standard Guide for Microspectrometry and Color Measurement in Forensic Paint Analysis
Description	This is a qualitative test for colorants. Suitable instruments with appropriate optics, sensitivity, resolution, and dynamic range can measure and produce spectral curves of light energy from small samples as that light is transmitted, absorbed, or reflected by the sample. These spectra are collected over small measurement steps or increments of one-half to a few nanometers each. MSPs typically operate in the visible spectral region (~380 to ~800 nm) and also in the ultraviolet region (~190 to ~380 nm). They should not be confused with broadband or absorption filter-based, tristimulus systems or low resolution, large measurement step (5 nm or more) spectral analyzers.
Technique	Microspectrophotometer comparison with standards.
Sample Prep Method	Present a relatively flat surface or relatively transparent thin sample to spectrometer.
Analyte	C ₃₃ H ₃₂ CIN ₃
Detection	The processes responsible for producing the color of pigments include: crystal-field effects with transition metal compounds (most of the inorganic pigments belong to this group), electron transitions between molecular orbitals in compounds with conjugated double bonds (organic pigments), electron transitions in compounds with conduction energy bands (metal pigments and pure semiconductors), and other processes caused by geometrical and wave optics (interference, scattering, diffraction in optically variable pigments, liquid crystal pigments, and so forth). All of these processes are based on the interaction between ultraviolet-visible (UV-Vis) light waves themselves or with electrons in pigments and can be measured and compared using MSP.
Detection Limit	Unknown
Range	190-800 nm



TABLE 77 Test Method(s) for C.I. Basic Violet 3

Chemical Formula	$C_{25}H_{30}ClN_3$
Test Method	Standard Guide for Microspectrometry and Color Measurement in Forensic Paint Analysis
Description	This is a qualitative test for colorants. Suitable instruments with appropriate optics, sensitivity, resolution, and dynamic range can measure and produce spectral curves of light energy from small samples as that light is transmitted, absorbed, or reflected by the sample. These spectra are collected over small measurement steps or increments of one-half to a few nanometers each. MSPs typically operate in the visible spectral region (~380 to ~800 nm) and also in the ultraviolet region (~190 to ~380 nm). They should not be confused with broadband or absorption filter-based, tristimulus systems or low resolution, large measurement step (5 nm or more) spectral analyzers.
Technique	Microspectrophotometer comparison with standards.
Sample Prep Method	Present a relatively flat surface or relatively transparent thin sample to spectrometer.
Analyte	$C_{25}H_{30}ClN_3$
Detection	The processes responsible for producing the color of pigments include: crystal-field effects with transition metal compounds (most of the inorganic pigments belong to this group), electron transitions between molecular orbitals in compounds with conjugated double bonds (organic pigments), electron transitions in compounds with conduction energy bands (metal pigments and pure semiconductors), and other processes caused by geometrical and wave optics (interference, scattering, diffraction in optically variable pigments, liquid crystal pigments, and so forth). All of these processes are based on the interaction between ultraviolet-visible (UV-Vis) light waves themselves or with electrons in pigments and can be measured and compared using MSP.
Detection Limit	Unknown
Range	190-800 nm

TABLE 78 Test Method(s) for C.I. Solvent Blue 4; (α,α -bis[4-(dimethylamino)phenyl]-4 (phenylamino)naphthalene-1-methanol)

Chemical Formula	$C_{33}H_{33}N_3O$
Test Method	Standard Guide for Microspectrometry and Color Measurement in Forensic Paint Analysis
Description	This is a qualitative test for colorants. Suitable instruments with appropriate optics, sensitivity, resolution, and dynamic range can measure and produce spectral curves of light energy from small samples as that light is transmitted, absorbed, or reflected by the sample. These spectra are collected over small measurement steps or increments of one-half to a few nanometers each. MSPs typically operate in the visible spectral region (~380 to ~800 nm) and also in the ultraviolet region (~190 to ~380 nm). They should not be confused with broadband or absorption filter-based, tristimulus systems or low resolution, large measurement step (5 nm or more) spectral analyzers.
Technique	Microspectrophotometer comparison with standards.
Sample Prep Method	Present a relatively flat surface or relatively transparent thin sample to spectrometer.
Analyte	$C_{33}H_{33}N_3O$
Detection	The processes responsible for producing the color of pigments include: crystal-field effects with transition metal compounds (most of the inorganic pigments belong to this group), electron transitions between molecular orbitals in compounds with conjugated double bonds (organic pigments), electron transitions in compounds with conduction energy bands (metal pigments and pure semiconductors), and other processes caused by geometrical and wave optics (interference, scattering, diffraction in optically variable pigments, liquid crystal pigments, and so forth). All of these processes are based on the interaction between ultraviolet-visible (UV-Vis) light waves themselves or with electrons in pigments and can be measured and compared using MSP.
Detection Limit	Unknown
Range	190-800 nm

TABLE 79 Test Method(s) for C.I. Solvent Violet 8; (4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol)

Chemical Formula	C ₂₄ H ₂₉ N ₃ O
Test Method	Standard Guide for Microspectrometry and Color Measurement in Forensic Paint Analysis
Description	This is a qualitative test for colorants. Suitable instruments with appropriate optics, sensitivity, resolution, and dynamic range can measure and produce spectral curves of light energy from small samples as that light is transmitted, absorbed, or reflected by the sample. These spectra are collected over small measurement steps or increments of one-half to a few nanometers each. MSPs typically operate in the visible spectral region (~380 to ~800 nm) and also in the ultraviolet region (~190 to ~380 nm). They should not be confused with broadband or absorption filter-based, tristimulus systems or low resolution, large measurement step (5 nm or more) spectral analyzers.
Technique	Microspectrophotometer comparison with standards.
Sample Prep Method	Present a relatively flat surface or relatively transparent thin sample to spectrometer.
Analyte	C ₂₄ H ₂₉ N ₃ O
Detection	The processes responsible for producing the color of pigments include: crystal-field effects with transition metal compounds (most of the inorganic pigments belong to this group), electron transitions between molecular orbitals in compounds with conjugated double bonds (organic pigments), electron transitions in compounds with conduction energy bands (metal pigments and pure semiconductors), and other processes caused by geometrical and wave optics (interference, scattering, diffraction in optically variable pigments, liquid crystal pigments, and so forth). All of these processes are based on the interaction between ultraviolet-visible (UV-Vis) light waves themselves or with electrons in pigments and can be measured and compared using MSP.
Detection Limit	Unknown
Range	190-800 nm

TABLE 80 Test Method(s) for Di-n-pentyl Phthalate

Chemical Formula	C ₁₈ H ₂₆ O ₄
Test Method	EN 14372:2004
Description	A sample of polymer is extracted and the extracted phthalates are then run through a gas chromatograph. This method has not been validated for this analyte.
Technique	Soxhlet extraction
Sample Prep Method	2 g of the article is obtained for analysis. The sample is extracted in a Soxhlet extraction apparatus with diethyl ether for 6 h.
Analyte	Di-n-pentyl phthalate
Detection	Mass spectrometry
Detection Limit	0.2 mg/kg
Range	0.2 mg/kg – 10 mg/kg

TABLE 81 Test Method(s) for Diboron Trioxide, Boric Oxide

Chemical Formula	B ₂ O ₃
Analytical Approach	No test method is known for detecting B ₂ O ₃ directly. To calculate a hypothetical maximum of B ₂ O ₃ , elemental boron is detected and calculated as if all of the boron is from B ₂ O ₃ .
Test Method	EPA Method 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive detectors.
Technique	ICP-OES
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	B (elemental)
Detection	Atomic emission at 249.679 nm
Detection Limit	4 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.



TABLE 82 Test Method(s) for Diisopentyl Phthalate

Chemical Formula	C ₁₈ H ₂₆ O ₄
Test Method	EN 14372:2004
Description	A sample of polymer is extracted and the extracted phthalates are then run through a gas chromatograph. This method has not been validated for this analyte.
Technique	Soxhlet extraction
Sample Prep Method	2 g of the article is obtained for analysis. The sample is extracted in a Soxhlet extraction apparatus with diethyl ether for 6 h.
Analyte	Diisopentyl phthalate
Detection	Mass spectrometry
Detection Limit	0.2 mg/kg
Range	0.2 mg/kg – 10 mg/kg

TABLE 83 Test Method(s) for Distillates (coal tar), Heavy Oils

Chemical Formula	XXXX
Analytical Approach	Coal tar distillates are made up of crude coke oven tar components, which are produced during the high temperature coking of bituminous coal. They boil between 100°C and 400°C during the distillation process to produce carbon pitch. Refined chemical oil distills between 210°C and 315°C. The distillates that distill above 315°C are high molecular weight aromatic hydrocarbons (middle and heavy distillates). The final residue after distillation is called coal-tar pitch. Coal tar distillates contain greater than 75 wt% polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons. Distillates (coal tar), heavy oils is considered persistent bioaccumulative toxic chemical.
Reference	Environmental contaminants encyclopedia coal tar entry, July 1, 1997, Roy J. Irwin, National Park Service
Test Method	EPA Method 8270D, The expanded scan for PAHs [828] (a modified EPA Method 8270 including alkyl homologues and lower detection limits)
Description	This method is used to determine the concentration of semi volatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 3510, EPA Method 3520, EPA Method 5041, EPA Method 3540, EPA Method 3550, EPA Method 3580.
Analyte	Polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Gas chromatography retention time and mass spectrometry – primary ion and confirmation ion.
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte
Test Method	EPA Method 8310
Description	This method is used to determine the concentration of certain polynuclear aromatic hydrocarbons in ground water and wastes.
Technique	HPLC
Sample Prep Method	Extraction with methylenechloride followed by exchange to acetonitrile
Analyte	Polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Liquid chromatography retention time and ultraviolet spectrum
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte

TABLE 84 Test Method(s) for Distillates (coal tar), Heavy Oils, Pyrene Fraction

Chemical Formula	XXXX
Analytical Approach	Coal tar distillates are made up of crude coke oven tar components, which are produced during the high temperature coking of bituminous coal. They boil between 100°C and 400°C during the distillation process to produce carbon pitch. Refined chemical oil distills between 210°C and 315°C. The distillates that distill above 315°C are high molecular weight aromatic hydrocarbons (middle and heavy distillates). The final residue after distillation is called coal-tar pitch. Coal tar distillates contain greater than 75 wt% polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons. Coal tar contains up to 2 wt% pyrene. Distillates (coal tar), heavy oils, pyrene fraction is considered persistent bioaccumulative toxic chemical.
Reference	Environmental contaminants encyclopedia coal tar entry, July 1, 1997, Roy J. Irwin, National Park Service
Test Method	EPA Method 8270D, The expanded scan for PAHs [828] (a modified EPA Method 8270 including alkyl homologues and lower detection limits)
Description	This method is used to determine the concentration of semi volatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 3510, EPA Method 3520, EPA Method 5041, EPA Method 3540, EPA Method 3550, EPA Method 3580.
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Gas chromatography retention time and mass spectrometry – primary ion and confirmation ion.
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte
Test Method	EPA Method 8310
Description	This method is used to determine the concentration of certain polynuclear aromatic hydrocarbons in ground water and wastes.
Technique	HPLC
Sample Prep Method	Extraction with methylenechloride followed by exchange to acetonitrile
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Liquid chromatography retention time and ultraviolet spectrum
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte

TABLE 85 Test Method(s) for Distillates (coal tar), Pitch, Pyrene Fraction

Chemical Formula	XXXX
Analytical Approach	Coal tar distillates are made up of crude coke oven tar components, which are produced during the high temperature coking of bituminous coal. They boil between 100°C and 400°C during the distillation process to produce carbon pitch. Refined chemical oil distills between 210°C and 315°C. The distillates that distill above 315°C are high molecular weight aromatic hydrocarbons (middle and heavy distillates). The final residue after distillation is called coal-tar pitch. Coal tar distillates contain greater than 75 wt% polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons. Coal tar contains up to 2 wt% pyrene. Distillates (coal tar), pitch, pyrene fraction is considered persistent bioaccumulative toxic chemical.
Reference	Environmental contaminants encyclopedia coal tar entry, July 1, 1997, Roy J. Irwin, National Park Service
Test Method	EPA Method 8270D, The expanded scan for PAHs [828] (a modified EPA Method 8270 including alkyl homologues and lower detection limits)
Description	This method is used to determine the concentration of semi volatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 3510, EPA Method 3520, EPA Method 5041, EPA Method 3540, EPA Method 3550, EPA Method 3580.
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Gas chromatography retention time and mass spectrometry – primary ion and confirmation ion.
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte
Test Method	EPA Method 8310
Description	This method is used to determine the concentration of certain polynuclear aromatic hydrocarbons in ground water and wastes.
Technique	HPLC
Sample Prep Method	Extraction with methylenechloride followed by exchange to acetonitrile
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Liquid chromatography retention time and ultraviolet spectrum
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte



TABLE 86 Test Method(s) for Formamide

Chemical Formula	CH ₃ NO
Test Method	EPA 1671
Description	Direct analysis of environmental samples by GC-FID
Technique	GC-FID
Sample Prep Method	Aqueous portion of sample is separated from solids and measured using GC-FID after addition of internal standard
Analyte	Formamide
Detection	Direct aqueous injection GC-FID using tetrahydrofuran as internal standard
Detection Limit	100 mg/L
Range	Method found to be linear over range 0-5 µg/L of acrylamide monomer

TABLE 87 Test Method(s) for Further Arsenic Compounds

Chemical Formula	Various
Analytical Approach	No test method is known for detecting arsenic compounds directly. To calculate a hypothetical maximum of arsenic compounds, elemental arsenic is detected and calculated as if all of the arsenic is from an arsenic compound.
Test Method	EPA 6010
Description	The characteristic emission spectra are measured by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and the intensities of the emission lines are monitored by photosensitive devices.
Technique	ICP-OES
Sample Prep Method	EPA Method 3051, Microwave assisted acid digestion
Analyte	Arsenic
Detection	Atomic Emission at 193.696
Detection Limit	35 µg/L
Range	Unknown
Caveat	Method scoped for soils and wastes samples. Method should be validated with sample matrix similar to actual samples.

TABLE 88 Test Method(s) for Lead(II) bis(methanesulfonate)

Chemical Formula	C ₂ H ₆ O ₆ PbS ₂
Analytical Approach	No test method is known for detecting C ₂ H ₆ O ₆ PbS ₂ directly.
Test Method	Screen for Lead
Description	A common screening method uses X-ray fluorescence. See Appendix X2 . Calculation is performed to see if a worst case would trigger further action. Worst case associates all of the lead as C ₂ H ₆ O ₆ PbS ₂ .
Technique	EPA Method 6200, Field portable X-ray fluorescence spectrometry XRF; ASTM Guide E1621 ; ASTM Guide D5831 . Reference IEC 62321.
Sample Prep Method	Sample must be homogeneous. Reference ASTM Guide D1257 ; IEC 62321. See X1.2 .
Analyte	Pb
Detection	When a sample is irradiated with X rays, the source X rays may undergo either scattering or absorption by sample atoms. This latter process is known as the photoelectric effect. When an atom absorbs the source X rays, the incident radiation dislodges electrons from the innermost shells of the atom, creating vacancies. The electron vacancies are filled by electrons cascading in from outer electron shells. Electrons in outer shells have higher energy states than inner shell electrons, and the outer shell electrons give off energy as they cascade down into the inner shell vacancies. This rearrangement of electrons results in emission of X rays characteristic of the given atom. The emission of X rays, in this manner, is termed X-ray fluorescence.
Detection Limit	60 mg/Kg
Range	Unknown

TABLE 89 Test Method(s) for Michler's Base; (N,N,N',N'-tetramethyl-4,4'-methylenedianiline)

Chemical Formula	C ₁₇ H ₂₂ N ₂
Analytical Approach	N,N,N',N'-tetramethyl-4,4'-methylenedianiline is similar in structure to and in the boiling range of the semi volatile organic compounds listed in EPA Method 625. Direct injection is recommended.
Test Method	EPA Method 625
Description	This method is to be used to analyze semi-volatile organic compounds, which are extractable from municipal and industrial discharges by isotope dilution gas chromatography mass spectrometry.
Technique	GC-MS
Sample Prep Method	Methylenechloride extraction followed by evaporation, then analyzed
Analyte	N,N,N',N'-tetramethyl-4,4'-methylenedianiline
Detection	Mass spectrometry – primary ion at m/z = 254; confirmation ion at m/z = 210 and 134; secondary conformation ion at m/z= 237 and 165
Detection Limit	Not provided
Range	Not provided

TABLE 90 Test Method(s) for Michler's Ketone; (4,4'-bis(dimethylamino)benzophenone)

Chemical Formula	C ₁₇ H ₂₀ N ₂ O
Analytical Approach	4,4'-bis(dimethylamino)benzophenone is similar in structure to and in the boiling range of the semi volatile organic compounds listed in EPA Method 625. Direct injection is recommended.
Test Method	EPA Method 625
Description	This method is to be used to analyze semi volatile organic compounds, which are extractable from municipal and industrial discharges by isotope dilution gas chromatography mass spectrometry.
Technique	GC-MS
Sample Prep Method	Methylenechloride extraction followed by evaporation, then analyzed
Analyte	4,4'-bis(dimethylamino)benzophenone
Detection	Mass spectrometry – primary ion at m/z = 148; confirmation ion at m/z = 268; secondary conformation ion at m/z= 224 and 251
Detection Limit	Not provided
Range	Not provided

TABLE 91 Test Method(s) for Perfluorooctanic Acid (PFOA)

Chemical Formula	C ₈ HF ₁₅ O ₂ (PFOA)
Test Method	CEN/TS 15968
Description	The compounds are introduced into the LC-MS by injecting the sample extract into a liquid chromatograph (LC) equipped with a C ₁₈ column. The LC column is temperature programmed to separate the analytes, which are then detected with a mass spectrometer (MS) connected to the liquid chromatograph. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an appropriate calibration curve for the intended application.
Technique	LC-tandemMS or LC-qMS
Sample Prep Method	CEN/TS 15968
Analyte	Perfluorooctanoic acid (PFOA)
Detection	Retention time from LC-MS, m/Z of 413 and 369 in MS
Detection Limit	Unknown
Range	0.5 µg/L to 50 µg/L in extract

TABLE 92 Test Method(s) for Residues (coal tar), Pitch Distillation

Chemical Formula	XXXX
Analytical Approach	Coal tar distillates are made up of crude coke oven tar components, which are produced during the high temperature coking of bituminous coal. They boil between 100°C and 400°C during the distillation process to produce carbon pitch. Refined chemical oil distills between 210°C and 315°C. The distillates that distill above 315°C are high molecular weight aromatic hydrocarbons (middle and heavy distillates). The final residue after distillation is called coal-tar pitch. Coal tar distillates contain greater than 75 wt% polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons. Coal-tar pitches are shiny, dark-brown to black residues produced during the distillation of coal tars. They contain various PAHs, their methyl and polymethyl derivatives, and heteronuclear compounds. Residues (coal tar), pitch distillation is considered persistent bioaccumulative toxic chemical.
Reference	Environmental contaminants encyclopedia coal tar entry, July 1, 1997, Roy J. Irwin, National Park Service
Test Method	EPA Method 8270D, The expanded scan for PAHs [828] (a modified EPA Method 8270 including alkyl homologues and lower detection limits)
Description	This method is used to determine the concentration of semi-volatile organic compounds in extracts prepared from many types of solid waste matrices, soils, air sampling media and water samples.
Technique	GC-MS
Sample Prep Method	Various methods are recommended for various matrices. EPA Method 5030, EPA Method 3510, EPA Method 3520, EPA Method 5041, EPA Method 3540, EPA Method 3550, EPA Method 3580.
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Gas chromatography retention time and mass spectrometry – primary ion and confirmation ion.
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte
Test Method	EPA Method 8310
Description	This method is used to determine the concentration of certain polynuclear aromatic hydrocarbons in ground water and wastes.
Technique	HPLC
Sample Prep Method	Extraction with methylenechloride followed by exchange to acetonitrile
Analyte	Pyrene and polycyclic aromatic hydrocarbons and alkylated polycyclic aromatic hydrocarbons
Detection	Liquid chromatography retention time and ultraviolet spectrum
Detection Limit	Reference method table for specific analyte
Range	Reference method table for specific analyte

TABLE 93 Test Method(s) for TGIC (1,3,5-tris(oxiranylmethyl)-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione)

Chemical Formula	C ₁₂ H ₁₅ N ₃ O ₆
Test Method	AV-052 Ambient Monitoring Method for TGIC ISBN 0 644 33389 8
Description	Extracted samples are introduced into the column where they are separated. The characteristics retention time and UV detector are the analytical signals.
Technique	HPLC-UV
Sample Prep Method	Extraction with HPLC eluent
Analyte	TGIC
Detection	Retention time with UV
Detection Limit	0.4 µg
Range	6 to 240 µg

TABLE 94 Test Method(s) for β-TGIC; (1,3,5-tris[(2S and 2R)-2,3-epoxypropyl]-1,3,5-triazine-2,4,6-(1H,3H,5H)-trione)

Chemical Formula	C ₁₂ H ₁₅ N ₃ O ₆
Test Method	AV-052 Ambient Monitoring Method for TGIC ISBN 0 644 33389 8
Description	Extracted samples are introduced into the column where they are separated. The characteristics retention time and UV detector are the analytical signals.
Technique	HPLC-UV
Sample Prep Method	Extraction with HPLC eluent
Analyte	TGIC
Detection	Retention time with UV
Detection Limit	0.4 µg
Range	6 to 240 µg

(Nonmandatory Information)⁷

X1. STANDARDIZED METHODS

⁷ Only standard test methods are cited.

X1.1 *Test Methods*—See **Table X1.1**.

X1.2 *Sample Preparation Methods*—See **Table X1.2**.

TABLE X1.1 Test Methods

Method	Description
ASTM D1385	Standard Test Method for Hydrazine in Water
ASTM D3335	Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorption Spectrometry
ASTM D3545	Standard Test Method for Alcohol Content and Purity of Acetate Esters by Gas Chromatography
ASTM D5831	Standard Test Method for Screening Fuels in Soils
ASTM D7065-11	Standard Test Method for Determination of Nonylphenol, Bisphenol A, p-tert -Octylphenol, Nonylphenol Monoethoxylate and Nonylphenol Diethoxylate in Environmental Waters by Gas Chromatography Mass Spectrometry
ASTM D7485	Standard Test Method for Determination of Nonylphenol, p-tert-Octylphenol, Nonylphenol Monoethoxylate and Nonylphenol Diethoxylate in Environmental Waters by Liquid Chromatography/Tandem Mass Spectrometry
ASTM E1621	Standard Guide for X-Ray Emission Spectrometric Analysis
CEN/TS 15968	Determination of extractable perfluorooctanesulphonate (PFOS) in coated and impregnated solid articles, liquids and fire fighting foams - Method for sampling, extraction and analysis by LC-qMS or LC-tandem/MS
CPSC-CH-C ₁ 001-09.3	Standard Operating Procedure for Determination of Phthalates
EN 14362-1	Textiles. Methods for determination of certain aromatic amines derived from azo colorants. Detection of the use of certain azo colorants accessible with and without extracting the fibres
EN 14372:2004	Child Use And Care Articles - Cutlery And Feeding Utensils - Safety Requirements And Tests
EN 17234	Leather. Chemical tests for the determination of certain azo colorants in dyed leathers. Determination of 4-aminoazobenzene
EPA Method 504.1	EDB, DBCP, 123TCP by Microextractin & GC
EPA Method 524.2	VOCs - Purge & Trap / Capillary Column GC/MS
EPA Method 610	Polynuclear Aromatic Hydrocarbons
EPA Method 625	Acids and Base/Neutrals
EPA Method 1671	Volatile Organic Compounds - GC/FID
EPA Method 6010	Inorganics by ICP - Atomic Emission Spectroscopy
EPA Method 6020	Determination of over 60 substances in a variety of matrices by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)
EPA Method 6200	Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment
EPA Method 7010	Determination of metals in solution by Graphite Furnace Atomic Absorption Spectrophotometry (GFAA)
EPA Method 7196A	Colorimetric determination of hexavalent chromium using diphenylcarbazide
EPA Method 8032A	Acrylamide by GC
EPA Method 8095	Explosives by Gas Chromatography
EPA Method 8100	Determination of polynuclear aromatic hydrocarbons (PAHs) by Gas Chromatography and flame ionization detection
EPA Method 8131	Aniline & Selected Derivatives by Cap Column GC
EPA Method 8260B	VOCs by GC/MS Capillary Column Technique
EPA Method 8270D	Determination of semivolatile organic compounds by Gas Chromatography/Mass Spectrometry (GC-MS)
EPA Method 8310	Determination of the concentration of certain poly-nuclear aromatic hydrocarbons by High Performance Liquid Chromatography (HPLC)
EPA Method 8515	TNT in Soil by Colorimetric Screening
EPA Method 9056A	Determination of inorganic anions by ion chromatography
German ZEK01.4-08	Testing and Validation of Polycyclic Aromatic Hydrocarbons (PAH) in the course of GS-Mark Certification
Health Canada C-38	Amendments to the Food and Drugs Act (Bill C-38)
IEC 62321	Determination of levels of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers) by a variety of analytical test methods.
ISO 17353-2004	Water quality - Determination of selected organotin compounds - Gas chromatographic method
ISO 21587-3	Chemical analysis of aluminosilicate refractory products (alternative to the X-ray fluorescence method) - Part 3: Inductively coupled plasma and atomic absorption spectrometry methods
NIOSH Manual of Analytical Method 2004	NMAM is a collection of methods for sampling and analysis of contaminants in workplace air, and in the blood and urine of workers who are occupationally exposed. These methods have been developed or adapted by NIOSH or its partners and have been evaluated according to established experimental protocols and performance criteria. NMAM also includes chapters on quality assurance, sampling, portable instrumentation, etc.
NIOSH Method 7901	Determination of As ₂ O ₃ as As using Graphite Furnace Atomic Absorption Spectrophotometry
OSHA Method #57	Determination of 4,4'-Methylenedianiline (MDA) by Gas Chromatography
OSHA Method ID-211	Sampling and Analytical Method: Acrylamide
US FDA Method 21cfr 500 subpart F	Methods for Detection of Residues of Carcinogenic Compounds Used in Food-Producing Animals
USGS NWQL O-1433-01	Method of Analysis by the U.S. Geological Survey National Water Quality Laboratory - Determination of Wastewater Compounds by Polystyrene-devinylbenzene Solid-Phase Extraction and Cappillary-Column Gas Chromatography/Mass Spectrometry
USGS Method O-3112-83	TNT, RDX, and picric acid, total recoverable, high-performance liquid chromatographic

TABLE X1.2 Sample Preparation Methods

Method	Description
ASTM D1257	Standard Guide for Evaluating Grinding Materials Used for Surface Preparation in Spectrochemical Analysis Standard Practices for Digestion of Water Samples for Determination of Metals by Flame Atomic Absorption, Graphite Furnace Atomic Absorption, Plasma Emission Spectroscopy, or Plasma Mass Spectrometry Standard Practice for Sample Digestion Using Closed Vessel Microwave Heating Technique for the Determination of Total Metals in Water
ASTM D1971	
ASTM D4309	
CEN/TS 15968	Determination of extractable perfluorooctanesulphonate (PFOS) in coated and impregnated solid articles, liquids and fire fighting foams - Method for sampling, extraction and analysis by LC-qMS or LC-tandem/MS
EPA Method 3050B	Digestion procedure for the preparation of sediments, sludges and soil samples with repeated additions of nitric acid and hydrogen peroxide
EPA Method 3051A	This microwave extraction method is designed to mimic extraction using conventional heating with nitric acid, or alternatively, nitric acid and hydrochloric acid.
EPA Method 3052	This method is applicable to microwave assisted acid digestion of siliceous, organic and other matrices.
EPA Method 3060	This method is an alkaline digestion procedure for extracting hexavalent Cr(VI) from soluble, absorbed and precipitated forms of chromium compounds in soils, sludges and sediments.
EPA Method 3500C	Organic extraction and sample preparation methods
EPA Method 3510C	Separatory Funnel Liquid-Liquid Extraction
EPA Method 3520C	Continuous Liquid-Liquid Extraction - Organics
EPA Method 3540C	Soxhlet Extraction - Organics
EPA Method 3541	Automated Soxhlet Extraction
EPA Method 3550B	Ultrasonic Extraction - Organics
EPA Method 3550C	Ultrasonic Extraction (non or semi-volatile)
EPA Method 3580A	Waste Dilution
EPA Method 3585	Waste Dilution for Volatile Organics
EPA Method 5021	VOCs in Soils/Solid Matrices by Equilibrium Head
EPA Method 5030B	Purge & Trap for Aqueous Samples - Organic
EPA Method 5032	Volatile Organic Compounds - Vacuum Distillation
EPA Method 5035	Closed-System Purge/Trap/Extraction - Organics (and CLP- Volatiles in low level soils)
EPA Method 5041A	Desorption Sorbent Cartridges VOST - Cap GC/MS
EPA Method 5050	Bomb (combustion) sample preparation procedure for the determination of Cl.

X2. SCREENING METHOD AND LIMITATIONS

X2.1 Screening methods may be appropriate to determine whether a detectable amount of a substance is present. In many situations the application of a screening process may obviate the need to perform full quantitative analysis.

X2.2 Limits of detection, when practicable, should be validated. Otherwise, the presence determination will dictate a strategy requiring follow-up analysis for a more accurate and precise concentration determination. Ideally, the minimum detection level of the screening method is below the trigger level.

X2.3 Many samples can be effectively screened by detecting the key elements only. Methods based on X-ray fluorescence spectrometry (XRF) are widely employed for this purpose. Methods as described in IEC 62321 or EPA SW-846 Method 6200 are applicable. Other analytical capabilities may also be appropriate for screening the analyte of interest.

X2.4 Commercial XRF equipment typically can analyze sodium and heavier elements. Lithium to neon analysis is typically done by other methods. Refer to IEC 62321 or EPA SW-846 Method 6200 for XRF metrology details. The following caveats concerning XRF analysis should be heeded.

X2.4.1 Limits of detection for lighter elements can vary from fraction of a percent up to as much as 5 % (w/w).

X2.4.2 XRF signals of lighter elements represent mostly the near surface layer of the sample while the source of the heavier elements can be located at millimeters to centimeters in depth into the sample.

X2.4.3 XRF analysis is often used to analyze objects in their “as-is” condition. However, objects are often non-homogeneous by design. Qualitative determination may be the best that can be done in non-homogenous objects by XRF.

X2.4.4 X-ray line pairs for some combinations may not completely resolve. Therefore, care must be taken in the interpretation of the X-ray intensities. In some cases, alternative X-ray lines without interference can be used. Otherwise, mathematical calculations must be used to correct for the interferences. ASTM **E1621** provides guidance on the mathematical corrections.

X2.5 Screening as an analytical approach for specific organic species, should be used with caution or even be avoided. Common screening techniques may not be able to distinguish targeted organic species from a general organic group of molecules that are not on the SVHC list, resulting in misidentification.

X2.6 Full quantitative analysis may be required if the substance is suspected to be present and it is not possible to determine whether its concentration is above or below a targeted threshold level.

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