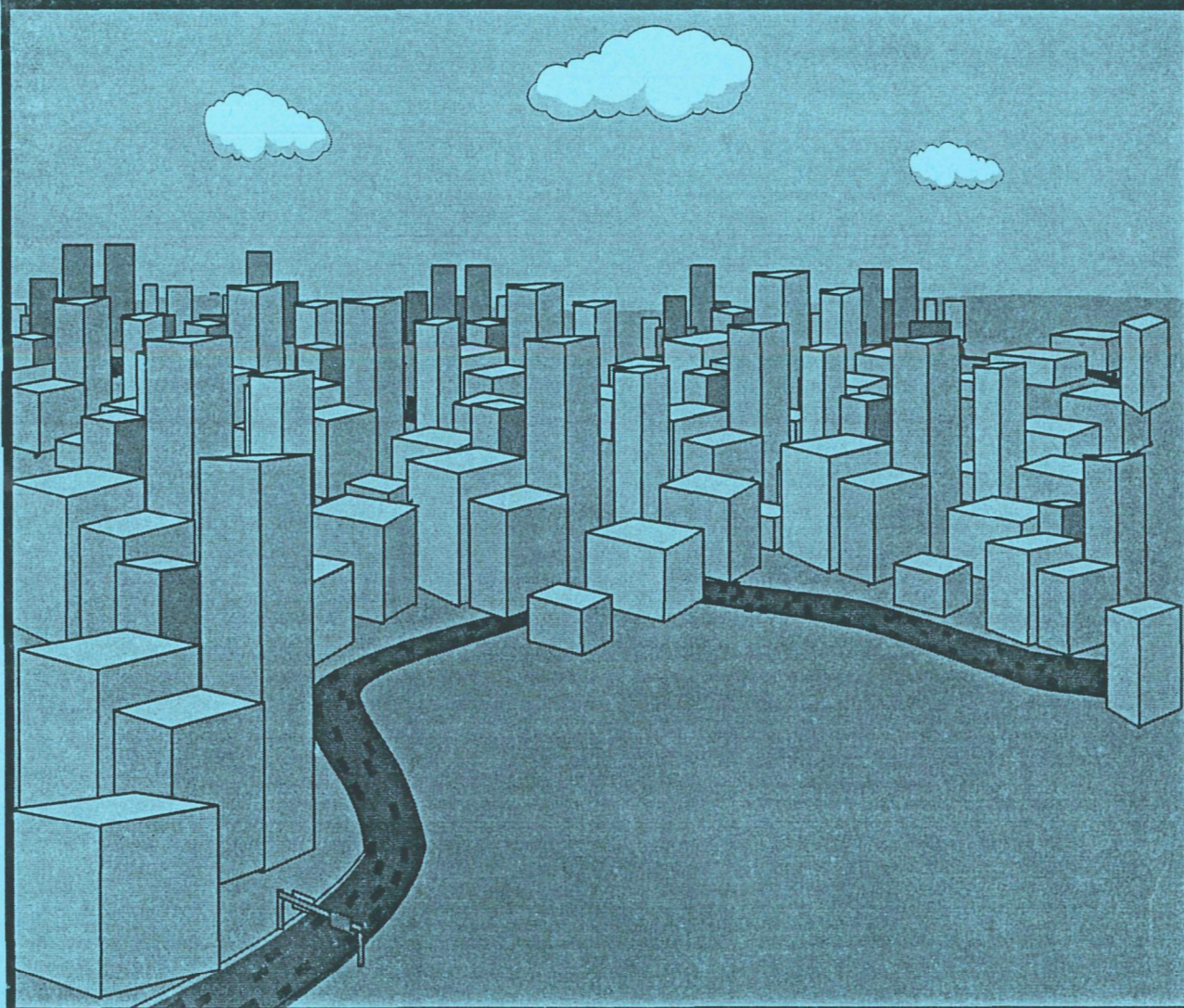


# **BROWNFIELDS**

## **Technical Resources: Industrial & Analytical Profiles**



**United States Environmental Protection Agency**  
**Region III**



# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET ABANDONED CHEMICAL FACILITIES**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Process-specific chemical production facilities manufacture formulate or repackage a wide range of chemicals for commercial and industrial use. These can include the formulation and synthesis of acids, bases, oxidizers, polymers, plastics, surfactants, cleaning solvents, dyes, soaps and waxes.

## **CHARACTERISTIC RAW MATERIALS**

The raw materials are specific to the individual process and final product. The method of manufacturing/repackaging process may be similar for each individual corporation, and could be easily researched for a specific location/process.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Due to the diversity of the individual process, specific waste streams and affected environmental media are highly varied. However, chemical facilities typically handle large volumes of chemicals utilizing above and below ground bulk storage tanks, transfer equipment, process lines and piping and raw material/final product storage areas. Additionally, off-spec and waste materials may be generated. Some of these materials may be found on site in surface impoundments, bulk storage tanks, waste piles and disposal pits. All of these areas may contribute to soil, building and groundwater contamination. Process-specific waste streams and case studies on the associated environmental impacts are available.

## **SAMPLING STRATEGIES**

All waste materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the waste materials may represent a significant direct contact

and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and lagoons should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed to confirm the extent of the contamination. Once the contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect subsurface disposal pits, process lines and underground chemical storage tanks

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

Another environmental concern is asbestos. Three forms of asbestos are typically found in buildings: (1) sprayed or trowled-on material; (2) insulation on pipes, boilers and ducts; and (3) miscellaneous forms, such as wallboard, ceiling tiles and floor tiles. Asbestos is a serious concern, especially during building demolition work.

### SUGGESTED ANALYTICAL PARAMETERS

Asbestos Analysis

Cyanide Analysis

Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

pH Analysis

Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticide/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET ABANDONED LABORATORIES**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Small laboratories which combine research and development with public analytical support are very common. Large research laboratories are less common, but can usually be found in conjunction with an individual chemical manufacturing and product testing facilities. A laboratory will typically have numerous working benches, supplied with natural gas, and water/drains. Vented hoods are common at laboratories using volatile or fuming compounds and reactions. Storage shelves containing large numbers of individual chemicals in limited quantity are always present.

## **CHARACTERISTIC RAW MATERIALS**

The raw materials are specific to the individual laboratory, but usually contain all classes of hazardous materials including explosive, corrosive, flammable or radioactive materials, mercuric products and metal compounds.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Due to the diversity of individual laboratories, waste streams and the affected environmental media are highly variable. However, commonly found waste groups include volatile, semivolatile, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metal compounds.

Severe building contamination may be present as related to broken chemical containers and poor housekeeping. A direct inhalation threat is also likely. Soil contamination may be associated with small burial pits encountered at rural lab locations.

## **SAMPLING STRATEGIES**

All waste materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. Radioactive materials are easily located using a scintillation counter. It should be noted that many of the waste materials may represent a significant direct contact and/or inhalation hazard to assessment personnel. Samples should be collected from nearby surface soils, drains, and obvious disposal areas.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if groundwater contamination is suspected.

### SUGGESTED ANALYTICAL PARAMETERS

The majority of the laboratory chemicals will be labeled and in their original container. These can be inventoried and “lab-packed” for disposal. Analysis of each individual chemical is not required.

Large groups of small quantity unknowns can be field screened, grouped by hazard class, bulked, and profiled for disposal. Disposal analysis of the bulked material may be required by the receiving disposal facility. Suggested analytical parameters are:

Target Analyte List (TAL) metals and cyanides

Target Compound List (TCL)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET ABANDONED OIL FACILITY**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

The term abandoned oil facility refers to any structure, group of structures, equipment, or device (other than a vessel) which is used for drilling, producing, storing, handling, transferring, processing, recycling and/or transporting of oil.

## **CHARACTERISTIC RAW MATERIALS**

Characteristic raw materials found at abandoned oil facilities include, but are not limited to fuel oils, motor oils, oil sludges, oil refuse and oil mixed with wastes.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Waste streams associated with abandoned oil facilities include solids and liquids containing petroleum hydrocarbons, metals (such as sulfur, zinc, calcium, barium, phosphorus, lead, aluminum, iron) and polychlorinated biphenyls (PCBs). Facilities may also contain oils that are corrosive. Used or recycled oils may contain additional contaminants from their prior use. These waste streams can contaminate soil and groundwater from repetitive spills, burial of sludges/tank bottoms and leaking tanks and process lines.

## **SAMPLING STRATEGIES**

Numerous soil screening products are available to detect total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylene (BTEX) and polychlorinated biphenyls (PCBs) in soil and water. Assessments should include sampling or screening of oils remaining on site, surface soils, surface water (if in close proximity to the site), and groundwater (monitoring wells or local residential wells). If surface soil and/or groundwater contamination is documented, and/or if underground storage tanks are/were present on site, subsurface soil should be tested.

## SUGGESTED ANALYTICAL PARAMETERS

Priority Pollutant Organics Analysis (volatiles, semivolatiles, and pesticides/PCBs)

Target Analyte List (TAL) Metals

Total Petroleum Hydrocarbons (TPH)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET ASBESTOS PILE**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Asbestos piles can result from natural resources (including mining operation), ship building yards, tailing from industrial operations and disposal of operation debris.

## **CHARACTERISTIC RAW MATERIALS**

Any material containing asbestos at more than one percent is designated as asbestos containing material (ACM). The common types of asbestos found in a pile are chrysotile, amosite, and crocidolite. Other types of asbestos which can also be found in small quantities in the pile are anthophyllite, tremolite, and actinolite.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

The main contributor of asbestos to an asbestos pile is domestic debris. Three forms of ACM are typically found in buildings: (1) sprayed or trowled-on material; (2) insulation on pipes, boilers and ducts; and (3) miscellaneous forms, such as wallboard, ceiling tiles and floor tiles. This material arrives at the pile from building demolition work or during remodeling of existing structures. Naturally occurring asbestos may result from the excavation for a building foundation, in areas where bed rock contains asbestos fibers. ACM can also be generated during mining operations and as tailings from certain industrial manufacturing processes. During earlier times, ACM was used as an insulating agent in various areas of a ship. Friable asbestos may be responsible for the pollution of air, water and soil. Asbestos is a direct inhalation threat to humans. Potential health effects of asbestos exposure are asbestosis, mesothelioma, lung cancer and other cancer disorders.

## **SAMPLING STRATEGIES**

The most common types of asbestos, chrysotile, amosite and crocidolite, cannot be distinguished by visual observation. The presence of asbestos must be determined by



sampling and laboratory analysis. Bulk samples from an asbestos pile must be analyzed in a laboratory accredited by the U. S. Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP). The method should be by polarized light microscopy (PLM). A finding of less than one percent asbestos is required for all samples in a homogenous area to determine that it contains no ACM; only one sample needs to be analyzed as greater than one percent to determine that a homogenous area contains ACM.

Erosion and sedimentation control must be considered during any on-site activity at the asbestos pile. Before starting any work, an erosion and sedimentation plan must be approved by the county or the township authority.

#### SUGGESTED ANALYTICAL PARAMETERS

Percentage of asbestos present in the suspected asbestos containing material by PLM.

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET AUTO BODY FACILITIES**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

A wide variety of materials are used in the repair of automobile and truck body parts. The process involves removing the damaged area, repairing or replacing the part, filling and sanding the affected area, and priming and repainting the repaired area. The repairs often require the use of cutting and welding equipment, cleaners, solvents, paints, epoxies and polymers. A smaller concern may also be the automotive fluids that leak from heavily damaged vehicles kept on the property.

## **CHARACTERISTIC RAW MATERIALS**

This industry typically stores small quantities of paints, cleaners, solvents, epoxies, polymers and compressed gases. Some typical chemicals utilized in the auto body industry include:

Acetylene (g)	Oxygen (g)	Acetone (l)
Ammonia (g/l)	Carbon Tetrachloride (l)	Hydrochloric Acid (l)
Monostyrene (l)	Nitrous Oxide (g)	Perchloroethylene (l)
Toluene (l)	Trichloroethylene (l)	Xylene (l)

(l) liquid      (s) - solid      (g) - gas

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

There is minimal storage of waste products on site due to the use of small quantities of hazardous materials. The highest areas of contamination tend to be associated with the stripping and painting operations. Common wastes encountered at Superfund assessment and remediation projects include waste paints, corrosive liquids and sludges, metals- and solvent-contaminated soils, metals- and solvent-contaminated groundwater, and unused raw materials. The toxicity and mobility of paint mixtures and related cleaning solvents

make groundwater contamination the primary environmental concern. Minor and localized soil contamination may also be encountered.

Additionally, building contamination may be a concern in the painting building and chemical/waste storage areas. Building decontamination and wipe testing of demolition materials may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials and contaminated areas on site should be visually identified and confirmed using immune-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing corrosive and toxic compounds may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits and bulk storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticides/PCBs)

Priority Pollutant Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent /total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

**BROWNFIELD ASSESSMENTS  
INDUSTRY PROFILE FACT SHEET  
BETHLEHEM-ASBESTOS/TAILING MINE**

**INTRODUCTION**

This Industry Profile Fact Sheet is presented by the Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

**INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Bethlehem Mines Corporation's Grace Mine is located in Joanna, Berks County, PA. Fugitive dust emission was a problem for the corporation since 1977. It was also anticipated that the dust contained asbestos. In 1977, following an inquiry by Pennsylvania Department of Environmental Resources (PADER), Bethlehem Mine provided information that analytical from sampling events showed the presence of asbestos in air and water.

In 1985 Environmental Protection Agency (EPA) was on site in response to a request from the Pennsylvania Department of Health (PADOH). At the end of the response it was concluded that the effort by the responsible party to cover and vegetate the exposed portion of the site had not been effective.

**CHARACTERISTIC RAW MATERIALS**

The main contaminant found at tailing mines of this type is asbestos, which can be found in airborne dust, in soil, and in water.

**WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site asbestos piles contain asbestos containing material (ACM), which is defined as any material containing asbestos more than one percent. The common forms of asbestos found in typical ACM pile are Chrysotile, Amosite, and Crocidolite. Other forms of asbestos which can also be present in small quantities in a pile are Anthophyllite, Tremolite, and Actinolite. Asbestos is a direct inhalation hazard to humans. Potential health effects of asbestos exposure include asbestosis, mesothelioma, lung cancer, and other cancer disorders.

**SAMPLING STRATEGIES**

The most common type of asbestos (such as Chrysotile, Amosite, and Crocidolite) can not be distinguished by visual observation. Presence of asbestos cannot be determined without sampling and laboratory analysis. Bulk samples from an asbestos pile must be analyzed in a laboratory accredited by the National Bureau of Standards (or EPA in the interim), utilizing the polarized light microscopy (PLM) method.

Samples should be collected from air, soil and water; however, it should be noted during sampling that the solubility of asbestos in water is negligible.

#### SUGGESTED ANALYTICAL PARAMETERS

Percentage of asbestos present in air, soil and water should be calculated from the analysis.



**BROWNFIELD ASSESSMENTS  
INDUSTRY PROFILE FACT SHEET  
BATTERY RECLAMATION FACILITIES**

**INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

**INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Battery reclamation facilities salvaged the metals, primarily lead compounds, from automobile and truck batteries. A typical process includes a cracking area, sulfuric acid dumping or storage area, metal salvage area, and battery casing piles or burial pits. Older facilities used manual labor to pour the sulfuric acid from the batteries and separate the lead compounds from the battery casings. Sulfuric acid was often poured onto the ground or into small unlined lagoons. Mobile conveyor belts or trucks were used to move the large volumes of battery casings to waste piles or burial areas.

**CHARACTERISTIC RAW MATERIALS**

This industry was primarily a recovery operation; so, very few raw materials were used. Due to the volume and concentration of the sulfuric acid generated during recovery, it was not usually cost effective to neutralize the sulfuric acid. Soda ash or similar neutralizing agents were occasionally used for neutralizing sulfuric acid at newer facilities.

**WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site waste piles and burial pits for battery casings, and unlined lagoons and waste pits for sulfuric acid were common treatment/storage techniques prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Common waste products encountered at Superfund assessment and remediation projects include lead-contaminated soils (percent level) and ground water, highly acidified (pH as low as 1.5) soils and leachate, and large volumes of contaminated battery casings. Nickel, cadmium, copper, zinc, arsenic, mercury and chromium-contaminated soils and groundwater may also be encountered at facilities which accepted non-vehicle batteries and associated materials.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

It should be noted that many of the site contaminants contain corrosive and heavy metal compounds which may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and lagoons may be screened with a pH meter, then characterized by collecting several samples for metals laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Augering or drilling may be difficult due to extensive burial of battery casings. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, filled lagoons, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

#### Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/ total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

#### pH Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET DYE FACILITIES**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Dyes are intensely colored substances used for the coloration of various substrates, including paper, leather, fur, hair, food, drugs, cosmetics, waxes, greases, petroleum products, plastics, and textiles. The methods used for the application of dyes to substrate differ widely, depending upon the substrate and class of dye.

There are presently approximately some 1,200 different commercial dyes manufactured in the United States, and another 800 are imported. Dyes can be classified as acid dyes, basic dyes, direct dyes, disperse dyes, fluorescent highlighters, reactive dyes, sulfur dyes and vat dyes. Dyes are produced by a variety of chemical reactions from raw materials; most of these materials are hazardous to humans.

## **CHARACTERISTIC RAW MATERIALS**

Common raw materials used to produce dyes include cyclic aromatic compounds, such as benzene and naphthalene. In addition to the cyclic aromatics, many aliphatic reagents and inorganic chemicals are also used. These include sulfuric acid and oleum for sulfonation, nitric acid for nitration, chlorine and bromine for halogenation, caustic soda and caustic potash for fusion and neutralization, and sodium nitrite for diazotization, as well as ammonia, hydrochloric acid, chlorosulfonic acid, and sodium carbonate, bicarbonate, and sulfide. The heavy metals (copper, chromium, mercury, nickel, and zinc) which are used as catalysts and complexing agents for the synthesis of dyes and dye intermediates are considered priority pollutants. The raw materials commonly brought into the facility in large quantities and stored at the facility in tanks, drums or other containers. The final products are also stored at the facility until shipment to suppliers or end users.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site waste piles, lagoons and waste pits were common treatment/storage techniques prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Effluents from dye factories are the major waste from dye production and processing. They should be treated before leaving the plant. Effluent treatment methods include physical, chemical and biological methods.

The toxic nature of some dyes has long been recognized. The specific carcinogenic compounds involved in the dye industry include the following:

2-naphthylamine	4-aminobiphenyl
benzidine (4,4'-diaminobiphenyl)	fuchsine (CI Basic Violet 14)
auramine (CI Solvent Yellow 2)	

The possible contamination of drinking water supplies is of concern because certain classes of dyes are known to be enzymatically degraded in the human digestion system, producing carcinogenic substances. Additionally, contaminated building and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this materials may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing corrosive and poisonous compounds may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas should be characterized by collecting samples for laboratory analysis. Surface and subsurface soil sampling should be performed to confirm the suspected contaminated areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas.

The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, process lines and chemical storage tanks. On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Fluorescent Compounds Analysis  
pH Analysis  
Target Analyte List (TAL) Analysis  
Target Compound List (TCL) Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET DRUM RECYCLING FACILITY**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Drum recycling facilities receive drums with residual chemicals and oil from various facilities. Based on the label information or field screening, the drums are separated into in various compatibility categories. When the residual chemicals are consolidated, the drums are rinsed, leak tested, reshaped, and painted for reuse. Soap detergent and steam cleaning are the most common process for rinsing. Unusable drums are crushed and disposed as scrap material.

## **CHARACTERISTIC RAW MATERIALS**

Any kind of chemical can be found on a drum recycling facility. The most common chemicals are:

Oils and greases	Paints and thinners	Soaps and detergents
Corrosive liquids	Organic solvents	Pesticides

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site storage of consolidated bottoms/sludges from the drum cleaning process are common at drum recycling facilities. Incompatible, leaking and unusable drums are often stored in large drum storage yards. These areas may contain heavily contaminated soils. At some abandoned facilities, lagoons, waste pits or buried drums may contribute to subsurface soil or groundwater contamination. The drum rinsate is generally reused, or treated and discharged into the municipal sewer.

## **SAMPLING STRATEGIES**

It should be noted that many of the drums containing chemicals may represent a significant inhalation threat to assessment personnel. All drums encountered onsite should be visually inspected, inventoried and staged. The contents may be identified by reading labels



followed by confirmation using qualitative indicators or wet chemistry field screening techniques. Unlabeled drums should be sampled for on-site screening and laboratory analysis. Visually identified contaminated areas, waste piles, drums and lagoons should be characterized by collecting several samples for laboratory analysis. Application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, buried drums and storage tanks.

Nearby surface water, on-site and local wells may be sampled if surface or groundwater contamination is an environmental concern.

### **SUGGESTED ANALYTICAL PARAMETERS**

Due to the wide range of potential contaminants, analytical parameters should be selected based on field screening results. The analysis may include the following parameters:

Cyanide Analysis

pH analysis

Target Analyte List (TAL) metals

Target Compound List (TCL) (volatile, semivolatile and pesticide/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET ELECTROPLATING**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

A wide variety of metal components are transported from the original manufacturing location to an electroplating facility to be coated with specific metals to improve the appearance, resistance to corrosion, or engineering performance. Metal components are cleaned, etched, electroplated and finished by dipping into a series of vats containing a combination of corrosive, metal and/or cyanide containing chemical solutions.

## **CHARACTERISTIC RAW MATERIALS**

This industry typically uses a series of plating solutions containing strong acids, strong bases, metals and cyanide salts. Acid and bases are usually received by the facility in drums and occasionally by bulk transport (tank trucks). The metal and cyanide containing salts are usually received as bagged or containerized solids, or drummed liquids, which are dissolved or diluted into large plating vats. The following chemical compounds are/were commonly utilized in the electroplating process:

Zinc Cyanide (s)	Sodium Cyanide (s)	Potassium Cyanide (s)
Basic Cyanide Solutions (l)	Sulfuric Acid (l)	Hydrochloric Acid (l)
Nitric Acid (l)	Hydrofluoric Acid (l)	Chromic Acid (l)
Purified metal compounds (s)		

(l) - liquid      (s) - solid

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site waste piles, lagoons and waste pits were common treatment/storage techniques prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Common waste products encountered at Superfund assessment and remediation projects include waste cyanide, heavy metals and corrosive liquids and sludges, metals and cyanide-contaminated soils, metals and cyanide-contaminated

groundwater, and unused raw materials listed above. The relative toxicity of cyanide, cadmium, and chromium warrant special concern when evaluating groundwater contamination.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing corrosive and cyanide compounds may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and lagoons should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Cyanide (total/available) Analysis

Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

pH Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET GAS STATIONS**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

The largest concern in assessing a gas station is the presence of underground storage tanks containing old gasoline products which could contaminate sub-surface soils and groundwater. These storage tanks, and the lines used to transfer the fuels to the pumps, may erode over time and begin to leak. If the station also provided automotive service, it may also have small containers of various lubricants, degreasers, cleaners, fuel additives, tires, automotive batteries (lead and acids) and possibly compressed gas cylinders.

## **CHARACTERISTIC RAW MATERIALS**

The main product, gasoline, is brought in by bulk transport (tank truck) and stored in large underground storage tanks (UST) for transfer to the pumping stations. Small containers of materials used to service automobiles is often stored in the garage or storage areas and are often purchased in large quantity, depending on the size of the service center. Below is a list of some materials often found in a gas station with a small service center:

Acetylene Gas (g)	Ethylene Glycol (l)	Rubber (s)
Compressed Oxygen (g)	Automotive Oils (l)	Degreasing Agents (s/l)
Gasoline (l)	Hydraulic Oils (l)	Fuel Additives (l)
Diesel Fuels (l)	Common Lubricants (s/l)	Lead (s)

(g) - gas      (l) - liquid      (s) - solid

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

The primary environmental hazard involves fuel contamination of subsurface soils and groundwater. This contamination is usually caused by leaking USTs or a long history of minor spills, leaks and tank overflows.

On-site dumping was common prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Common waste products encountered at Superfund assessment and remediation projects include waste oils, used solvents, old automotive batteries, tires and/or rubber sealing agents, oil sludges, compressed gas cylinders of acetylene and oxygen, volatile organic contaminated soil and groundwater and unused raw materials.

Additionally, contaminated buildings, concrete pads and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials encountered on-site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing organic solvents and any compressed gases may represent a significant flammability, direct contact, and/or inhalation hazard to assessment personnel. Visually identified contaminated areas and pressurized containers should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits and underground storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Diesel Range Organics (DRO)

Gasoline Range Organics (GRO)

Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		



**BROWNFIELD ASSESSMENTS  
INDUSTRY PROFILE FACT SHEET  
GLASS MANUFACTURING FACILITIES**

**INTRODUCTION**

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**INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Most glass manufacturing utilizes a process in which raw materials are converted at high temperatures to a molten glass. The molten glass is then formed into various products using molding, pressing and blowing processes.

A facility may consist of several interconnected buildings including a primary kiln room, drying area, pigment application rooms, and separate etching rooms. Vats of etching mixtures or frosting agents may be located in close proximity to the kiln area.

**CHARACTERISTIC RAW MATERIALS**

Sand and limestone are the most common raw materials in glass manufacturing. Other raw materials include boron, soda ash and some metallic additives. Some facilities utilize recycled glass as the primary raw material.

The hazardous components of the raw materials include the etching agents, typically hydrogen fluoride and fluoride-donating salts. Strong oxidizing corrosives, such as nitric acid, may be present in limited quantities to produce the correct oxidation states in the pigment metals. Amines and strong reducing agents are occasionally utilized in the process. Heavy metals containing arsenic, cobalt, zinc, thorium, and uranium were common pigment materials in addition to specialty organic dyes. Above or below ground bulk storage tanks containing fuels for primary and secondary kilns may also be present.

**WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Solid waste streams containing spent pigments and dyes are typical surface soil contaminants. Some small volume liquid waste streams, resulting from the etching process, may also be present. These liquid waste streams may also contain dissolved metals. Discharges to waterways and sensitive areas present significant threats from the

heavy metals pigments, organic dyes, and strong corrosives. The fluoride waste streams are extremely dangerous to human populations. Waste piles consisting of off-spec materials and glass products may be a source of contaminated run-off.

### SAMPLING STRATEGIES

All waste materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. Radioactive materials can easily be detected using a scintillation counter. It should be noted that many of the waste materials may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and lagoons should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed to confirm the extent of the contamination. Once the contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

#### Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

#### Isotopic Identification for Individual Radioactive Materials

#### Total Petroleum Hydrocarbon (TPH) Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET INFECTIOUS WASTES**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Biohazards and infectious wastes can range from plant dusts, allergens and toxins, to microbiological organisms. An infectious waste is derived from a biohazard agent which is capable of replication and has the ability to produce deleterious effects upon other biological organisms. The common classes of biohazard agents include infectious and parasitic agents, microorganisms such as fungi, yeast and algae, and animal products which cause infectious disease.

## **CHARACTERISTIC RAW MATERIALS**

Not applicable.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Infectious or “red bag” waste can contain anything classifiable as infectious waste from sharps hazards to autoclaved bacteria and virus strains. Etiological agents and vectors for human disease are regulated through the Public Health Service, U.S. Department of Transportation, and the Foreign Quarantine regulations. The U.S. Department of Agriculture is involved in the regulation of animal and plant pathogens.

Most infectious wastes are a contact threat from “fluid to fluid” contact, although other routes of exposure are possible. There is no “safe” level of uncontained pathogen. Illegally dumped infectious wastes are often found in loose piles, plastic bags or drums. The actual infectious material can often be disinfected with bleach or other agents, repackaged and sent for proper disposal.

## **SAMPLING STRATEGIES**

Biohazards and infectious wastes can range from plant dusts, allergens and toxins, to microbiological organisms. Sampling infectious wastes is rarely necessary at illegal

dumping or storage locations. However, methods for the collection and evaluation of biological materials may be used which parallel those used for chemical sampling, except that the sample may have to be preserved “alive” to minimize the loss between the collection and evaluation stage.

The three main types of biohazard sampling are liquids sampling, surface wipe sampling, and air sampling. Specific methods for suspected agents and sampling strategies must be developed for each individual biohazards incident.

### SUGGESTED ANALYTICAL PARAMETERS

Specific for each biohazard

**BROWNFIELD ASSESSMENTS  
INDUSTRY PROFILE FACT SHEET  
MANUFACTURED GAS PLANTS/COAL TAR SITES**

**INTRODUCTION**

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**INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Manufactured gas has been produced since the early 1800s as a fuel source for residential and industrial locations. Coal, or to a lesser extent oil, was burned to volatilize the desired gas fuel. The primary gas product from this reaction was purified, while the wastes were consolidated in a tar-like matrix known as coal tar.

**CHARACTERISTIC RAW MATERIALS**

The heating of the coal volatilizes the impurities into oven or furnace gas which is transferred to a by-products recovery plant. The oven gas usually goes through distillation processes to remove the waste products as coal tar. Depending on the complexity of the facility, various by-products including natural gas, benzene, toluene, xylenes, phenol, creosols, pyride, anthracene, naphthalene, sulfuric acid, light oils, paraffin and ammonia sulfate may be recovered. This by-products recovery is more common with large coking operations. Numerous waste products may be generated including hydrogen sulfide gas, coal tar, complex cyanide salts, coal fines, wastewater and process still bottoms.

**WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Due to the immense amounts of coal which could be handled per year, manufactured gas plant sites often have very large wastewater lagoons and coal tar pits. Common waste products encountered at Superfund assessment and remediation projects include high concentrations of polynuclear aromatic hydrocarbons (PAHs), sulfur compounds, complex cyanide compounds and lower concentrations of volatile and phenolic compounds. These wastes are concentrated in a dense, aromatic coal tar and associated waste waters. This coal tar waste is typically found in large on-site pits, many of which are over 20 feet deep. The metals concentration accumulated in the ash collection system is dependent on the content of the original fuel. The most common metals include aluminum, iron, lead, nickel, and chromium. The ash may be encountered on site mixed with the coal tar or as a



separate waste pile. Other inorganic compounds are not typically encountered at significant levels.

Groundwater may be contaminated as a result of leaching or percolation of surface and subsurface contaminants, surface impoundments and leaking process lines and tanks.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Associated heat transmission equipment may contain significant amounts of asbestos. Decontamination, asbestos remediation, and wipe testing of this material may be required prior to off-site landfill disposal or scrapping of process equipment.

### SAMPLING STRATEGIES

All waste materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the waste materials may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and lagoons should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed to confirm the extent of the contamination. Once the contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect subsurface tar pits, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Benzene, Toluene, Ethylbenzene, Xylene (BTEX) Analysis

Cyanide (total/available) Analysis

Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

Phenol Analysis

Sulfate/Sulfide Analysis

pH Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET MUNICIPAL LANDFILL**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Landfilling of solid waste has been practiced since very early times, when refuse was deposited in an open dump and allowed to decompose naturally. In most states today, a municipal landfill is restricted primarily to house hold garbage, office waste, rubble and debris from the construction industry, and vegetation from land clearing, lawn and leaf waste, etc. Modern municipal landfills should not be used to dispose of chemical or industrial wastes. Depending on when a landfill was constructed and operated, there may be engineering controls installed, such as liners, leachate collection/treatment, monitoring wells, etc.

## **CHARACTERISTIC RAW MATERIALS**

Because of unregulated use or illegal dumping practices, landfills in use prior to 1970 may contain volatile organic compounds, pesticide/PCBs, polynuclear aromatic hydrocarbons (PAHs), cyanides, heavy metals, and other contamination. Even strictly domestic or household waste can contain small quantities of oil and grease, paint, corrosives, solvents and other miscellaneous consumer chemicals.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

During the early stage of waste decomposition in a landfill the degradation process is essentially anaerobic, forming carbon dioxide and finally methane gas. Methane, in proper proportion with air, forms an explosive combination. Other generated gas, such as hydrogen sulfide, is toxic and lethal. Leachate produced by water moving through deposited refuse represents a potential hazard to soils as well as surface or groundwater.

## **SAMPLING STRATEGIES**

Any raw material encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. Obvious contaminated areas such as surface seeps should be characterized by collecting several

representative samples for laboratory analysis. Surface water and soil samples should be collected from suspected areas, including erosion ditches. It should be noted that landfills may contain corrosive and poisonous gas which present a threat to the assessment personnel

### SUGGESTED ANALYTICAL PARAMETERS

#### Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

#### Priority Pollutant Organics Analysis (volatile, semivolatile and pesticide/PCBs)

#### Total Petroleum Hydrocarbons (TPH) Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET ORDNANCE SITES**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Ordnance consists of a wide variety of military munitions and weaponry including rifle rounds, shells, bombs, grenades, mines, explosives and special purpose explosive agents. Ordnance sites include a range of facilities which manufactured, assembled, disposed or stored military ordnance or associated components. Some of these facilities date back to pre-World War I, while others were operated for specialty purposes for only a few months or years. In many cases, the facilities are not identified with any special markings, signs or warnings. Some facilities were associated with specific military posts. Characteristic features may include increased security (high, barbed-wire fencing), bunker-style/mounded buildings, unusually remote or uncharacteristic industrial locations, and well-spaced small buildings.

## **CHARACTERISTIC RAW MATERIALS**

Due to their specialty nature, ordnance facilities may include various chemicals used in the final stages of explosives manufacturing. The following chemical compounds are common raw materials, chemical intermediates or waste products encountered in the manufacturing of explosives:

di and tri-nitro benzene	strong acids	ethyl alcohol
di and tri-nitro phenol	mercury	ethylene glycol
di and tri-nitro toluene	reactive metals	phenols
ketones	ethers	formaldehyde
nitroglycerin	ammoniated compounds	sodium hydroxide

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site waste piles and burial pits were common treatment/disposal techniques prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Common waste products encountered at Superfund assessment and remediation

projects include: buried spent ordnance, unexploded ordnance (UXO) and ordnance components, such as di- and tri-nitro compounds (commonly used in explosives), solvents (e.g., toluene, formaldehyde), and fuels (gasoline, diesel and aircraft fuels). These compounds may be encountered in contaminated soils, surface water, and/or groundwater. Additionally, contaminated buildings, asbestos-containing material, and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and analytical testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

It should be noted that UXO and the associated components may represent a serious fire, explosion and fragmentation hazard to assessment personnel. Explosive intermediate chemicals and waste products may represent a serious inhalation, ingestion or direct contact hazard. Ordnance facilities should be screened for UXO by specially training individuals using established military standard procedures. Visually identified UXO or associated components should be marked and left undisturbed until explosives experts can be mobilized.

Once the site has been cleared of UXO, a series of soil screening kits and techniques are available to detect tri-nitro toluene (TNT), the explosive compound RDX, and fuel contamination in soil. Waste piles and burial pits should be characterized by collecting several representative samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. The application of non-intrusive subsurface geophysics as opposed to conventional drilling and boring should be evaluated to detect underground burial pits, process lines and chemical storage tanks. Special precautions must be taken when utilizing intrusive investigation techniques (e.g., drilling, boring operations) due to the potential for buried explosive materials. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the extent of contamination.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be considered only if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

Nitro-Aromatic

Priority Pollutant Organic Analysis (volatiles, semivolatiles, pesticide/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET PAINT INDUSTRY**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Many materials are brought to the site/facility and mixed in varying quantities to produce paint and coatings to be used in public, and sometimes private, sectors. The raw materials are often purchased in bulk quantities (truck-load) and then incorporated into a process line to be added to the final product. The manufacture of paint involves mixing, grinding, thinning adjustments, filling, and labeling.

## **CHARACTERISTIC RAW MATERIALS**

This industry typically uses a wide variety of materials depending on what type of coating/paint is being manufactured. Some common materials found include surfactants, chemical dryers, polymers, organic compounds, heavy metals (in the coloring agents), epoxies, solvents, mild corrosives, polyurethanes, herbicides and fungicides. Most of these materials are brought to the facility/site by bulk transport (tank trucks) and may be stored in large quantities for inclusion in the process. Some materials, such as the pigments, are in solid form but most of the materials encountered are in a liquid state. Due to a wide variety of specialty paints, it is difficult to name specific chemicals; however, the following is a list of some commonly encountered materials:

Toluene (l)	Xylene (l)	Ethyl Acetate (l)	Lead (s)
Acetone (l)	Titanium Dioxide (s)	Cadmium (s)	Zinc (s)
Chromium (s)			

(l) - liquid      (s) - solid

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

In general, there is little waste generated by a paint manufacturer because most of the materials are used up in the process. During the vat cleanings, waste products were often washed into a sewer drain. Common waste products encountered at Superfund

assessment and remediation projects include off-spec paint, volatile organic compounds, waste metals (from the pigments), waste or spent polymers, surfactants, herbicides, anti-bacterial agents and mild corrosives (for cleaning the process line and vats). Most of these compounds are in the form of sludges and/or solids and will harden over time if not utilized. These materials may be in drums, tanks or in the process lines themselves.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing corrosive and herbicide compounds may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, containers or process lines should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

#### Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Titanium	Zinc	

#### Herbicide/Fungicide Analysis

#### Priority Pollutant Organics Analysis (volatiles, semivolatiles)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET PESTICIDE FACILITIES**

## **INTRODUCTION**

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## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Pesticides include insecticides, herbicides, fungicides and all other chemicals used to control insects, weeds and other pests from disturbing grown or stored materials. There are three ways of applying pesticides: spraying (utilizing oil and/or water), dusting (spreading dry powder) and fumigating (releasing a gas). A wide variety of materials, almost all of which are hazardous to humans, are used in pesticide production. Contamination can be found at abandoned manufacturing facilities, bulk storage locations, and end-user sites such as farms, golf courses, and orchards. This industry typically combines a series of separate compounds in a process line and incorporates them into a final product for distribution and sale. The materials are often brought into the facility in large quantities (tank truck or rail car) and stored in tanks until they are used in the process. Final products are also stored in large quantities for shipment to suppliers or end users.

## **CHARACTERISTIC RAW MATERIALS**

Compounds typically found at a pesticide facility include the following:

Ammonia (g)	Benzene (l/g)	Carbon Tetrachloride (g)
Hydrogen Cyanide (g)	Mercury (l)	Nitric Acid (g/l)
Phosgene (g)	Sulfuric Acid (l)	Xylene (l)

(l) - liquid      (s) - solid      (g) - gas

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site waste piles, lagoons and waste pits were common treatment/storage techniques prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Waste products are often containerized on site in medium to large quantities for recycling into the process or disposal. Common waste products



encountered at Superfund assessment and remediation projects include waste cyanide, heavy metals, corrosive liquids and sludges, unused raw materials listed above, and discarded finished product. These materials may be found in soils, sediments, and surface and/or groundwater. They may also pose an inhalation hazard under certain conditions.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing corrosive and poisonous compounds may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and lagoons should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

#### Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent /total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

Priority Pollutant Organics Analysis (volatiles, semivolatiles, and pesticide/PCBs)

**BROWNFIELD ASSESSMENTS  
INDUSTRY PROFILE FACT SHEET  
PRINT SHOPS**

**INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

**INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Print shops store large quantities of inks and paper due to the nature of their service. Printing inks are a viscous to semi-solid suspension of pigments in a carrier liquid which forms a fluid or paste which can be printed on paper. The inks used in printing fall into four classes: letterpress, lithographic, flexographic and rotogravure. The letterpress and lithographic are based mainly in mineral oil, while flexographic and rotogravure use very volatile solvents.

**CHARACTERISTIC RAW MATERIALS**

This industry typically uses a wide variety of materials depending on what type of printing is used. Materials are often stored in large quantities; however, they are stored in small containers for convenience. These materials are often purchased directly from manufacturers or distribution centers and stored on site, often in a back storage area. Common materials used include solvents, inks and cleaning materials (which may be corrosive). The following is a list of some commonly encountered materials:

Acetone (l)	Alcohol (l)	n-Butyl Acetate (l)
Cresol (l)	Ethyl Acetate (l)	Methyl Ethyl Ketone (l)
Methyl Isobutyl Ketone (l)	Toluene (l)	Xylene (l)
Sodium Hydroxide (l)	Hexane (l)	Esters (l)

(l) - liquid

**WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

In general, there is minimal waste generated by a print shop as most of the materials are used up in the process. Waste materials are usually generated during machine cleanings or during unexpected break downs. Occasionally, stored materials may leak, resulting in contamination to the storage area, which may or may not have been addressed. Spills,

leaks, and discarded material will typically migrate to and contaminate soils, stream sediments, and groundwater. Common waste products encountered at Superfund assessment and remediation projects include volatile organic compounds, waste metals (from the pigments), waste or spent corrosives (for cleaning) and solvents. Most of these compounds are in the form of sludges and/or solids as they will harden over time if not utilized. These materials may be in drums, but are often in small containers.

Additionally, contaminated building materials (i.e. rugs, walls) and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing corrosive and organic compounds may present a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, containers or process lines should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed in the suspected contaminated areas outward to the suspected clean areas if information suggests that soils are contaminated. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

#### Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent /total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

#### pH Analysis

#### Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticides/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET PETROLEUM RECYCLING FACILITY**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Recycling is the recovery for reuse of materials and energy from wastes that are usually destined for disposal. Recyclable oils can be obtained from a variety of sources, including automotive garages, service stations, truck and taxi fleets, military installations, individuals, manufacturing facilities, and wastewater treatment plants. The primary types of used petroleum oil that are being recycled are motor, hydraulic and industrial lubricating oils. The additives and contaminants typically found in these oils may cause environmental problems associated with the recycling process.

Generally, used oil recycling facilities have three kinds of processes: recycling used oil as a fuel, reclaiming and re-refining. In many cases, an oil recycler may be involved with more of these processes.

## **CHARACTERISTIC RAW MATERIALS**

Chemical analysis, primarily for inorganic constituents, is performed on used oils and waste oils when they are received at the recycling facility. Many organic contaminants contained in such oils have not been analyzed. At older facilities, polychlorinated biphenyls (PCBs) were often not detected in used or waste oils, despite the strict regulations concerning PCB containing oil. These regulations on PCBs are established by the Toxic Substances Control Act (TSCA) with additional regulations based on hazardous waste provisions in the Resource Conservation and Recovery Act (RCRA).

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

The primary waste streams from a petroleum oil recycling facility include oily sludges and wastewater containing metals (sulfur, zinc, calcium, barium, phosphorus, lead, aluminum, iron) and PCBs. These contaminants are frequently found in surface and subsurface soils as well as groundwater due to poor facility housekeeping, repetitive spills and undetected

releases from bulk storage tanks. These contaminants may also become airborne as dust particles during demolition and construction operations.

### SAMPLING STRATEGIES

Surface and subsurface soils and groundwater should be sampled at the site at handling, processing and bulk storage areas, to identify sources of contamination. Additional sampling may be conducted to determine the extent of the contamination. If floating product is anticipated above the water table, monitoring wells should be drilled in the suspected contaminant locations and water samples at depths should be collected. Air pollution is not anticipated if the site is not undergoing major construction activities.

### SUGGESTED ANALYTICAL PARAMETERS

PCBs Analysis

Target Analyte List (TAL) Metals Analysis

Total Petroleum Hydrocarbons (TPH) Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET PLASTICS**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

The term plastics is given to any compound that has been made from a resin through a manufacturing process involving the application of heat and/or pressure. The actual production of the resin is generally thought of as part of the chemical industry (refer to the Abandoned Chemical Facility Industry Profile Fact Sheet). The use of these resins as they are treated and shaped to become components of other products as starting materials is considered the plastics industry.

## **CHARACTERISTIC RAW MATERIALS**

The plastics industry uses resins that are grouped into two main categories, depending on their characteristic behavior to heat. Thermoplastic resins can be heated and cooled repeatedly without a change occurring in their basic properties or composition. Some examples are: acrylonitrile-butadiene-styrene (ABS), acrylics, nylons and vinyls (PVC). The second category is thermosetting resins. These resins, including epoxies, silicones, and urethanes, cannot be subjected to any hot-cold transitions without irreversible changes occurring in composition and properties.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Most, if not all, of the raw materials in the plastics process are recycled. During the working process, some gases and vapors encountered might be: acrylonitrile, butadiene, carbon dioxide, hydrogen sulfide, olefins, styrene, and vinyl chloride.

Spillage of liquid resins could result in contaminated soil, sediment, and/or groundwater. Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

## SAMPLING STRATEGIES

Any suspected spill areas around tanks and/or vats should be sampled. Soil samples should be taken around the facility, as well as in any sumps or spill areas that might be present.

Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, filled lagoons, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

## SUGGESTED ANALYTICAL PARAMETERS

Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticide/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET QUARRY SITES**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Quarries are open mining environments, where a select stone, ore or rock formation is removed from the surrounding strata. The stone or ore can be further refined on site by smelting, chemical washing or physical cutting and/or crushing before shipment to the end user. The sections of quarry wall containing material of interest can be removed using powered equipment, or dropped in sheets using explosive charges.

## **CHARACTERISTIC RAW MATERIALS**

The hazardous substances most likely to be present at quarry sites are fuels for heavy equipment, detonators, explosive charges, detonation cord, various metals, and nitrate fertilizers used for large fragmentation charges.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Any of the detonators or explosive charges would be listed as a dangerous waste stream and would require specialized and trained personnel for handling operations. As the explosives industry is highly regulated, an examination of previous quarry permits would indicate what types, if any, of explosives were utilized.

Most quarry operations are conducted below the groundwater table, so constant pumping is required to keep the site dry. An abandoned or unused quarry can fill with water, and are often used as illegal dumping sites for hazardous materials. The intersection of the water table allows easy transport of the fuels and hazardous substances into the surface or groundwater.

## **SAMPLING STRATEGIES**



All waste materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the waste materials may represent a significant direct contact and/or inhalation hazard to assessment personnel. Explosives constitute a significant threat to personnel. Visually identified contaminated areas, waste piles or pits should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed to confirm the extent of the contamination. Once the contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

#### Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

#### Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticides/PCBs)

#### Total Kjeldahl Nitrogen (TKN) series

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET RAIL YARD FACILITIES**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Rail yard facilities are highly specialized facilities consisting of one or more areas including engine maintenance buildings, fueling areas, track and switching areas, and track maintenance/material storage yards. The engine maintenance building was used to perform a wide variety of work on train engines.

## **CHARACTERISTIC RAW MATERIALS**

The raw materials associated with this industry are primarily used in fueling and maintenance operations. Numerous solvents, paints, coatings, PCB oils, creosote compounds, and degreasers were commonly used and stored in maintenance and storage areas.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Typical contamination includes degreasing solvents, PCBs from engines and electrical equipment, and some heavy metals. Since most newer train engines use diesel fuel, diesel range organics (DRO) may be a common contaminant of the surface and subsurface soils and shallow groundwater in engine fueling areas. Track and switching areas may have DRO and oil-contaminated surface soils and rail ballast due to the constant use and repetitive minor leakage of engines and rail cars. The maintenance/material storage yard areas used a wide variety of solvents, paints, treated railroad ties and wastes. Historical leakage due to poor housekeeping and spills of oils, hazardous materials, paints, solvents, and creosote from railroad ties, account for the majority of the contamination incurred. Due to the volume and concentration of the hazardous materials shipped via rail, special attention should be given to areas where historical tank car releases of hazardous materials have occurred.

Common waste products encountered at Superfund assessment and remediation projects include PCB-contaminated soils and run-off from electrical generation areas and maintenance shops, DRO-contaminated soils and groundwater from fueling operations and

leaking above- and below-ground storage tanks, solvent-contaminated soils and groundwater from maintenance and painting operations, and miscellaneous heavy metals contamination associated with many industrial operations.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

It should be noted that site contaminants may contain solvents, PCBs and fuels which may represent a direct contact and/or inhalation hazard to assessment personnel. Visually identified spill or stained areas may be screened with a variety of soil screening kits for PCBs, chlorinated compounds, BTEX or other compounds. Rail yards may have numerous and highly varied sources and extents of contamination. A historical information search should be conducted to determine areas of historical use, storage or spills of hazardous materials and oil.

Once potential source areas are identified, surface and subsurface soil sampling should be performed to confirm contamination and determine the extent of contamination. Augering or drilling may be difficult due to the hazards associated with an operational rail yard or maintenance area. The applicability of non-intrusive subsurface geophysics may be limited due to the presence of large metal objects and high voltage electrical equipment and transmission lines.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

DRO Analysis (suspected fuel releases)

Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticides/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET RADIATION**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Radioactive compounds can be encountered in various industrial/commercial settings. The majority of radiation sites which could be encountered under the Brownfield initiatives may be divided into two primary categories: research/medical facilities and mining/refining operations. Research/medical facilities include research laboratories, universities, x-ray photography facilities, munitions and instrument manufacturing plants, and hospitals. Mining/refining operations include pit and shaft mining locations, ore handling and refining facilities, and tailings piles.

## **CHARACTERISTIC RAW MATERIALS**

The majority of the mining and refining operations in the United States involve thorium and uranium ores and related compounds. The research/medical fields utilize primarily isotopes of cesium, cobalt, and radium. The munitions industry fabricates spent uranium into dense armor-piercing projectiles.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

The half-life is the length of time necessary for one-half of the atoms of a radioactive substance to decay to some other isotope. Many research/medical radioactive materials and wastes are stored on site until the radioisotopes become stabilized through relatively short half-life decay cycles. There is the potential for human and multi-media environmental contamination during these cycles if the radioactive materials are not properly managed.

The three types of ionizing radiation which represent the greatest human health concern at redevelopment sites are alpha, beta, and gamma radiation. Particulate radiation (alpha, beta) are released during the decay cycle and may deposit on almost any surface. This

form of radiation contamination can affect soil, surface water, ground water, and air quality as the high energy particles are transported away from the original sources.

Contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and monitoring of these of these materials may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

Once radioactive materials are detected, the site should be screened for the radiation types present in the corresponding decay chain. Soil samples may be taken to confirm the activity at areas identified during the site screening from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid monitoring or sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, filled lagoons, process lines and underground storage tanks.

On-site and local wells and surface water may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

Air sampling can be conducted for radon gas or particulate radiation which are decay products of some radioactive materials. Dust sampling can also be conducted to detect radioactive particles which have collected on ledges or other unsuspecting areas.

### SUGGESTED ANALYTICAL PARAMETERS

Gross alpha/beta

Gamma spectroscopy

Radium

Radon gas

Specific radio isotopes

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET SCRAP METAL**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

The scrap metal industry purchases metals from various industrial and private sources for reuse in the fabrication of new metal stock and products. Sources of scrap metal include car parts, structural steel, electrical equipment, tanks and vats, and commercial salvage operations. Metals are sorted by type, compacted or shredded and stored prior to sale to an end user.

## **CHARACTERISTIC RAW MATERIALS**

Common metals found at scrap metal sites could include iron, steel, aluminum, copper, tin, brass, lead and zinc.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Heavy metals contamination is the main concern at a former scrap metal site. Soil contamination should be suspected. Waste piles of non-metallic materials may be present. These piles consist of materials which were associated with the original metal such as asbestos, foam padding and insulating materials. Other associated waste stream materials are trichloroethylene, trichloroethane, xylenes, benzene, ethyl benzene and toluene. PCB-contaminated soils may be at facilities which recovered copper and other metals from electrical equipment. Many scrap metal facilities utilize a wide variety of hydraulic equipment to move, compact and process scrap. Hydraulic oil and fuels may also contribute to soil contamination.

## **SAMPLING STRATEGIES**

Soil samples should be taken around the facility from sumps, drainage swales or discolored areas. Heavy metals contamination should also be suspected in any nearby waterway.

Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, process lines and underground tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

#### SUGGESTED ANALYTICAL PARAMETERS

Heavy metals analysis, including (include lead, nickel, copper, chromium and zinc)

Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticide/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET SALVAGE YARDS**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Salvage yards accept a wide variety of materials, depending on the type of salvage yard (i.e. auto, tank, etc.), to be disassembled to recover parts or reusable scrap metals, plastics or building aggregates. The non-recyclable components are then stored on site or sent to a municipal landfill. Salvage yards often contain a wide variety of materials and containers due to the nature of their business; however, automobile salvage is the most common.

## **CHARACTERISTIC RAW MATERIALS**

This industry typically uses hydraulic oils for heavy equipment, compressed gases for metal cutting operations, and petroleum-based materials as solvents. These materials are usually received by the facility in compressed gas cylinders and small containers, but are occasionally obtained in larger quantities. The following chemical compounds are/were commonly found in scrap yards:

Acetylene Gas (g)	Common Solvents (l)	Rubber (s)
Compressed Oxygen (g)	Automotive Fluids (l)	Degreasing Agents (s/l)
Gasoline (l)	Hydraulic Oils (l)	Fuel Additives (l)
Diesel Fuels (l)	Common Lubricants (s/l)	Asbestos (s)
Lead (s)	Sulfuric Acid (l)	

(g) - gas      (l) - liquid      (s) - solid

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

In addition to the compounds used by the facility, waste products were stored in the scrap and are also present in varying concentrations. On-site waste piles, burial pits, and bulk storage tanks were common storage techniques prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Common waste products encountered at Superfund assessment and remediation projects include



fuels, waste oils, used solvents, tires and/or rubber sealing agents, asbestos insulation, oil sludges, old battery casings, and compressed gas cylinders. Fuel, oil and solvent contaminated soils and groundwater may be present due to poor housekeeping, repetitive small spills, leaking bulk storage tanks and run-off from waste piles.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

### SAMPLING STRATEGIES

All raw materials encountered on-site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing organic and PCB compounds may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and burial pits should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated areas are established, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits and underground storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Asbestos (if suspected)

Cyanide Analysis

Heavy Metals Analysis:

Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent/total)
Copper	Lead	Mercury	Nickel	Selenium
Silver	Thallium	Zinc		

Priority Pollutant Organic Analysis (volatiles, semivolatiles, pesticide/PCBs)

Total Petroleum Hydrocarbons (TPH) Analysis

**BROWNFIELD ASSESSMENTS**  
**INDUSTRY PROFILE FACT SHEET**  
**STEEL MANUFACTURING - ELECTRIC ARC/COKE**

**INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

**INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Steel is the generic name for a group of ferrous metals composed principally of iron ore, scrap metal, coke, and or limestone (depending on furnace type). Other materials may be added to enhance the engineering properties or appearance of the steel. Historically, most of the steel was made in an open-hearth furnace where scrap metal, processed iron ore and fuel were introduced into the furnace in the presence of heated air to create molten steel. More recently, electric arc furnaces utilizing electrodes have been used to melt scrap into molten steel. Then the molten steel is poured into ingots or casts which are shipped to other plants for fabrication into other steel products.

**CHARACTERISTIC RAW MATERIALS**

Modern steel making relies primarily on scrap metal. Additives, including molybdenum, nickel, titanium and chrome, are used to improve the engineering qualities and appearance of the steel. Oxidation is used to remove unwanted elements by forming oxides which enter the furnace stack gas or the oven slag.

Older open-hearth furnace systems utilized iron ore, scrap, coke and limestone to manufacture the raw steel. These furnaces included coking ovens where coal was heated in a low oxygen atmosphere to volatilize the impurities into an oven or furnace gas, which was transferred to a by-products recovery plant. Common by-products recovered include natural gas, benzene, toluene, xylenes, phenol, creosols, pyridine, anthracene, naphthalene, sulfuric acid, light oils, paraffin and ammonia sulfates and nitrates.

**WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Modern furnaces often have very large scrap yards; older furnaces had iron ore storage areas, coke storage areas, product storage areas, waste piles, and wastewater lagoon areas. Modern plants may generate wastewater, oven slag, oven ash and materials from the air pollution control equipment as waste streams. Waste products associated with

older operations may include coal tar, hydrogen sulfide gas, complex cyanide salts, coal fines, quenching wastewater, process still bottoms, slag, and sulfuric acid. The metals concentration in the ash is dependent on the furnace type, plant configuration and content of the original fuel. The most common metals include aluminum, iron, lead, manganese, sulfur, nickel, and chromium. Common waste products encountered at Superfund assessment and remediation projects contain high concentrations of polynuclear aromatic hydrocarbons (PAHs), sulfur compounds, and complex cyanide, volatile or phenolic compounds. Other inorganic compounds are not typically encountered at significant levels.

Large volumes of wastewater are generated in coke quenching and steel processing operations. This wastewater is commonly stored in large on-site surface impoundments. Coal tars, coal fines, sludges and tank bottoms may be encountered in waste piles and large tar pits. Groundwater may be contaminated as a result of leaching or percolation of surface and subsurface contaminants, surface impoundments or leaking process lines and tanks.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Associated heat transmission equipment, such as boilers or furnaces, and electrical equipment may contain significant amounts of asbestos and PCBs. Decontamination, asbestos remediation, wipe testing and other analysis of this material may be required prior to off-site landfill disposal or scrapping of process equipment.

### SAMPLING STRATEGIES

All waste materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the waste materials may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and lagoons should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed to confirm the extent of the contamination. Once the contaminated areas are established by using field screening techniques, grid or random sampling may be performed to confirm the suspected clean areas. The application of non-intrusive subsurface geophysics should be evaluated to detect subsurface pits, process lines and chemical storage tanks.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Priority Pollutant Metals Analysis

Priority Pollutant Organics Analysis (volatiles, semivolatiles, pesticide/ PCBs)

Sulfate/Sulfide Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET TIRE FIRES**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Tire storage areas can potentially have thousands and up to millions of tires stored at one location. These storage areas are often non-regulated from a state or federal perspective. In many cases, local license and inspection or nuisance ordinances are the only potentially applicable regulations.

## **CHARACTERISTIC RAW MATERIALS**

Many types of materials are combined in the tire production process, including formic acid, lead, naphtha, adhesives, oils, and steel belts.

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

Tire fires generate irritant smoke from the incomplete or pyrolytic (oxygen deficient) combustion that can affect areas far from the fire itself. Water from fire fighting efforts can travel to local rivers and streams, causing contamination and possible fish kills downstream. A pyrolytic oily tar material may be formed during a large, prolonged tire fire, causing constituent materials to recombine chemically and form a more toxic group of substances in soils and surface waters.

## **SAMPLING STRATEGIES**

Soil samples should be taken at any areas that have been impacted by a tire fire. Water samples should also be obtained from contained fire run-off or run-off impacted waterways in the immediate area.

Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminated

areas are established, grid or random sampling may be performed to confirm the suspected clean areas.

On-site and local wells may be sampled if groundwater is an environmental concern. Installation of monitoring wells or other groundwater sampling techniques should be evaluated if it is necessary to fill data gaps.

### SUGGESTED ANALYTICAL PARAMETERS

Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) Analysis

Polyaromatic Hydrocarbons (PAHs) Analysis

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET TANNING FACILITY**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

Tanning is the process of manufacturing leathers from animal hides. Before shipping to the tanning facility, animal hides are preserved with a brine solution. A typical tanning facility consists of three sections: the beam house, tanning room, and finishing area. In the beam, house salt and hair are removed from the hide. The hides are then pickled with sulfuric acid to a pH of less than 3. During the tanning process the tanning solution is allowed to fully penetrate the hide. The most common tanning solution is trivalent chromium sulfate solution. The pH is then raised slowly with sodium bicarbonate and dried. In the finishing area, the hide surface is treated and dyed as required.

## **CHARACTERISTIC RAW MATERIALS**

This industry typically uses chemicals for dehairing, liming, deliming, tanning and curing. The following chemicals are/were commonly utilized in tanning industries:

Trivalent chromium sulfate	Sodium bicarbonate
Sodium sulfide or sodium sulfhydrate	Arsenic or cyanide as sharpening agent
Ammonium sulfate	Sulfuric acid
Lime	Aniline dyes

## **WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA**

On-site waste piles, pits and vats were common treatment/storage techniques prior to the promulgation and enforcement of the Resource Conservation and Recovery Act of 1976 (RCRA). Common waste products encountered at Superfund assessment and remediation projects include solid and liquid wastes containing trivalent chromium sulfate, corrosive liquids and sludges, volatile organic compounds, metals, cyanides, and sulfides, in addition to unused raw materials. These compounds often are absorbed into building walls, floors, ceilings and underlying soils.

## SAMPLING STRATEGIES

All raw materials encountered on site should be visually identified and confirmed using immuno-assay, qualitative indicators, or wet chemistry field screening techniques. It should be noted that many of the raw materials containing corrosive and cyanide compounds may represent a significant direct contact and/or inhalation hazard to assessment personnel. Visually identified contaminated areas, waste piles and storage tanks should be characterized by collecting several samples for laboratory analysis. Surface and subsurface soil sampling should be performed from the suspected contaminated areas outward to the suspected clean areas. Once the primary contaminants are established, grid or random sampling may be performed to confirm suspected clean areas. Application of non-intrusive subsurface geophysics should be evaluated to detect underground burial pits, process lines and storage tanks.

Additionally, contaminated buildings and the associated demolition debris may be encountered at abandoned or inactive sites. Decontamination and wipe testing of this material may be required prior to off-site landfill disposal.

Nearby surface water, on-site and local wells may be sampled if surface or groundwater is an environmental concern.

## SUGGESTED ANALYTICAL PARAMETERS

Arsenic Analysis

Cyanide Analysis

Chromium (hexavalent/total) Analysis

pH analysis

Sodium Analysis

Sulfides Analysis

Target Compound List (TCL) Analysis

Priority Pollutant Organics Analysis (volatile, semivolatile, pesticide/PCBs)

# **BROWNFIELD ASSESSMENTS INDUSTRY PROFILE FACT SHEET WOOD TREATING FACILITY**

## **INTRODUCTION**

This Industry Profile Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist state, local, and municipal agencies, and private groups in the initial planning and evaluation of sites being considered for remediation, redevelopment or reuse. It is intended to provide a general description of site conditions and contaminants which may be encountered at specific industrial facilities. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive.

## **INDUSTRY, PROCESS, OR SITE DESCRIPTION**

A wood treating facility normally consists of a wood or log preparation area, process building with pressure vessels, and numerous chemical storage tanks, drip or drying areas and a roofed wood storage area. Wood was treated with a preservative compound which was injected using a steam and pressure or dipping process. Some facilities have components of a water treatment system.

## **CHARACTERISTIC RAW MATERIALS**

If the facility was active before 1980, they may have used coal tar creosote and/or pentachlorophenol for treating the wood. If the facility started after 1980, it is more likely that chromium, copper and arsenic (CCA) was used for treating wood.

Oily waste with tar or creosote oil and pentachlorophenol are the main contaminants from a wood treating industry.

Coal tar creosote, pentachlorophenol (PCP) and CCA are used as preservatives in the wood treating industry. Waste generated consists of water squeezed from the wood during processing, retort and cylinder sludge, process waste and spillage. Existence of less toxic forms of dibenzo-dioxins may also be associated with the waste and associated contaminated soils.

If the industry used CCA for treating the wood, then copper, chromium and arsenic would be the main contamination concern in the soil, surface water, groundwater and the sludge beneath the pit, lagoon or tank.



## WASTE STREAMS AND POTENTIALLY AFFECTED ENVIRONMENTAL MEDIA

Wastewater generated during the treatment process, slugs, and tank bottoms is generally treated or stored on site in lined or unlined lagoons. If the lagoons are lined and monitored regularly, associated groundwater contamination is less likely. Unlined lagoons are a constant source of surface water as well as groundwater contamination.

## SAMPLING STRATEGIES

Typically, the highest levels of soil contamination will be found in the drip areas adjacent to the pressure vessels, under the bulk storage tanks and beneath the lagoons. Soil samples should be collected in and around the facility as well as in any sumps or discolored area that may be present. Sludge samples should also be collected from the bottom of unlined lagoons, if sludge exists.

Groundwater samples should be collected from the top of the water table. An understanding of the hydrogeology of the underground strata is necessary to identify the sampling location for groundwater collection.

Additionally, contaminated buildings and associated demolition debris may be encountered at the abandoned wood treating facility. Decontamination and wipe sampling of these materials may be required prior to off-site landfill disposal.

## SUGGESTED ANALYTICAL PARAMETERS

Chromium, copper and arsenic analysis (if CCA is used in the industry)

Semivolatile organics analysis (if Polynuclear Aromatic Hydrocarbons, creosote, and pentachlorophenol is suspected)

## BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF VOLATILE ORGANIC COMPOUNDS

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

A volatile organic compound is an organic compound which has a boiling point below that of water and which can easily vaporize or volatilize.

### LIST OF VOLATILE ORGANIC COMPOUNDS \*

Chloromethane	Total-1,2-dichloroethene	Cis-1,3-dichloropropene	Tetrachloroethene
Bromomethane	Chloroform	Trichloroethene	1,1,2,2-Tetrachloroethane
Vinyl chloride	1,2-Dichloroethane	Dibromochloromethane	Toluene
Chloroethane	2-Butanone	1,1,2-Trichloroethane	Chlorobenzene
Methylene chloride	1,1,1-Trichloroethane	Benzene	Ethylbenzene
Acetone	Carbon tetrachloride	Trans-1,3-dichloropropene	Styrene
Carbon disulfide	Vinyl acetate	Bromoform	Total Xylenes
1,1-Dichloroethene	Bromodichloromethane	4-Methyl-2-pentanone	
1,1-Dichloroethane	1,2-Dichloropropane	2-Hexanone	

\* **Please note:** The list above corresponds to the EPA Contract Laboratory Program (CLP) volatile list, and is not a complete list of all toxic volatile organic compounds. If the site history suggests a volatile organic compound may be present which is not on this list, the compound should be included in the requested analysis.

### ANALYSIS METHODS

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of volatile organic compounds. In addition, these are not drinking water test methods.

METHOD	APPLICABLE MATRICES
EPA 624 (1)	Aqueous
EPA SW-846 5030/8240 OR 5030/8260 (2)	Aqueous, Soil/Sediment, & Waste
EPA CLP Statement Of Work 3/90	Aqueous & Soil/Sediment

(1) U.S. Environmental Protection Agency (EPA). 1992. *Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. Washington, D.C. July.

(2) EPA. 1986. *Test Methods for Evaluating Solid Waste*. SW-846. Washington, D.C. September.

### COLLECTION MEDIA/VOLUME

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE	HOLDING TIME
Soil/Sediment	4-oz soil VOA jar	1 4-oz jar	ice to 4° C	14 days
Aqueous	40-mL VOA vial	2 40-ml vials	HCl to pH < 2 & ice to 4° C	14 days if preserved with HCl 7 days without HCl
Waste	4 or 8-oz wide mouth jar	1 4-oz jar	none required (ice preferred)	none (try not to exceed 14 days)

## MINIMUM LABORATORY QUALITY CONTROL MEASURES

The laboratory should have Standard Operating Procedures available for review for the volatile organic analyses and for all associated methods needed to complete the volatile analysis, such as total solids procedures, instrument maintenance procedures, procedures for sample handling, and sample documentation procedures. In addition, the laboratory should have a Laboratory Quality Assurance/Quality Control Statement available for review which includes all key personnel qualifications.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Gas Chromatograph/Mass Spectrometer (GC/MS) Tuning	Once per day or more frequently if required by method	See method criteria for acceptable limits
Initial Calibration	Prior to analysis of samples (minimum three concentration levels for every compound and an instrument blank)	% Relative Standard Deviation of Response Factors of $\leq 30$ (See method for any allowable variations), and a minimum Response Factor of $\geq 0.05$ (see method for calculation)
Continuing Calibration	Once per day (mid-level standard containing all compounds) or more frequently if required by method	% Difference for Response Factor of $\leq 25$ (see method for any allowable variations), and a minimum Response Factor of $\geq 0.05$ (see method for calculation)
Method Blank	Once per day	See method for allowable limits
Internal Standards	Three per sample (see method for suggested internal standard compounds)	-50% to + 100% of Daily standard area and retention time shift (limits depend if packed or capillary column, see method)
Matrix Spike/Matrix Spike Duplicate	One set of MS/MSD per 20 samples or analysis set	See method for allowable limits
Surrogate Spikes	Added to each sample (see method for suggested surrogate compounds)	Report recovery

## MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Return copy of the chain of custody form sent with the samples with laboratory receipt acknowledgment, and the internal or laboratory chain of custody forms.
- Method blank results.
- GC/MS tuning data summary.
- GC/MS initial and continuing calibration data summary forms.
- GC/MS internal standard data for samples and associated daily standard.
- Surrogate spike recoveries, either on a separate table or with the results, including laboratory QC limits.
- Matrix spike recovery tables, including laboratory recovery and relative percent difference QC limits.
- Date samples were analyzed, on a separate sheet, tune sheet, or results page.
- Optional: sample, standard and blank chromatograms, quantitation sheets, mass spectra, instrument run logs, and total solids logs.

**Note:** The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

# BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF SEMIVOLATILE ORGANIC COMPOUNDS

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

A semivolatile organic compound is an organic compound which has a boiling point higher than water and which may vaporize when exposed to temperatures above room temperature. Semivolatile organic compounds include phenols and polynuclear aromatic hydrocarbons (PAH).

## LIST OF SEMIVOLATILE ORGANIC COMPOUNDS \*

Phenol	4-Chloroaniline	Phenanthrene
Bis(2-chloroethyl)ether	Hexachlorobutadiene	Anthracene
2-Chlorophenol	4-Chloro-3-methylphenol	Carbazole
1,3-Dichlorobenzene	2-Methylnaphthalene	Di-n-butylphthalate
1,4-Dichlorobenzene	Hexachlorocyclopentadiene	Fluoranthene
1,2-Dichlorobenzene	2,4,6-Trichlorophenol	Pyrene
2-Methylphenol	2,4,5-Trichlorophenol	Butylbenzylphthalate
Bis(2-chloroisopropyl)ether	2-Chloronaphthalene	3,3'-Dichlorobenzidine
4-Methylphenol	2-Nitroaniline	Benzo(a)anthracene
n-Nitroso-di-n-propylamine	Dimethylphthalate	Chrysene
Hexachloroethane	Acenaphthylene	Bis(2-ethylhexyl)phthalate
Nitrobenzene	2,6-Dinitrotoluene	Di-n-octylphthalate
Isophorone	3-Nitroaniline	Benzo(b)fluoranthene
2-Nitrophenol	Acenaphthene	Benzo(k)fluoranthene
2,4-Dimethylphenol	2,4-Dinitrophenol	Benzo(a)pyrene
Bis(2-chloroethoxy)methane	4-Nitrophenol	Indeno(1,2,3-cd)pyrene
2,4-Dichlorophenol	4-Bromophenyl-phenylether	Dibenz(a,h)anthracene
1,2,4-Trichlorobenzene	Hexachlorobenzene	Benzo(g,h,i)perylene
Naphthalene	Pentachlorophenol	

**\* Please note:** The list above corresponds to the EPA Contract Laboratory Program (CLP) semivolatile organic list, and is not a complete list of all toxic semivolatile organic compounds. If the site history suggests a semivolatile organic compound may be present which is not on this list, the compound should be included in the requested analysis.

## ANALYSIS METHODS

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of semivolatile organic compounds. In addition, these are not drinking water test methods.

METHOD	APPLICABLE MATRICES
EPA 625 or 1625 (1)	Aqueous
EPA SW-846 3010 or 3020/8250 or 8270 (2)	Aqueous
EPA SW-846 3500 or 3550/8250 or 8270 (2)	Soil/Sediment & Waste
EPA CLP Statement of Work 3/90	Aqueous & Soil/Sediment
EPA SW-846 8100 or 8310 (2) 610 (1)	Water and Soil/Sediment for PAH
EPA SW-846 8040 (2) or 604 (1)	Water and Soil/Sediment for Phenols

(1) U.S. Environmental Protection Agency (EPA). 1992. *Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. Washington, D.C. July.

(2) EPA. 1986. *Test Methods for Evaluating Solid Waste*. SW-846. Washington, D.C. September.

## COLLECTION MEDIA/VOLUME

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE	HOLDING TIME
Soil/Sediment	8-oz wide mouthed jar	1 8-oz jar	ice to 4° C	14 days
Aqueous	32-oz amber bottle	2 amber bottles	ice to 4° C	7 days
Waste	8-oz wide mouth jar	1 8-oz jar	none required (ice preferred)	none (try not to exceed 14 days)

## MINIMUM LABORATORY QUALITY CONTROL MEASURES

The laboratory should have Standard Operating Procedures available for review for the semivolatile organic compound analyses and for all associated methods needed to complete the semivolatile analysis, such as total solids, instrument maintenance, sample handling, and sample documentation procedures. In addition, the laboratory should have a Laboratory Quality Assurance/Quality Control Statement available for review which includes all key personnel qualifications.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Gas Chromatograph/Mass Spectrometer (GC/MS) Tuning	Once per day or more frequently if required by method	See method criteria for acceptable limits
Initial Calibration	Prior to analysis of samples (minimum three concentration levels for every compound and an instrument blank)	% Relative Standard Deviation of Response Factors of $\leq 30$ (see method for any allowable variations), and a minimum Response Factor of $\geq 0.05$ (see method for calculation)
Continuing Calibration	Once per day (mid-level standard containing all compounds) or more frequently if required by method	% Difference for Response Factor of $\leq 25$ (see method for any allowable variations), and a minimum Response Factor of $\geq 0.05$ (see method for calculation)
Method Blank	Once per extraction batch	See method for allowable limits
Internal Standards	Six per sample (see method for suggested internal standard compounds)	-50% to + 100% of Daily standard area and retention time shift (limits depend if packed or capillary column, see method)
Matrix Spike/Matrix Spike Duplicate	One set of MS/MSD per 20 samples or analysis set	See method for allowable limits
Surrogate Spikes	Added to each sample (see method for suggested surrogate compounds)	Report recovery

## MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Return copy of the chain of custody form sent with the samples with laboratory receipt acknowledgment, and the internal or laboratory chain of custody forms.
- Method blank results.
- GC/MS tuning data summary.
- GC/MS initial and continuing calibration data summary forms.
- GC/MS internal standard data for samples and associated daily standard.
- Surrogate spike recoveries, either on a separate table or with the results, including laboratory QC limits.
- Matrix spike recovery tables, including laboratory recovery and relative percent difference QC limits.
- Date samples were analyzed, on a separate sheet, tune sheet, or results page.
- Optional: sample, standard and blank chromatograms, quantitation sheets, mass spectra, instrument run logs, and total solids logs.

Note: The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

## BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF NITROAROMATICS AND NITROGLYCERINE

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

Nitroaromatic compounds are compounds usually associated with explosive manufacturing and ordnance facilities. Nitroaromatic compounds include TNT, DNT, RDX, and HMX.

### ANALYSIS METHODS

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of nitroaromatics and nitroglycerine. In addition, these are not drinking water test methods.

TEST	ANALYSIS METHOD
Nitroaromatics	8090, 8330 (2), or 609 (1)
Nitroglycerine	8332 (2)

(1) U.S. Environmental Protection Agency (EPA). 1992. *Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. Washington, D.C. July.

(2) EPA. 1986. *Test Methods for Evaluating Solid Waste*. SW-846. Washington, D.C. September.

### COLLECTION MEDIA/VOLUME

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE	HOLDING TIME
Soil/Sediment	8-oz soil jar	1 8-oz jar	ice to 4° C	7 days
Water	32-oz amber bottle	1 32-oz bottle	ice to 4° C	7 days

### MINIMUM LABORATORY QUALITY CONTROL MEASURES

The laboratory should have Standard Operating Procedures available for review for the nitroaromatics and nitroglycerine analyses and for all associated methods needed to complete these analyses, such as total solids, instrument maintenance, sample handling, and sample documentation procedures. In addition, the laboratory should have available for review a Laboratory Quality Assurance/Quality Control Statement which includes all key personnel qualifications.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Initial Calibration	Prior to analysis of samples (minimum three concentration levels for every compound and an instrument blank)	Correlation Coefficient for all analyses should be >0.995. blank concentration should not exceed twice the instrument detection limit
Continuing Calibration	Once per 10 samples (mid-level standard containing all compounds) and a continuing calibration blank	Within 10% of true value Blank concentration should not exceed twice the instrument detection limit
Method Blank	Once per extraction set	See method for allowable limits
Matrix Spikes	One per set or per 20 samples	75-125%
Duplicates	One per set or per 20 samples	

#### MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Returned copy of the chain of custody form sent with the samples with laboratory receipt acknowledgment, and the internal or laboratory chain of custody forms.
- Method blank results.
- Initial and continuing calibration data summary forms.
- Matrix spike recovery tables, including laboratory recovery QC limits, and duplicate relative percent difference QC limits.
- Date samples were analyzed, on a separate sheet, or results page.
- Optional: sample, standard and blank instrument printouts, instrument run, digestion, and total solids logs.

**Note:** The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

# BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF ORGANOPHOSPHOROUS PESTICIDES AND HERBICIDES

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

## ORGANOPHOSPHOROUS PESTICIDES COMPOUNDS \*

## HERBICIDE COMPOUNDS

Azinphos Methyl	Fenthion	2,4-D
Bolstar	Merphos	2,4-DB
Chlorpyrifos	Mevinphos	2,4,5-T
Coumaphos	Naled	2,4,5-TP (Silvex)
Demeton-O	Parathion Methyl	Dalapon
Demeton-S	Phorate	Dicamba
Diazinon	Ronnel	Dichlorprop
Dichlorous, Disulfoton	Stirophos (Tetrachlorinphos)	Dinoseb
Ethoprop	Tokuthion (Prothiofos)	MCPA
Fensulfothion	Trichloronate	MCP

**\* Please note:** The list above corresponds to pesticide and herbicide lists contained in the methods listed below, and is not a complete list of all toxic pesticide or herbicide compounds. If the site history suggests a pesticide or herbicide compound may be present which is not on this list, the compound should be included in the requested analysis.

## ANALYSIS METHODS

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of pesticide or herbicide compounds. In addition, these are not drinking water test methods.

METHOD	APPLICABLE MATRICES
EPA 615 (1) or EPA SW-846 3010 or 3020/8150 (2)	Aqueous Herbicides
EAP 614 (1) or EPA SW-846 3010 or 3020/8140 (2)	Aqueous Pesticides
EPA SW-846 3500 or 3550/8150 (2)	Soil/Sediment & Waste Herbicides
EPA SW-846 3500 or 3550/8140 (2)	Soil/Sediment & Waste Pesticides

(1) U.S. Environmental Protection Agency (EPA). 1992. *Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. Washington, D.C. July.

(2) EPA. 1986. *Test Methods for Evaluating Solid Waste*. SW-846. Washington, D.C. September.

## COLLECTION MEDIA/VOLUME

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE	HOLDING TIME
Soil/Sediment	8-oz wide mouth jar	1 8-oz jar	ice to 4° C	14 days
Aqueous	32-oz amber bottle	2 amber bottles	ice to 4° C	7 days
Waste	8-oz wide mouth jar	1 8-oz jar	none required (ice preferred)	none (try not to exceed 14 days)



### MINIMUM LABORATORY QUALITY CONTROL MEASURES

The laboratory should have Standard Operating Procedures available for review for the organophosphorous pesticide or herbicide analyses and for all associated methods needed to complete the pesticide or herbicide analysis, such as total solids, instrument maintenance, sample handling, and sample documentation procedures. In addition, the laboratory should have a Laboratory Quality Assurance/Quality Control Statement available for review which includes all key personnel qualifications.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Initial Calibration	Prior to analysis of samples (minimum three concentration levels for every compound and an instrument blank) and every 72 hours thereafter	% Relative Standard Deviation of Response Factors of $\leq 25$ (see method for any allowable variations), and a minimum Response Factor of $\geq 0.05$ (see method for calculation), also resolution check criteria must be met, and retention time windows established
Continuing Calibration	Once every 10 sample runs (mid-level standard)	% Difference for Response Factor of $\leq 25$ (see method for any allowable variations), a minimum Response Factor of $\geq 0.05$ (see method for calculation), and retention times must be within windows
Second Column Confirmation	All hits	All hits must be confirmed on a dissimilar column from original analysis
Method Blank	Once per extraction batch	See method for allowable limits
Matrix Spike/Matrix Spike Duplicate	One MS/MSD per 20 samples or per extraction set	See method for limits
Surrogate Spikes	Added to each sample (see method for suggested surrogate compounds)	Report recovery

### MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Returned copy of the chain of custody form sent with the samples with laboratory receipt acknowledgment, and the internal or laboratory chain of custody forms.
- Method blank results.
- GC initial and continuing calibration data summary forms.
- GC pesticide breakdown and resolution forms, and analytical sequence forms.
- Surrogate spike recoveries, either on a separate table or with the results, including laboratory QC limits.
- Matrix spike recovery tables, including laboratory recovery and relative percent difference QC limits.
- Date samples were analyzed, on a separate sheet, or results page.
- Optional: sample, standard and blank chromatograms, instrument run logs, and total solids logs.

**Note:** The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

# BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF TARGET ANALYTE METALS (HEAVY METALS) AND CYANIDE

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

## LIST OF TARGET ANALYTE METALS AND CYANIDE

Aluminum	Cobalt	Selenium
Antimony	Copper	Silver
Arsenic	Iron	Sodium
Barium	Lead	Thallium
Beryllium	Manganese	Vanadium
Cadmium	Magnesium	Zinc
Calcium	Mercury	Cyanide (Total)
Chromium (Total)	Nickel	Cyanide (Amenable)
Chromium (Hexavalent)	Potassium	

## ANALYSIS METHODS

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of metals and cyanide. In addition, these are not drinking water test methods.

METHOD	APPLICABLE MATRICES
EPA 200 Series (1)	Aqueous
EPA SW-846 Metals Digestion 3000 Series Analysis 7000 Series & 6010 (2) Cyanide 9010 or 9020 (2)	Aqueous, Soil/Sediment, & Waste
EPA CLP Statement Of Work 3/90	Aqueous & Soil/Sediment

(1) U.S. Environmental Protection Agency (EPA). 1983. *Test Methods for the Chemical Analysis of Water and Wastes*. Washington, D.C. March.

(2) EPA. 1986. *Test Methods for Evaluating Solid Waste*. SW-846. Washington, D.C. September.

## COLLECTION MEDIA/VOLUME

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE	HOLDING TIME
Soil/Sediment	8-oz soil jar	1 8-oz jar	ice to 4° C	28 days for metals; 14 days for cyanide; 24 hours for hexavalent chromium
Aqueous	1 liter polypropylene bottle	1 L bottle	metals: HNO <sub>3</sub> to pH < 2 & ice to 4° C, cyanide; NaOH to pH > 12 & ice to 4° C, hexavalent chromium; ice to 4° C	28 days 14 days 24 hours
Waste	8-oz wide mouth jar	1 8-oz jar	none required (ice preferred)	none (try not to exceed 14 days for cyanide)

### MINIMUM LABORATORY QUALITY CONTROL MEASURES

The laboratory should have Standard Operating Procedures available for review for the metals and cyanide analyses and for all associated methods needed to complete the volatile analysis, such as total solids, instrument maintenance, sample handling, and sample documentation procedures. In addition, the laboratory should have a Laboratory Quality Assurance/Quality Control Statement available for review which includes all key personnel qualifications.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Initial Calibration	Prior to analysis of samples (minimum three concentration levels for every compound and an instrument blank)	Correlation Coefficient for all analyses should be $> 0.995$ , ICP analysis should include interference checks, and serial dilutions, all furnace results should be acquired in duplicate and at least one cyanide standard must be extracted with the samples Blank concentration should not exceed twice the instrument detection limit
Continuing Calibration	Once per 10 samples (mid-level standard containing all compounds) and a continuing calibration blank	Within 10% of true value (20% for cyanide and mercury) Blank concentration should not exceed twice the instrument detection limit
Method Blank	Once per digestion or extraction set	See method for allowable limits
Matrix Spikes	One per set or per 20 samples	75-125%
Duplicates	One per set or per 20 samples	

### MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Returned copy of the chain of custody form sent with the samples with laboratory receipt acknowledgment, and the internal or laboratory chain of custody forms.
- Method blank results.
- Initial and continuing calibration data summary forms, including ICP interference forms and ICP serial dilution forms.
- Matrix spike recovery tables, including laboratory recovery QC limits, and duplicate relative percent difference QC limits.
- Date samples were analyzed, on a separate sheet, or results page.
- Optional: sample, standard and blank instrument printouts, instrument run logs, digestion logs, and total solids logs.

**Note:** The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

## BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF ASBESTOS

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

### ANALYSIS METHODS

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of asbestos. In addition, these are not drinking water test methods.

MATRIX	ANALYSIS METHOD
Soil/Solid	NIOSH 9002 (1)
Air	NIOSH 7400 or 7402 (1) OSHA ID160 (2)

(1) National Institute of Safety and Health (NIOSH). *NIOSH Manual of Analytical Methods*. Cincinnati, OH.

(2) Occupational Safety and Health Administration (OSHA). 1985 *OSHA Analytical Methods Manual*. Washington, D.C..

### COLLECTION MEDIA/VOLUME

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE
Soil/Solid	plastic zip locking bag	minimal	wet down
Air	MCE filter anti-static cassette, support pad	as per method	none

### MINIMUM LABORATORY QUALITY CONTROL MEASURES

The laboratory should have Standard Operating Procedures available for review for the asbestos analyses and for all associated methods needed to complete these analyses, such as total solids, instrument maintenance, sample handling, and sample documentation procedures. In addition, the laboratory should have a Laboratory Quality Assurance/Quality Control Statement available for review which includes all key personnel qualifications. It is also preferable that the laboratory chosen have current National Volunteer Laboratory Certification Program (NVLAP) Certification for the U.S. Department of Commerce National Institute of Standards Testing.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Initial Calibration	Prior to analysis	Instrument must meet manufacturers' specifications
Method Blank	Once per analysis set	See method for allowable limits
Duplicates	One per set or per 20 samples	

### MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Returned copy of the chain of custody form sent with the samples with laboratory receipt acknowledgment, and the internal or laboratory chain of custody forms.
- Method blank results.
- Optional: sample, standard and blank instrument printouts, and extraction or preparation logs.

**Note:** The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

# **BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF TOTAL PETROLEUM HYDROCARBONS, REACTIVE CYANIDE, REACTIVE SULFIDE, IGNITABILITY, AND CORROSIVITY**

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

## **ANALYSIS METHODS**

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of total petroleum hydrocarbons, reactive cyanide, reactive sulfide, ignitability, or corrosivity. In addition, these are not drinking water test methods.

TEST	ANALYSIS METHOD
Petroleum Hydrocarbons	418.1 (1)
Reactive Cyanide	SW-846 7.3.3.2 (2)
Reactive Sulfide	SW-846 7.3.4.1 (2)
Ignitability	SW-846 7.1 or 1010, 1020 (2)
Corrosivity	SW-846 7.2 or 9040, 9041, 9045 (2)

(1) U.S. Environmental Protection Agency (EPA). 1983 *Test Methods for the Chemical Analysis of Water and Wastes*. Washington, D.C. March.

(2) EPA. 1986. *Test Methods for Evaluating Solid Waste*. SW-846. Washington, D.C. September.

## **COLLECTION MEDIA/VOLUME**

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE	HOLDING TIME
Soil/Sediment	8-oz soil jar	1 8-oz jar	ice to 4° C	28 days for TPHC
Waste	8-oz wide mouth jar	1 8-oz jar	none required (ice preferred)	none (try not to exceed 28 days for cyanide)

## **MINIMUM LABORATORY QUALITY CONTROL MEASURES**

The laboratory should have Standard Operating Procedures available for review for the total petroleum hydrocarbons, reactive cyanide, reactive sulfide, ignitability, and corrosivity, and for all associated methods needed to complete these analyses, such as total solids, instrument maintenance, sample handling, and sample documentation procedures. In addition, the laboratory should have a Laboratory Quality Assurance/Quality Control Statement available for review which includes all key personnel qualifications.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Initial Calibration	Prior to analysis of samples (minimum three concentration levels for every compound and an instrument blank)	Correlation Coefficient for all analyses should be $>0.995$ Blank concentration should not exceed twice the instrument detection limit
Continuing Calibration	Once per 10 samples (mid-level standard containing all compounds) and a continuing calibration blank	Within 10% of true value Blank concentration should not exceed twice the instrument detection limit
Method Blank (does not apply to ignitability and corrosivity)	Once per extraction set	See method for allowable limits
Matrix Spikes (TPHC, reactive cyanide and reactive sulfide only)	One per set or per 20 samples	75-125%
Duplicates	One per set or per 20 samples	

#### MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Returned copy of the chain of custody form sent with the samples with laboratory receipt acknowledgment, and the internal or laboratory chain of custody forms.
- Method blank results.
- Initial and continuing calibration data summary forms.
- Matrix spike recovery tables, including laboratory recovery QC limits, and duplicate relative percent difference QC limits.
- Date samples were analyzed, on a separate sheet, or results page.
- Optional: sample, standard and blank instrument printouts, instrument run logs, digestion logs, and total solids logs.

**Note:** The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

# BROWNFIELD ASSESSMENTS FACT SHEET FOR ANALYSIS OF ORGANOCHLORINE PESTICIDE/POLYCHLORINATED BIPHENYL COMPOUNDS

This Fact Sheet is presented by the U. S. Environmental Protection Agency, Region III (EPA) to assist in the selection of analytical parameters and the associated Quality Assurance and Quality Control (QA/QC) procedures to be utilized in Phase II Environmental Assessments under the U.S. Environmental Protection Agency (EPA) Brownfields initiative. This fact sheet is presented for informational purposes only, and should not be construed as a federal policy or directive. The Brownfields Coordinator for this region may be reached at 215-566-5000.

## LIST OF ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYL (PCB) COMPOUNDS \*

Alpha-BHC	Endrin	Toxaphene
Beta-BHC	Endosulfan II	Aroclor 1016
Delta-BHC	4,4'-DDD	Aroclor 1221
Gamma-BHC (Lindane)	Endosulfan Sulfate	Aroclor 1232
Heptachlor	4,4'-DDT	Aroclor 1242
Aldrin	Methoxychlor	Aroclor 1248
Heptachlor Epoxide	Endrin Ketone	Aroclor 1254
Endosulfan I	Endrin Aldehyde	Aroclor 1260
Dieldrin	Alpha-chlordane	
4,4'-DDE	Gamma-chlordane	

**\* Please note:** The list above corresponds to the EPA Contract Laboratory Program (CLP) pesticide/PCB list, and is not a complete list of all toxic pesticide/PCB compounds. If the site history suggests a pesticide/PCB compound may be present which is not on this list, the compound should be included in the requested analysis.

## ANALYSIS METHODS

**Please note** that the methods listed below are EPA approved and the most commonly used by EPA and their contractors. However, they are not the only methods for the analysis of pesticide/PCB compounds. In addition, these are not drinking water test methods.

METHOD	APPLICABLE MATRICES
EPA 608 (1)	Aqueous
EPA SW-846 3010 or 3020/8080 (2)	Aqueous
EPA SW-846 3500 or 3550/8080 (2)	Soil/Sediment, & Waste
EPA CLP Statement of Work 3/90	Aqueous & Soil/Sediment

(1) U.S. Environmental Protection Agency (EPA). 1992. *Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. Washington, D.C. July.

(2) EPA. 1986. *Test Methods for Evaluating Solid Waste*. SW-846. Washington, D.C. September.

## COLLECTION MEDIA/VOLUME

Listed below are the EPA-recommended preservation and holding times as well as suggested glassware.

MATRIX	GLASSWARE	VOLUME	PRESERVATIVE	HOLDING TIME
Soil/Sediment	8-oz wide mouth jar	1 8-oz jar	ice to 4° C	14 days
Aqueous	32-oz amber bottle	2 amber bottles	ice to 4° C	7 days
Waste	8-oz wide mouth jar	1 8-oz jar	none required (ice preferred)	none (try not to exceed 14 days)



## MINIMUM LABORATORY QUALITY CONTROL MEASURES

The laboratory should have Standard Operating Procedures available for review for the organochlorine pesticide/PCB analyses and for all associated methods needed to complete the pesticide/PCB analysis, such as total solids, instrument maintenance, sample handling, and sample documentation procedures. In addition, the laboratory should have a Laboratory Quality Assurance/Quality Control Statement available for review which includes all key personnel qualifications.

QC TYPE	FREQUENCY OF ANALYSIS	ACCEPTABLE LIMITS
Initial Calibration Organochlorine Pesticides	Prior to analysis of samples (minimum three concentration levels for every compound and an instrument blank) and every 72 hours thereafter	% Relative Standard Deviation of Response Factors of $\leq 25$ (see method for any allowable variations), and a minimum Response Factor of $\geq 0.05$ (See method for calculation), also breakdown criteria must be met, resolution check criteria must be met, and retention time windows established
Initial Calibration PCBs	Minimum 1 fingerprint per Aroclor be analyzed prior to sample analysis and three concentration levels of any Aroclor detected in the samples be analyzed during or directly after sample analysis	% Relative Standard Deviation of Response Factors of $\leq 25$ (see method for any allowable variations), at least three peaks per Aroclor should be used to calculate response factors and identify Aroclors
Continuing Calibration	Once every 10 sample runs (mid-level standard containing pesticide compounds) or an Aroclor fingerprint	% Difference for Response Factor of $\leq 25$ (see method for any allowable variations), a minimum Response Factor of $\geq 0.05$ (see method for calculation), and retention times must be within windows
Second Column Confirmation	All pesticide hits Optional PCB hits	All pesticide hits must be confirmed on a dissimilar column from original analysis
Method Blank	Once per extraction batch	See method for allowable limits
Matrix Spike/Matrix Spike Duplicate	One MS/MSD per 20 samples or per extraction set	See method for limits
Surrogate Spikes	Added to each sample (see method for suggested surrogate compounds)	Report recovery

## MINIMUM DATA PACKAGE REQUIREMENTS

- Sample results in a tabular form (if soil or sediment) reported on a dry weight basis.
- Report % moisture or % solids for all soil and sediment samples.
- Report sample volumes or weights, as well as any dilution factors, for each sample analysis.
- Returned signed copy of the chain of custody form sent with the samples, and the internal or laboratory chain of custody forms.
- Method blank results.
- GC initial and continuing calibration data summary forms.
- GC pesticide breakdown and resolution forms, and analytical sequence forms.
- Surrogate spike recoveries, either on a separate table or with the results, including laboratory QC limits.
- Matrix spike recovery tables, including laboratory recovery and relative percent difference QC limits.
- Date samples were analyzed, on a separate sheet, or results page.
- Optional: sample, standard and blank chromatograms, instrument run logs, and total solids logs.

**Note:** The optional QC must be maintained by laboratory for at least one year for possible future QC audits.

# BROWNFIELDS CLEANUP FACT SHEET

INDUSTRY/SITE	CONTAMINANTS	CLEANUP TECHNOLOGY	COST GROUP (SEE SEC. 3)
ABANDONED CHEMICAL FACILITY	TAL METALS, TCL ORGANICS, ASBESTOS	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
ABANDONED OIL FACILITY	TCL ORGANICS, TPH	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		BIOREMEDIATION	D
		SOLVENT EXTRACTION	D
		INCINERATION	E
ABANDONED LABORATORY	TAL METALS, TCL ORGANICS CYANIDE	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
ASBESTOS PILE	ACM	ON-SITE LANDFILL	B
		OFF-SITE LANDFILL	G
AUTOBODY FACILITY	TAL METALS, TCL ORGANICS	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
BATTERY RECYCLING FACILITY	pH , TAL METALS	NEUTRALIZATION	F
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
BETHLEHEM ASBESTOS PILE	ACM	ON-SITE LANDFILL	B
		OFF-SITE LANDFILL	G

# BROWNFIELDS CLEANUP FACT SHEET

INDUSTRY/SITE	CONTAMINANTS	CLEANUP TECHNOLOGY	COST GROUP (SEE SEC. 3)
COAL TAR SITE	BTEX, CYANIDE, TAL METALS, PHENOL, SULFIDE/SULFATE	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		NEUTRALIZATION	F
DYE FACILITY	pH, TAL METALS, TCL ORGANICS	NEUTRALIZATION	F
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
DRUM RECYCLING FACILITY	pH, TAL METALS, CYANIDE	INCINERATION	E
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
ELECTROPLATING FACILITY	pH, TAL METALS, CYANIDE	NEUTRALIZATION	F
		INCINERATION	E
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		NEUTRALIZATION	D
GAS STATION	TAL METALS, DRO, GRO	BIOREMEDIATION	D
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		BIOREMEDIATION	D
MUNICIPAL LANDFILL	TAL METALS, TCL ORGANICS, pH, CYANIDE	OFF SITE DISPOSAL	C
		CAPPING ON SITE	B

# BROWNFIELDS CLEANUP FACT SHEET

INDUSTRY/SITE	CONTAMINANTS	CLEANUP TECHNOLOGY	COST GROUP (SEE SEC. 3)
PAINT FACILITY	TAL METALS, TCL ORGANICS	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
PESTICIDE FACILITY	TAL METALS, TCL ORGANICS	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
PETROLEUM RECYCLING FACILITY	TPH, TAL METALS, PCBs	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
PLASTIC MANUFACTURING FACILITY	TCL ORGANICS	NEUTRALIZATION	F
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		INCINERATION	E
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
PRINT SHOP	TAL METALS, TCL ORGANICS, pH	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
QUARRY	TAL METALS, TCL ORGANICS TOTAL KJELDAH NITROGEN	NEUTRALIZATION	F
		FILL WITH CLEAN MATERIAL	D

# BROWNFIELDS CLEANUP FACT SHEET

INDUSTRY/SITE	CONTAMINANTS	CLEANUP TECHNOLOGY	COST GROUP (SEE SEC. 3)
RAIL YARD	TAL METALS, TCL ORGANICS DRO AND PCBs	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		INCINERATION	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
SALVAGE YARD	pH, TAL METALS, TCL ORGANICS, CYANIDE, ASBESTOS	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		INCINERATION	E
SCRAP METAL	TAL METALS, TCL ORGANICS	NEUTRALIZATION	F
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
STEEL MANUFACTURING FACILITY	TAL METALS, TCL ORGANICS, SULFIDE/SULFATE	INCINERATION	E
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
TIRE FIRE	BTX, PAHs	NEUTRALIZATION	F
		INCINERATION	E
		SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		THERMAL DESORPTION	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		VACUUM EXTRACTION	D

# BROWNFIELDS CLEANUP FACT SHEET

INDUSTRY/SITE	CONTAMINANTS	CLEANUP TECHNOLOGY	COST GROUP (SEE SEC. 3)
TANNING FACILITY	TAL METALS, TCL ORGANICS, SULFIDE/SULFATE, pH, CYANIDE	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		SOLVENT EXTRACTION	D
		BIOREMEDIATION	D
		NEUTRALIZATION	F
		INCINERATION	E
WOOD TREATING FACILITY	CCA, SEMIVOLATILE, DI-OXINE	SOLIDIFICATION	A
		ON-SITE LANDFILL	B
		OFF-SITE DISPOSAL	C
		SOIL WASHING	D
		INCINERATION	E
		BIOREMEDIATION	D
		DECHLORINATION	D

# BROWNFIELDS CLEANUP FACT SHEET

## NOTES:

### 1. General

It should be noted that the actual selection of a cleanup technology will be dependent on community input, cleanup goals, site conditions and situations, the level and extent of contamination, the cost of equipment, materials and labor, and the future use of the site.

The approach and procedures presented in this document are intended solely for informational purposes. They are not intended, nor can they be relied upon to create any rights enforceable by any party in litigation with the United States Environmental Protection Agency (EPA). EPA officials may decide to follow the approach and procedures provided in this document, or to act at variance with the approach and procedures, based on an analysis of site circumstances. The agency also reserves the right to change this fact sheet at any time without public notice.

### 2. Abbreviations

ACM	Asbestos-Containing Material
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CCA	Chromium, Copper, Arsenic
DRO	Diesel Range Organics
GRO	Gasoline Range Organics
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
TAL	Target Analyte List
TCL	Target Compound List (Volatile, Semivolatile and Pesticide/PCBs)
TPH	Total Petroleum Hydrocarbon
TNT	Trinitrotoluene
UXO	Unexploded Ordnance

### 3. Cost Category

- A. Solidification (on-site) cost (including excavation and mixing) for 100 foot long by 100 foot wide by 15 foot deep area using cement lime is approximately \$150,000 or \$470 per ton.
- B. On-site land disposal cost (including excavation, transportation and back filling of the excavated area) for an area 100 foot by 100 foot is approximately \$70,000 to \$100,000.
- C. Off-site Disposal Cost:
- |  |                               |
|--|-------------------------------|
| Waste characterization                                       | \$1,000 to \$1,500 per sample |
| Transportation, one truck load, 250 miles one way            | \$1,200 per truck load        |
| Treatment and disposal of contaminated soil (no free liquid) |                               |
| Inorganic Waste  | \$600 to \$1,000 per ton      |
| Organic Waste  | \$400 to \$1,200 per ton      |
| Inorganic and Organic Waste                                  | \$500 to \$1,600 per ton      |
| Pesticide Waste  | \$1,500 to \$1,700 per ton    |

## BROWNFIELDS CLEANUP FACT SHEET

### Treatment and disposal of contaminated liquid

Inorganic Waste	\$900 to \$1,100 per ton
Organic Waste	\$850 to \$1,150 per ton
Inorganic and Organic Waste	\$1,000 to \$1,200 per ton
Pesticide Waste	\$1,200 to \$1,500 per ton

- D. Cost for remediation using these technologies varies according to the volume of the contaminated soil, the number of contaminants and the concentration of contaminants present in the treatment media. Without knowing the site details no cost could be provided for this document.
- E. Cost of incineration of bulk solid by Rotary Kiln is approximately \$800 to \$2,000 per ton.
- F. Soil with low pH can be treated with hydrated lime. Approximate cost of treatment is \$300 per acre including the cost of lime, equipment and manpower.
- G. Cost of off-site disposal (no treatment) to a landfill is approximately \$100 to \$200 per ton.