NORTECH

SUSTAINABLE ENVIRONMENT, ENERGY, HEALTH & SAFETY PROFESSIONAL SERVICES

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October 8, 2023

Sent by email to:
Flannery.Ballard@alaska.gov

Alaska Department of Environmental Conservation
PO Box 11800
Juneau, AK 99811-1800

ATTN: Flannery Ballard

RE: Kake Elementary School Site Visit and Sampling Work Plan
April 2022 Interior Paints and Concrete Sampling - PCB Results Summary

Dear Ms. Ballard:

NORTECH Environment, Energy, Health & Safety is pleased to submit this limited work plan (WP) as part of our providing professional services to the Alaska Department of Environmental Conservation (DEC) under the TRFP 18-530-23. This WP summarizes our approach to conducting a limited polychlorinated biphenyl (PCBs) in paint evaluation of exterior and interior paints at the former Kake Elementary School located downtown in Kake near the intersection of Church Street and Fourth Avenue. Our objective is to complete a site visit to coordinate with the City of Kake representatives, and to collect a limited number of paint samples to determine if PCBs are present in primary paint coatings on exterior and interior paints, if accessibility to the interior of the structure is granted.

Figure 1 - School location in downtown Kake, Alaska. (Google Map image, 2023).

Background

The school operated between 1952 and 1996 when it was closed following the construction of a new school. The building was originally constructed in 1951 with additions made in 1979 and 1986. The 1986 addition included the library located on the east side of the school, with a separate entrance. Previous ownership was the Presbyterian Church, who deeded the property to the City in 1989. The northwest portion of the roof collapsed into two classrooms (129 and 130) and the north end of hall 135 (south intersection of library and original structure). The floor area throughout the original portion of the structure has collapsed into the crawlspace. The interior walls were frame construction, and the classroom walls were typically of gypsum wallboard covered with wainscot. Exterior walls were wood framed with horizontal lap siding, with the exception of the southern wall which had vertically aligned siding. The property is currently condemned and the City deems the former school structure a safety and environmental hazard, and it is an attractive nuisance to the community.

Figure 2 - Looking southeast across top of school, showing collapsed roof in original school structure. (Photo courtesy of DEC Solid Waste Program, 2023.)

A hazardous building materials survey (HBMS) was completed on the structure in 2014. Asbestos containing materials (ACM) were detected as was the presence of lead classified as lead-containing material, but not requiring special handling or disposal requirements for lead. According to the report, the ACM materials present in floor tiles, mastic, joint compound, cement asbestos board, light fixtures, heat shields, and boiler gaskets and sealants are classified as friable ACM or may become friable if damaged. Due to the condition and instability of the structure, it was recommended that it may be necessary to leave all ACM in place and treat all demolition debris as asbestos-containing waste. With this understanding, cost estimates were developed for demolition and disposal for both on-island and off-island disposal with all material being managed as ACM, rather than a pre-demolition abatement and the remaining materials disposed as construction and demolition (C&D) debris.

Rationale for PCB Testing

PCBs have been detected in paint coatings on structures of the age of the original structure (1950's), and no testing for PCBs in paint was completed at the time of the HBMS. The presence of very low concentrations of PCBs can require disposal of any material coated with low-level PCBs in paint coatings to be disposed of out of state unless they are removed and managed separately. Abating painted surfaces can be difficult and time consuming and require additional confirmation sampling. With the building in a dilapidated condition such, if PCB abatement weas determined necessary, it may not be feasible or economical. The threshold for PBB concentrations is 1 part per million (ppm), although most landfills will not allow any detectable concentrations. The presence of PCBs in paint may require that the demolition debris be transported from Kake to a receiving center outside Alaska, at additional costs that have not yet been considered.

The City would like to see the school safely demolished and removed from the site as soon as possible with a potential community center be built in its place. The City has a $2 million EPA Brownfield Cleanup Grant to assist with the demolition and disposal of the structure. The PCB assessment will help determine if PCBs are present in select paints, the presence of which may determine disposal location. The effort will not be a complete characterization of all paints, but rather an evaluation of paints that are available for sampling to provide a basis for in-state or out-of-state disposal.

PCB Sampling Methodology

PCBs are quantified as "Aroclors" in analytical work. Aroclor was the tradename for PCB mixtures manufactured by the Monsanto Chemical Company. The first two numbers of the Aroclor designation represent the number of carbon atoms and the second two numbers represent the percent of chlorine by weight.

NORTECH's limited PCB assessment site includes a review of the previous HBMS, a site inspection, and discussion with available City representatives at the time of the site visit. The samples will be collected to assess the concentration of PCBs in two obvious exterior wall paints, and interior wall paints that may impact the location of building disposal.

The sampling approach will be completed in accordance with ***NORTECH***'s Hazardous Materials Methodology (v.19), which is attached. Project staff will include EPA-certified AHERA Asbestos Inspectors overseen by a Professional Environmental Engineer.

Target Sample Locations

Sample locations will target paints in wide-spread use to determine if they are likely present in other areas within the structure. ***NORTECH*** will coordinate access to the site through the Alaska Municipal League representative who is currently managing the grant on behalf of the City of Kake. We will additionally reach out to the City to determine if they may permit access to the south or east end of the structure where the roof has not collapsed. No entry will be made if it is determined that the condition of the structure is unsafe.

Only a select number of samples will be targeted. Exterior samples are presumed to be readily accessible and two paint colors are easily identified as depicted in Figure 1. White and red paints are visible in a recent aerial photograph and will be sampled. An additional exterior paint sample may be collected from the door trim or other varying paint colors if present.

Sample Collection and Analysis

We estimate that no more than 10 samples will be collected, to include one duplicate sample. We will attempt to collect bulk material samples as described below. Alternative testing will use wipe samples if the collection of bulk samples is impeded for any reason.

Figure 3 - Photo looking north. White paint and red will be targeted. Door trim may be selected if it is distinctive and readily used elsewhere on the structure. Yellow dots indicate potential paint coatings to be sampled. (Photo courtesy of DEC Solid Waste Program, 2023.)

Bulk material testing for PCBs collects a representative sample of a material to be sent for laboratory analysis. For porous materials, such as concrete, brick, and wood, a minimum of 2 cm deep and 2cm wide material shall be collected as a core sample rather than a traditional surface bulk sample. Best practices are utilized in the core sampling procedure to minimize dust generation and potential area contamination. Alternatively, if a core is not possible, select scrap material may be collected and sampled at the ***NORTECH*** office prior to submittal to the laboratory. A minimum of 10 grams of material is placed in a glass jar for laboratory analysis by EPA SW-846 3540C/8082A. Samples will be placed, stored, and shipped in a cooled container to maintain a temperature of <4°C. The reporting limit for this method of detection is 0.5 mg/Kg.

For non-porous unpainted surfaces and materials, such as metals, a wipe sample is used to determine potential PCB contamination. An acetone/hexane moistened wipe is used to thoroughly rub a surface with an area of 100 cm^2 or 10 cm by 10 cm. The wipe sample is placed in a glass jar for laboratory analysis by EP SW-846 3550B/8082A. Samples will be placed, stored, and shipped in a cooled container to maintain a temperature of <4°C. The reporting limit for this method is 0.50 µg/100 cm^2.

It is uncertain if any interior samples will be collected due to the unknown conditions at the site, and the potential to obtain safe entry. All samples collected will be opportunistic based on accessibility at the time of the site visit. Priority will be accessing and sampling the original school structure to the west, since it was constructed in the 1950's, much earlier than the library.

The target materials will be gypsum wallboard, window trim, and doors. With the understanding that the floor has potentially collapsed throughout the original structure, it may not be possible to access samples. This determination will be made at the time of sampling. If other potential access points are possible (i.e., plywood covered window), this will be evaluated at the time of the site visit.

Quality Control
The primary tool used to assess data quality will be the ADEC Laboratory Data Review Checklist (LDRC). A LDRC will be completed for the laboratory work order and included in a summary report with the laboratory reports. The laboratory report case narrative will be reviewed against the ADEC LDRC for potential laboratory QA/QC issues.

Required QA/QC will include a single blind field duplicate sample if ten or less samples are collected. It will not be possible to determine which sample is likely to be positive, if any, and the duplicate sample will likely be collected from one of the exterior paint samples.

Results of field duplicate pairs are a QC check on field sampling techniques and laboratory error. Precision, expressed as the relative percent difference (RPD) between field duplicate sample results, is an indication of consistency in sampling, sample handling, preservation, and laboratory analysis. Another QC check will be to compare the laboratory limit of quantitation (LOQ) and the lab detection limit (DL) with ADEC cleanup levels.

Reporting
A summary letter report of the results will be provided shortly after obtaining the data to document the field effort. We will include a summary of the results, a quality control review, the LDRC, and all laboratory data. The reporting will not include a discussion on how the results impact the demolition and disposal of the building, if at all. We anticipate that a review and discussion of the results will be coordinated with DEC and the City of Kake at a later date, and if there are any impacts on the remediation costs, they will be incorporated into the cost estimation documentation.

Closure
We thank you for the opportunity to work with you on this project and appreciate your confidence in our Firm.

Sincerely,
NORTECH

Primary Author Signature

John Carnahan
Sr. Environmental Specialist

Attachments: Hazardous Materials Standardized Methodology

Attachment 1

**HAZARDOUS MATERIALS
STANDARDIZED METHODOLOGY
Version 19
June 2021**

Objective and Management

NORTECH hazardous materials assessment methodologies are developed to comply with currently applicable regulations utilizing standard industrial hygiene practices designed for the anticipation, recognition, evaluation, and control of those factors or stressors arising in or from the workplace that may cause sickness, impaired health and well-being, or significant discomfort among workers or citizens of the community. Qualified personnel with current certifications and experience conduct field assessment inspections and sampling efforts. All work completed is managed, reviewed, and signed off on by a board Certified Industrial Hygienist (CIH) or Professional Engineer.

Scope of Work

NORTECH provides a variety of hazardous material services as necessary to meet project specific needs cost effectively. In order to minimize costs, ***NORTECH*** has developed the following standardized hazardous material assessment scopes of work.

> **Limited Hazardous Material Assessment**: The assessment scope of work is limited to specifics as specified by the client in the written contract and/or project communications. Limitations may include/exclude contaminants, destructive testing, costs, and/or areas to be assessed.
>
> **Pre-Renovation Hazardous Material Assessment**: The assessment is limited to a specific project renovation scope.
>
> **Pre-Demolition Hazardous Material Assessment**: The assessment is in preparation for an entire building demolition.

Hazardous materials included in this standard are:

- Asbestos Containing Materials (ACM)
  - Building Materials
  - Naturally Occurring Asbestos (NOA)
- Asbestos in Dust
- Silica in Dust
- Lead Based Paint (LBP)
- Lead in Soil
- Universal Wastes
- Polychlorinated Biphenyls (PCBs)
  - Bulk Materials
  - Wipe Samples
  - Air Samples
  - TSCA Regulated Materials
- RCRA Eight Heavy Metals
- Other Wastes Requiring Special Handling

Definition of Hazardous Materials

Hazardous materials are defined as any material requiring special handling or disposal during demolition or renovation. Of particular interest are asbestos containing building materials

(ACBM), lead based paint (LBP), RCRA eight heavy metals and other hazardous materials including polychlorinated biphenyls (PCBs), radioactive materials in smoke detectors & self-illuminating exit signs, lead-acid batteries, wastewater, water intrusion fungal amplification, petroleum oils and lubricants (POLs) mercury containing equipment (switches, bulbs etc.) and other chemical and biological contaminants.

Universal Waste
EPA's universal waste regulations set forth in 40 CFR part 273 streamline hazardous waste management standards for federally designated "universal wastes," which include:

- Batteries
- Paints & pressurized containers
- Chemicals & pesticides
- Mercury in switches and fluorescent light tubes

The regulations govern the collection and management of these widely generated wastes. These regulations are designed to improve hazardous material handling and disposal of universal wastes by easing the regulatory burden on generators and facilitating disposal program development.

Regulatory
The hazardous material surveys are conducted to comply with the asbestos survey requirements of the Occupational Safety and Health Administration (OSHA) found in 29 CFR 1926. These regulations state that before authorizing or allowing any construction, demolition, renovation, or remodeling, the owner, owner's agent, or employer, must notify contractors or other persons of the location and quantities of ACM within the work area.

U.S. Environmental Protection Agency National Emissions Standards for Hazardous Air Pollutants (NESHAP) requires a thorough inspection for friable and non-friable ACM by an accredited Asbestos Hazard Emergency Response Act (AHERA) inspector prior to any renovation or demolition activity (40 CFR 61.145). NESHAP also requires notification for removal or abatement of regulated quantities of ACM (>260 square feet, >160 linear feet, or >35 cubic feet of regulated asbestos containing material (RACM)).

Asbestos Containing Materials
The asbestos sampling collection technique used during the survey generally follows the AHERA method as defined in 40 CFR 763. Laboratory analysis of samples are completed by a laboratory certified through the National Voluntary Laboratory Accreditation Program (NVLAP) to perform asbestos analysis by polarized light microscopy (PLM) according to EPA method 600/R-93/116 to determine the percent concentration by weight as required by the current OSHA standard. Building material containing 1% or greater asbestos content is considered asbestos containing material.

Asbestos containing building materials with sample results less than 5% asbestos are analyzed by 400-point count EPA 600/R-93/116 method. Analysis by 400-point count has a detection limit of 0.25% and can provide greater accuracy, especially for sample results on the margin of 1%. Alternatively, for non-friable organically bound materials such as vinyl flooring, roofing, mastics, and caulking, gravimetric preparation of the sample is an additional process to the 400 point count EPA 600/R-93/116 method. Asbestos present in those materials are typically tightly bound and not easily identified by microscopy and thus may require additional sample preparation.

It is a common practice to measure asbestos concentration in air if you suspect that asbestos fibers may be present. Sampling is performed if asbestos was discovered in a particular area, if you accidentally disturbed an asbestos-containing material, or when asbestos was removed, and abatement team needs to verify that no residual asbestos is left in the air. Asbestos concentration in air is strictly regulated. Asbestos concentration in the air of a working zone cannot exceed 0.1 fiber per centimeter cube (f/cc). For asbestos abatement clearance test, this level is: 0.01 f/cc. The most common method for asbestos testing in air is a method developed by National Institute of Occupational Safety and Health (USA): NIOSH

Asbestos in Dusts
Protocol for determining asbestos containing material (ACM) in dust collection requires analysis by TEM (Transmission Electron Microscopy) by a laboratory certified through the National Voluntary Laboratory Accreditation Program (NVLAP) to perform TEM analysis. Dust collection for lab testing may either involve dust wipe collection using a laboratory supplied “Ghostwipe”™ and sized template, or by utilizing a laboratory supplied 37 mm TEM air cassette inline with a pump and plastic tubing and vacuuming a known amount of surface area coated in dust.

With regard to lab analysis of samples collected, there are no standards for asbestos in settled dust against which one can compare results. However, the literature (Millette and Hays, 1994) has provided some general conclusions regarding interpretation of sampling data on the level of asbestos in settled dust and is based on extensive field data, observation, and experience. They report that a level of less than 1,000 asbestos structures/cm^2 is low, while levels above 10,000 s/cm^2 are considered generally above background. Levels greater than 100,000 s/ cm^2 are indicative of elevated concentrations of asbestos fibers with significant risk of exceeding the OSHA permissible exposure level (PEL) for most work tasks.

Silica in Dusts
Air Sample Collection: Sampling for silica is performed by using 37mm PVC filters utilizing an air sampling cyclone. A minimum of 2.7 liters/minute of air is required to achieve a laboratory limit of detection compatible to the OSHA PEL and Action Level. Both NIOSH Method 7500 and NIOSH Method 7602 are comparioble for laboratory analysis of airborn silica. NIOSH 7500 uses X-Ray Diffraction while NIOSH 7602 uses the Fourier Transform Infared Spectroscopy. The determination of laboratory method should be by comparing any known or suspected interferences in the sample, such as phosphates, potash, or zircon and choosing the analysis that does not contain known interferences with those identified during sampling. Laboratory sensitivity for both tests of 5 μg/m^3, which is 10% of the PEL.

Wipe Sample Collection: Wipe sampling of silica on horizontal surfaces, a modified NIOSH 7500 or modified NIOSH 7602 is performed during laboratory testing utilizing a ghost wipe as the preferred sampling media. A minimum of 50 milligrams of settled dust is required from an area of 1 ft^2 to be placed in to a sealed container.

Workers’ exposures would be limited to a PEL of 50 micrograms of respirable crystalline silica per cubic meter of air (μg/m^3), averaged over an 8-hour day. An Action Level of 25 μg/m^3 was established where exposure control methods, respiratory protection, and regulated areas with a a written control plan with exposure assessment should be performed. The Action Level and PEL are the same in both general industry, maritime, and construction. There is currently no standard to compare settled silica dust concentrations against potential respirable concentrations. The presence of silica contamination in dust is a worker exposure issue if the dust becomes airborne and is inhaled.

Lead Based Paint (LBP)
Quantification of lead-based paint is performed according to NIOSH 7702, using a Thermo Fisher NITON XLp-303A, x-ray fluorescent (XRF) spectrum analyzer, providing EPA accepted real-time, on-site sample results. A Performance Characteristics Sheet (PCS), that routinely accompanies the NITON analyzer, provides supplemental information to be used in conjunction with Chapter 7 of the HUD guidelines. The PCS indicates that substrate corrections are not required for this instrument when operated in accordance with the manufacturer's instructions and HUD guidelines. Environmental Protection Agency/Department of Housing and Urban Development (EPA/HUD) protocol for the inspection of LBP in residential structures is generally followed.

Lead analysis of paint may also be determined by scrape sample and lab analysis. Representative paint scrape samples of the building's construction materials are collected from each representative paint type and color. Paint scrapes are collected within a 10 cm^2 area and sent to lab for analysis by percentage of lead per weight of paint collected.

All paint may contain a measurable amount of lead, however, EPA and HUD consider paint containing 1.0 mg/cm^2 (XRF analysis) or 0.5 percent (5,000 ppm) by weight (lab analysis) and higher to be LBP. These guidelines may not be directly applicable to this project, but are a good reference for evaluating the investigation's sample results. Paint with lower concentrations of lead than these thresholds may still pose an OSHA health hazard if mishandled. The LBP assessment is completed by qualified personnel with current EPA lead inspector certification.

EPA guidance lists documented methodologies that are appropriate for the work practice standards, including U.S. Housing and Urban Development (HUD) guidelines and certain EPA methodologies, and states that "other equivalent methods" are acceptable.

Lead in Soil
EPA defines lead hazards in soils depending on the land use (40 CFR 745.65 (c) & Section 403 of Title X of the Toxic Substance Control Act (TSCA)). Bare soils meeting or exceeding the following limits are considered hazardous:

- Residential and children's high contact play areas 400 mg/Kg
- Commercial – non-residential, 800 mg/Kg
- Bare soil in industrial settings, 1200 mg/Kg

EPA regulates bare soils in excess of 1,200 mg/Kg as industrial, and restricts access by children. Soils in excess of 5,000 mg/Kg fall under the TCLP rule for hazardous wastes and would require abatement or permanent encapsulation.

The ADEC published residential soil cleanup level for lead is 400mg/Kg of soil dry weight. ADEC specific cleanup criteria language for lead in soils provided in Note 11 of Table B1 in 18 AAC 75.341 states:

> Lead cleanup levels must be determined on a site-specific basis, based on land use. For residential land use, the soil cleanup level is 400 mg/kg. For commercial or industrial land use, as applied in 18 AAC 75.340(e)(3), the soil cleanup level is 1,000 mg/kg. Through an approved site-specific risk assessment, conducted according to the *Risk Assessment Procedures Manual*, adopted by reference at 18 AAC 75.340, approved exposure models may be used to evaluate exposure to a child resident or an adult worker; a responsible person may also propose an alternative cleanup level, through a

site-specific risk assessment conducted according to the *Manual*, and based on a chemical speciation of the lead present at the site. For soils contaminated with lead more than 15 feet below ground surface, lead cleanup levels will be determined on a site-specific basis.

Polychlorinated Biphenyls (PCB)

Bulk sample collection: Bulk material testing for PCBs collects a representative sample of a material to be sent for laboratory analysis. Materials should be carefully collected independently to prevent potential contamination from other surfaces in direct contact with the suspected material. For porous materials, such as concrete, brick, and wood, a minimum of 2 cm deep and 2cm wide of material shall be collected as a cores sample rather than a traditional surface bulk sample. Best practices are utilized in the core sampling procedure to minimize dust generation and potential area contamination. A minimum of 10 grams of material is placed in a glass jar for laboratory analysis by EPA SW-846 3540C/8082A. Samples will be placed, stored, and shipped in a cooled container to maintain a temperature of <4°C. The reporting limit for this method of detection is 0.5 mg/Kg.

Wipe sample collection: For non-porous unpainted surfaces and materials, such as metals, a wipe sample is used to determine potential PCB contamination. A acetone/hexane moistened wipe is used to thoroughly rub a surface with an area of 100 cm^2 or 10 cm by 10 cm. The wipe sample is placed in a glass jar for laboratory for analysis by EP SW-846 3550B/8082A. Samples will be placed, stored, and shipped in a cooled container to maintain a temperature of <4°C. The reporting limit for this method is 0.50 µg/100 cm^2.

Indoor air sample collection: For Aroclor 1242 and Aroclor 1254, OSHA has a PEL of 1.0 mg/m^3 and 0.5 mg/m^3 respectively. For alaysis by NIOSH Method 5503, a Florisil tube with a Swinnex pre-filter is used to collect the air sample. The reporting limit for this method of analysis is 0.5 $\mu g/m^3$ based on 50 liters of air. For analysis by EPA TO-10A, a polyurethane foam plug sorbent tube is used with a flow rate of up to 5 liters per minute. This analysis method has a reporting limit of 0.05 $\mu g/m^3$ based on 1000 liters of air. A high flow air sample can also be utilized by EPA TO-4A analysis. A high flow air sample may be used with a flow rate up to 225 liters per minute and maintains the same sampling media, albeit of a larger sizing, as the EPA TO-10A method along with the same reporting limit.

Toxic Substances Control Act (TSCA): TSCA regulations state that any liquid containing PCBs at a concentration of greater than 50 ppm and solids containing a concentration greater 500 ppm are PCB containing and require proper disposal. Surface contamination of materials are applicable for materials that contain a surface concentration of PCBs greater than 100 µg/100 cm^2 and pertain to all applicaple regulations for solid materials greater than 500 ppm. For mineral oil-filled equipment manufactured before July 2, 1979, it must be assumed to be PCB containing unless a permanent label or other documentation from the manufacturer indicates the PCB concentration at the time of manufacture. For transformers, this assumption is only required when the transformer contains a minimum of 3 pounds of fluid other than mineral oil or the type of fluid is unknown. TSCA regulations state that cleanup levels of contamination are determined by the occupancy rate of the given area. For High occupancy areas, a cleanup level of less than 10 µg/100 cm^2 is required. For low occupany areas, a level of less than 100 µg/100 cm^2 is acceptable.

RCRA Eight Heavy Metals

Determination of the demolition waste toxicity for the RCRA eight heavy metals (Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver) is based on a certified lab performing the Toxicity Characteristic Leaching Procedure (TCLP) (EPA SW846, Method-1311) analysis of a representative composite sample of the structure's building materials.

During the field effort, a visual inspection is conducted to identify the presence of each of the RCRA eight heavy metals and approximate percent by weight of each expected to be in the building debris waste stream. A representative sample of the entire waste stream, including the RCRA metals present, is collected and homogenized into a composite sample of the entire project's debris/waste stream and then analyzed at a certified lab in accordance with TCLP procedure. The TCLP test measures the potential for the eight metals identified in the Resource Conservation and Recovery Act (RCRA) to leach from a representative composite sample of the debris/waste stream under simulated landfill conditions. RCRA regulations allow for calculating the TCLP result from a composite sample with total metals using the "20:1 Rule" that account for the dilution of metals concentrations during the analysis.

Another alternative method is to calculate a Theoretical TCLP based on the observed quantities of construction materials with regard to potential heavy metals. Assuming all paint associated with the structure is lead-based paint, a theoretical calculation of the ratio between paint to construction debris waste can be used in place of a representative waste stream (TCLP) sampling to determine whether the project waste stream will be hazardous for lead and heavy metals in accordance with hazardous waste standard. This method involves using project specific knowledge to calculate the concentration of lead in the entire quantity of debris as follows:

If a waste is 100% solid, as defined by the TCLP method, then the results of the total constituent analysis may be divided by twenty to convert the total results into the maximum leachable concentration. This factor is derived from the 20:1 liquid-to-solid ratio employed in the TCLP. If a waste has filterable liquid, then the concentration of the analyte in each phase (liquid and solid) must be determined.

The following equation may be used to calculate this value:

$$\frac{[A \times B] + [C \times D]}{B + [20\ (L/kg) \times D]} = E$$

Where:

A = Concentration of the analyte in liquid portion of the sample (mg/L)
B = Volume of the liquid portion of the sample (L).
C = Concentration of the analyte in solid portion of the sample (mg/kg)
D = Weight of the solid portion of the sample (kg)
E = Maximum theoretical concentration in leachate (mg/L)

The value obtained (E) can be used to show that the maximum theoretical concentration in a leachate from the waste could not exceed the concentration specified in the toxicity characteristic (TC) (40 CFR 261.24).

In addition, if the total constituent analysis results themselves are below the TC limits without dividing by 20, then the same argument holds true, i.e., the maximum theoretical concentration in the leachate could not exceed the TC limits.

The 100 milligrams per kilogram value used in the determination is based on the 20:1 rule which represents the lowest possible mass analysis concentration, which could leach out greater than 5.0 milligrams per liter in a TCLP test. This is due to the 20:1 dilution ratio of the TCLP test protocol and also assumes that 100% of the lead in the sample will leach out. In most circumstances, 100% of the lead would rarely leach out. However, this assumption must be made in the place of actual TCLP laboratory results. This "worst-case" assumption adds a "safety factor" to compensate for errors in the data or in calculating the mass of the structure. If the initial test results show that the average weight percent of lead in the lead-based paint, the average paint thickness, or the average paint density varies widely from one part of the structure to another, it may be better to do separate "mass of lead-based paint" or "mass of lead in the lead-based paint" calculations for each part of the structure with similar values. The individual results for the different parts of the structure can then be summed before dividing by the mass of the entire structure.

The presence or absence of suspect RCRA 8 hazardous metals is verified by visually inspecting the structure, testing multiple like components with a NITON XRF, or collecting paint chip samples for laboratory analysis during the investigation. If no RCRA 8 suspect materials or suspect conditions are observed, the total lead in milligrams (mg) can be calculated for the materials (paint and substrate) in which LBP concentrations are assumed to be greater than EPA/HUD's standard of <0.5% or <1mg/cm^2 limit for what can be considered non-lead based paint. The calculations use the highest average lead value for each painted surface. Not all surfaces of the structure are painted, nor are openings & voids accounted for in the square footages calculated. Multiplying the average value of LBP (in mg/cm^2) by the total square footage area (in cm^2) of all painted surfaces, a total amount of milligrams of lead in the paint is estimated. A total (minimum) expected mass of kilograms of demolition debris is then calculated for the waste stream. The final calculation of the theoretical TCLP then uses the total milligrams of lead divided by the kilograms of demolition debris which equals the mass (mg/kg) of lead in the demolition waste stream. If the mass concentration of lead is less than the 20:1 rule criteria of 100 mg/kg, the debris waste stream is considered either non-hazardous. If the calculated concentration is higher than 100 mg/kg than additional assessment may be recommended. or hazardous for leachable lead.

Other Hazardous Materials
Determination of other hazardous materials involves the processes described by EPA as follows:

- Is the material a solid waste? (See: 40 CFR Part 261.2)
- Is the waste specifically excluded from RCRA? (See: 40 CFR Part 261.4)
- Is the waste a listed hazardous waste? (See: 40 CFR Part 261.30)
- Does the waste exhibit a characteristic of hazardous waste? (See: 40 CFR Part 261.20)

During structure investigation, other hazardous materials posing an environmental concern or health risk are watched for and where visually observed are noted in the report findings. Determinations of other hazardous materials were based on the above EPA guidelines. These other hazardous materials include:

- Mastics
- Caulks
- Lead containing building materials
- Stored chemicals, heating oils, hydraulic oils, automotive fuel products & lubricants

- Radioactive materials in smoke detectors & self-illuminating emergency exit signs
- Lead-acid batteries in emergency lighting and emergency exit signs
- Mercury in thermostats, fluorescent light tubes & HID mercury vapor lighting
- PCB containing power transformers & PCB containing fluorescent light ballasts
- Stored, unidentified or flammable liquids, paints or pressurized containers
- Freon gas canisters
- Fire extinguishers & HALON fire suppression systems.

Limitations

NORTECH provides a level of service that is performed within the standard of care and competence found within this practice and the engineering profession. It must be recognized that limitations in a hazardous material inspection and assessment exist. The data presented should be considered representative of only the time and observances of our inspection. In addition, changes in the condition of the materials within the facility can occur with the passing of time, due to natural processes and/or from human activities. ***NORTECH*** has performed the work, made the findings, and proposed recommendations in accordance with generally accepted environmental engineering practices using the best technology available at the time the work was performed.

NORTECH has based its conclusions and recommendations on our current understanding of regulatory policies. The regulations concerning hazardous materials are constantly changing, including the interpretations of regulating agencies. If changes in regulations or their interpretation occur, then ***NORTECH*** reserves the right to amend or revise conclusions and/or recommendations.