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December 29, 2017

Ms. Kimberly N. Tisa, PCB Coordinator
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100 (OSRR07-2)
Boston, Massachusetts 02109-3912

Re: Feasibility Study - Interior PCB Containing Paints
Fairfield Ludlowe High School, Fairfield, Connecticut

Dear Ms. Tisa:

On behalf of the Town of Fairfield, please find attached a Feasibility Study prepared to assess potential remedial alternatives and select a remedial option to address polychlorinated biphenyl (PCB) containing paints at the Fairfield Ludlowe High School located at 785 Unquowa Road in Fairfield, Connecticut.

As required by Condition 1(b) of the United States Environmental Protection Agency's (EPA) December 10, 2015 PCB Cleanup and Disposal Approval under 40 CFR 761.61(c) and 761.79(h), the attached Feasibility Study has been prepared to address ≥ 50 parts per million (ppm) PCB containing interior paint in the 1961/1962 portion of the building. Given that interior paints within the 1950 and 1971/1972 portions of the building have been detected with concentrations of < 50 ppm PCBs and are also subject to 40 CFR 761 and the Connecticut Department of Energy and Environmental Protection's (CTDEEPs) PCB Program, this Feasibility Study includes an evaluation an approach for interior paints where PCBs have been detected at concentrations > 1 ppm.

We look forward to discussing the findings of the Feasibility Study with you following your review of the document. If you have any comments, questions, or require further information, please do not hesitate to e-mail or call me at the number listed above.

Sincerely,

WOODARD & CURRAN, INC.

Jeffrey A. Hamel, LSP, LEP
Senior Principal

cc: Gary Trombly, CTDEEP
Sal Morabito and Thomas Cullen, Fairfield Public Schools

FEASIBILITY STUDY

Interior PCB Containing Paints

Fairfield Ludlowe High School, Fairfield, CT

40 Shattuck Road | Suite 110
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Project Number 228875

Fairfield Public Schools

December 2017

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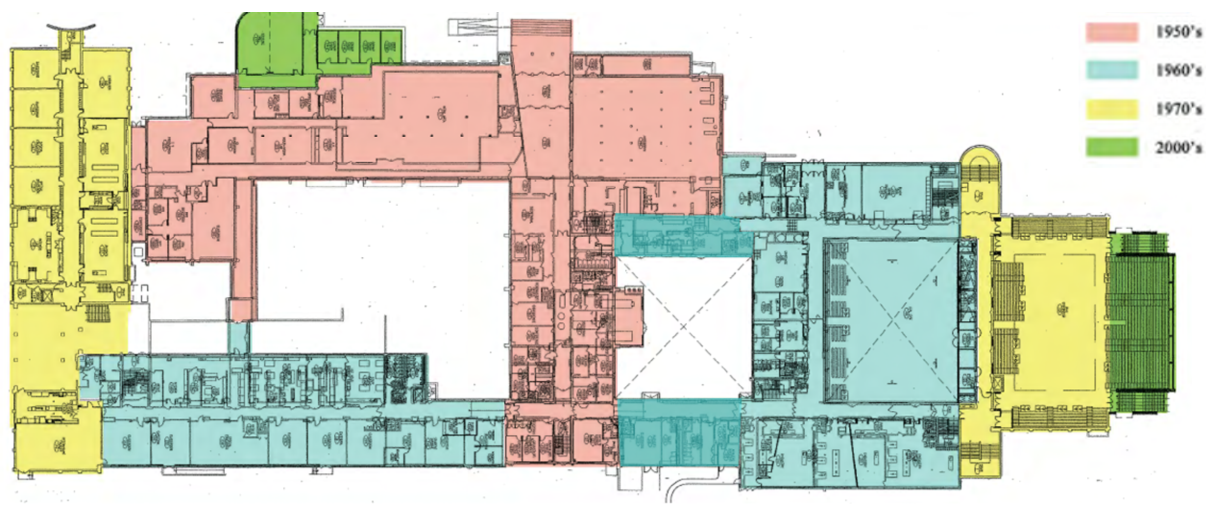
1. INTRODUCTION

As required by Condition 1(b) of the United States Environmental Protection Agency's (EPA) December 10, 2015 PCB Cleanup and Disposal Approval under 40 CFR 761.61(c) and 761.79(h), this Feasibility Study has been prepared to assess potential remedial alternatives and select a remedial option to address ≥ 50 parts per million (ppm) polychlorinated biphenyl (PCB) containing interior paint in the 1961/1962 portion of the Fairfield Ludlowe High School in Fairfield, Connecticut. Given that interior paints within the 1950 and 1971/1972 portions of the building have been detected with concentrations of < 50 ppm PCBs and are also subject to 40 CFR 761 and the Connecticut Department of Energy and Environmental Protection's (CTDEEPs) PCB Program, this Feasibility Study includes an evaluation an approach for interior paints where PCBs have been detected at concentrations > 1 ppm.

This report presents remedial action and regulatory objectives, identifies potential remedial technologies, and evaluates remedial alternatives related to the presence of PCBs in paint. This report documents the approach used to screen and evaluate remedial technologies and alternatives in a manner that supports the selection of a proposed remedial approach.

1.1 Background

Fairfield Ludlowe High School is located at 785 Unquowa Road in Fairfield, CT and consists of an approximately 296,000 square foot multi-story building originally constructed in 1950. Approximately 1,500 students are currently enrolled in the school. The building has undergone multiple additions and upgrades since its original construction, including major additions in the 1960s, 1970s, and 2000s. A schematic depiction of the different dates of these major renovations is provided below.



NOTE: This depiction does not show recent additions conducted in 2015.

The exterior of the building is constructed of unpainted brick or stone masonry with steel and wood structural components. Interior building construction materials were observed to be consistent in most areas of the school and can be characterized as having vinyl tile flooring, painted drywall, or concrete masonry unit (CMU) block walls, and drop ceilings. The initial construction date of the building was 1950; therefore, the time of construction falls within the timeframe of when PCBs were sometimes used in standard construction materials. The building additions constructed in 1961/62 and 1971/72 also fall within this timeframe. The building additions constructed in the 2000s and beyond fall outside of this timeframe.

As described in the Notification[1], in addition to PCB containing window and door sealants, PCB containing interior paint has been detected at concentrations ≥ 50 ppm on certain CMU block walls within building perimeter rooms in the 1961-62 portion of the building. Paint containing PCBs < 50 ppm have been detected within building perimeter rooms in three portions of the building (1950, 1961-62, and 1971-72 construction dates).

Activities included in the Notification and the conditions of EPA's Approval were divided into three primary aspects of PCB related activities: 1) PCB containing window/door caulking sealants; 2) PCB impacted soils around the building; and 3) PCB containing interior paints. A brief summary of the status of the first two aspects of the Approval is provided below. The remaining portions of this document have been developed to address the third aspect, the PCB containing interior paints.

PCB Containing Caulking Remediation (window and door replacement project) - During the summer of 2017, PCB remediation activities associated with more than 50% of the windows included in the renovation plans were completed in accordance with the Approval (removals and encapsulation). The remaining remediation activities associated with the window and door caulking are scheduled to be completed during the student summer break session in 2018.

PCB Impacted Soil Excavation – As described in Condition 1a of EPA's Approval, the cleanup of PCB impacted soils and other ground surfaces was not included in EPA's initial Approval of the Notification. A PCB Remediation Plan for the soils was submitted as an addendum to the Notification on November 24, 2015. Of note and as an interim measure, in December 2015, the more elevated concentrations of PCB impacted surface soils (> 10 ppm) were excavated and disposed off-site as a performance-based removal action (21 tons removed). As requested by EPA in a subsequent email on February 29, 2016, additional pre-excavation soil sampling was conducted in April 2016 and again in December 2017 to further define the vertical and lateral extent of PCB impacts in soils around the building. Results of this sampling, along with the revised excavation plans and proposed verification sampling programs will be submitted to EPA and CTDEEP for review and approval prior to the implementation of the soil excavation. The soil excavation work is planned to be conducted following the completion of the window/door work in the Summer of 2018. Additionally, based on EPA's and CTDEEP's request in December 2017 to cover PCB impacted soils prior to their removal, the Town received authorization from the Fairfield Ludlowe Building Committee to obtain cost estimates for the application of bulk mulch or other cover materials over the subject soils. Upon receipt, a proposal for this work will be presented to the Building Committee with a request for funding and authorization to proceed.

1.2 Stabilized Interior Conditions Assessment

As part of the Approval, EPA required an evaluation of interior conditions be conducted while the Feasibility Study was being developed. A Sampling Plan was submitted to EPA on January 19, 2016, revised on February 29, 2016 (after initial EPA comments), and approved by EPA on March 2, 2016. The first round of interior conditions assessment was conducted in April 2017. Additional comments were received from EPA on November 15, 2017 following review of the results from the April 2017 sampling event and a revised Sampling Plan was approved by EPA on November 20, 2017. The second round was conducted in December 2017.

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[1] The initial Notification was prepared by AMC Environmental, LLC followed by supplemental information provided by Woodard & Curran on behalf of the Town of Fairfield to satisfy the requirements under 40 CFR 761.61 (c) and 761.79 (h). Information was submitted on October 22, 2014 (Self-Implementing On-Site Cleanup and Disposal Plan [SIP]); January 16, 2015 (Revised SIP and Response to Comments); July 31, 2015 (Submittal for Window and Door Replacement Project prepared by Woodard & Curran); September 8, 2015 (email responses to EPA questions concerning paint and laboratory results); and September 11, 2015 (email response to request for additional laboratory results and CMU questions).

The plan was developed to support two objectives ahead of the completion of the Feasibility Study:

1. To confirm the conceptual site model for PCBs in paint, which indicated that PCB ≥ 50 ppm paint was only present in the 1961/62 portion of the building.

2. To demonstrate stabilized conditions in the interior environment via indoor air sampling and surface wipe sampling of painted surfaces and higher dermal contact surfaces (e.g., tables, sills, etc.) in all three portions of the building to support the proposed timeline for the remedial alternative assessment (December 2017).

Additional visual inspections of painted masonry surfaces were conducted throughout the building and included documenting the types of paints present at over 140 locations throughout all three portions of the building, including the scraping of paint to inspect for underlying coatings. A detailed discussion of the paint assessment and sampling is presented in Section 2; however, in summary, the inspections have indicated that a pale green paint, which was observed beneath the top coat(s) of paint on CMU block walls within rooms along the perimeter of the building on the first, second, and third floors of the 1961/62 portions of the building, is the only paint within the building that detected PCB concentrations in excess of 50 ppm. This pale green paint was not observed in other areas of the 1961/62 construction area (select rooms, specialty rooms, or transitory areas) nor was it observed in any portion of the building constructed in 1950 or in 1971/72. Also of note, this pale green paint was only observed beneath an existing paint (i.e., it was not observed on any accessible painted walls/surfaces). Samples of other colored paints and all samples of paints from the 1950s and 1971/1972 portions of the building were reported with PCBs < 50 ppm.

Information obtained during the paint inspections, as well as areas of perimeter windows, was used to select representative indoor air and surface wipe sample locations from all three portions of the building to demonstrate a stabilized interior condition with respect to inhalation and direct contact as potential exposure pathways to PCBs in the interior environment. Sample locations were distributed across all three construction periods, from the three main floors of the building, and from different types of room/spaces. In addition, samples were distributed to provide data from locations with and without the ≥ 50 ppm pale green paint and with and without the PCB containing window caulking that is being remediated in 2017 and 2018.

The current sampling program includes multiple rounds of monitoring through a combination of indoor air sampling and surface wipe sampling of painted surfaces. Discussions with school personnel indicated that collecting samples over three calendar intervals would represent differing ventilation and seasonal conditions, as this is driven by the individual unit/room ventilation units operated when the rooms are in use/students in session. The three events are represented by:

- Cooler Temperatures – Fall and Spring
- Colder Temperatures – Late Fall/Winter
- Warmer Temperatures –Summer/Early Fall

Sampling events completed to date include the first event, which was conducted in April 2017 and represents the cooler temperatures of Fall and Spring, and the second event, which was conducted in December 2017 to represent colder temperatures of late Fall and Winter. The results are summarized below.

<u>Painted Surface Wipe Sampling</u>

A total of 17 wipe samples were collected during the April 2017 sampling event and 19 wipe samples during the December 2017 event from painted surfaces throughout the building. Samples were collected using a hexane saturated gauze wiped over a 100 cm^2 area in accordance with the standard wipe testing methodology of 40 CFR 761.123.

The distribution of the samples was as follows:

Building Area	Number of Samples						
	Lower Level	First / Ground Floor		Second Floor		Third Floor	
	Dec 2017	April 2017	Dec 2017	April 2017	Dec 2017	April 2017	Dec 2017
1950	N/A	1	-	1	1	1	1
1961/62 West	N/A	1	1	2	2	2	4
1961/62 East	1	1	2	2	2	2	1
1971/72 West	N/A	1	1	1	1	1	1
1971/72 East	-	1	1	-	-	-	-

In addition to spatial distribution, 12 of the wipe samples were collected from CMU block surfaces with the underlying pale green paint identified as containing PCBs ≥ 50 ppm and 24 were collected from other painted surfaces.

Analytical results indicated that PCBs were non-detect (< 0.20 µg/100 cm^2) in all 36 samples collected. As such, the results indicate that PCBs are not available for direct contact transfer on the surfaces of the masonry paints. A summary of the results is presented on Table 1.

Additional Surface Wipe Sampling

A total of eight wipe samples were collected from horizontal surfaces during the December 2017 monitoring event to evaluate potential PCB impacts to high-contact surfaces such as tops of heater vents, desks, and window sills. The horizontal surface wipe sampling locations were spatially distributed around the 1961/62 and 1971/72 potions of the building with one sample collected from each construction area per floor.

Analytical results indicated that PCBs were non-detect (< 0.20 µg/100 cm^2) in the eight samples collected. A summary of the results is presented on Table 2.

Indoor Air Sampling

Indoor air samples were collected during two rounds of sampling. The first round of sampling was conducted on April 8, 2017 to represent conditions during a cooler time of the year when heating is typically on during the morning hours, then as the rooms heat up throughout the day, the heat is turned off and windows opened The second round of indoor air sampling was conducted on December 2, 2017 to represent conditions during colder times of the year when the building windows are anticipated to be shut and heating is on throughout the day. (NOTE: windows were shut during both sample collection events).

Thirteen indoor air samples were collected in April 2017 and 19 samples were collected in December 2017 from representative locations throughout the three building areas. In addition, one ambient/outdoor sample was collected from the west courtyard during each event. Samples were collected over a minimum of six hours in accordance with EPA Compendium Method TO-10A Determination of Pesticides and Polychlorinated Biphenyls in Ambient Air Using Low Volume Polyurethane Foam (PUF) Sampling. Samples were submitted to ConTest Analytical Laboratory for PCB homolog analysis via Gas Chromatographic/Multi-Detector Detection.

Field observations made during the sampling event as well as discussions with school personnel indicated that the ventilation was operating under normal conditions at the time of the sampling. It is also noted that room windows and doors were shut throughout the sampling.

Analytical results indicated that PCB concentrations were reported below the EPA's published levels for the evaluation of PCBs in indoor school air for 15 to 19 year old high school students (600 ng/m^3) and 19+ students and adults (500 ng/m^3) in all 32 of the samples collected. During the April event, four samples were reported as non-detect (reporting limits between < 4.7 and < 5.0 ng/m^3 – including the outdoor/ambient sample) and the maximum concentration was 245 ng/m^3 from a sample collected from a classroom within the 1961-62 portion of the building. During the December 2017 event, six samples were reported as non-detect (reporting limits between < 4.5 and < 5.3 ng/m^3 – including the outdoor/ambient sample) and the maximum concentration was 51 ng/m^3 from a sample collected from a conference room within the 1970-71 portion of the building. Analytical results are summarized on Table 3 and the locations of the samples are presented on Figures 1 through 4.

An evaluation of the indoor air sampling results across the three building areas was conducted to determine if variations were present based on the date of construction, types of paint within a space, or the presence/absence of window caulking containing PCBs ≥ 50 ppm. A summary of this evaluation is provided below.

- 1950 area (no ≥ 50 ppm PCB caulking or paints) – A total of 4 samples were collected during the 2 events. Analytical results indicated that PCBs were non-detect in 3 of the 4 samples collected and reported at a concentration of 24 ng/m^3 in one sample collected during the April event.
- 1971/1972 area (≥ 50 ppm window caulking, no ≥ 50 ppm paint) – A total of 8 samples were collected during the 2 events.
    - o Analytical results indicated that PCBs were non-detect in 3 of the samples and present at an average reported concentration of 21.2 ng/m^3 in the remaining 5 samples over the two events.
    - o 3 samples were collected from spaces that did not contain window caulking. PCBs were reported at concentrations of 13 and 16 ng/m^3 in a transitory hallway adjacent to the 1961/62 portion of the building and as non-detect (<4.9 ng/m^3) in a sample collected from 1st floor Room 151.
    - o 5 samples were collected from rooms with ≥ 50 ppm window caulking; analytical results indicated that PCBs were < 5.0 ng/m^3 and present at a concentration of 18 ng/m^3 in the two samples collected prior to removal of the caulking and were < 5.3 ng/m^3 and present at concentrations of 7.9 and 51 ng/m^3 in the 3 samples collected after the caulking was removed.
- 1961/1962 area (≥ 50 ppm window caulking and ≥ 50 ppm paint in select areas) – A total of 20 samples were collected during the 2 events.
    - o 3 samples were collected from transitory spaces or rooms with no > 50 ppm, caulking or paint. PCB concentrations ranged from 4.4 to 7.4 ng/m^3 with an average of 6.1 ng/m^3.
    - o 4 samples were collected from spaces containing both the ≥ 50 ppm window caulking (samples collected prior to removal) and pale green paint (3 samples in April and 1 sample in December). Analytical results indicated that PCBs were present at concentrations ranging from 11 to 245 ng/m^3 with an average of 98 ng/m^3.
    - o 5 samples were collected from spaces containing the ≥ 50 ppm paint after removal of the ≥ 50 ppm caulking. Analytical results from these samples indicated that PCBs were present at concentrations ranging from 20 to 47 ng/m^3 with an average reported concentration of 29.4 ng/m^3.
    - o 8 samples were collected from rooms with ≥ 50 ppm caulking but no pale green paint. Analytical results from these samples indicated that PCB were present at concentrations of 16, 48, and 65 ng/m^3 in the three samples collected prior to window abatement (1 sample in April [Room 368] and 2 samples in December [Rooms 202 and 368] with an average reported concentration of 43 ng/m^3) and at concentrations ranging from non-detect (2 samples) to 24 ng/m^3 after caulking abatement (average reported concentration of 17.9 ng/m^3 in 3 samples).

Conclusions

Overall, the results of the two rounds of interior sampling indicate a correlation between potential PCB sources (e.g., PCB containing caulking) to PCBs detected in indoor air (areas with the higher PCB-containing window caulking generally reported higher PCB concentrations in indoor air). The data does not suggest a correlation between the paint and indoor air results, as similar results were reported regardless of whether or not the area contained > 50 ppm PCB paint.

Both sets of data do indicate a condition of no unreasonable risk to human health with respect to potential exposure to PCBs through inhalation (all indoor air sample results were below EPA's published levels for indoor air in a school environment) and direct contact transfer (results from wipe samples were non-detect for PCBs). Additional indoor air sampling is currently scheduled to be conducted in the summer of 2018 to evaluate conditions during warmer temperatures. At this time and based on the two rounds of wipe sample results, no additional wipe samples are proposed during the next round of interior sampling.

Of note, this information has been shared with school teachers and other staff as well as being shared at public meetings associated with the overall renovation project, and posted on the Fairfield Public Schools website.

2. INTERIOR MASONRY PAINT INSPECTIONS AND SAMPLING ACTIVITIES

As part of the remediation planning for the window replacement project and as reported in the Notification submittal, bulk samples of interior painted CMU block (composite of paint and masonry) were collected to identify the extent of residual PCBs in masonry surrounding the interior window caulking that was to be removed. A summary of the interior CMU and mortar samples collected with distance from the caulking is presented below. As indicated on the table below, the highest PCB concentrations were detected at the window caulking with decreasing concentrations with distance from the caulking. However, it appears that the PCB ≥ 50 ppm paint in the 1961-1962 portion is influencing the sample results with painted CMU masonry not meeting the 1 ppm cleanup level even at > 24 inches from the window sealants. The table also shows that this phenomenon is not occurring, in general, in the 1971-1972 portion of the building with < 50 ppm PCBs detected in paint samples. As noted below, isolated low concentrations of PCBs were detected in masonry samples even when the paint was removed at some locations in the 1961-1962 portion of the building.

Building Portion	Interior CMU and Mortar Samples - Distance from Caulking				
		0 (at source)	2 inches	8 to 10 inches	16 to 32 inches
1961-1962 (PCBs detected in paint samples = 30, 39, 45, 61, 87, 99, 150, 390, 470, and 580 ppm)	Paint Present	None	13 samples; range 0.42 to 66 ppm; average = 35 ppm	5 samples; range 1.8 to 3.8 ppm; average = 2.6 ppm	20 samples; range ND to 9 ppm; average = 3.3 ppm
	No Paint Present (paint removed)	13 samples; range 0.41 to 33 ppm; average = 6.8 ppm	4 samples; range ND to 5.3 ppm; average = 2.2 ppm	14 samples; range ND to 2.2 ppm; average = 0.85 ppm	11 samples; range ND to 3.4 ppm; average = 0.79 ppm
1971-1972 (PCBs detected in paint samples = 6.8, 6.9, 7.3, 7.9, and 9.2 ppm)[1]	Paint Present	None	7 samples; range ND to 2.3 ppm; average = 0.86 ppm	5 samples; range 0.57 to 1.5 ppm; average = 0.87 ppm	7 samples; range 0.44 to 1.7 ppm; average = 0.94 ppm
	No Paint Present (paint removed)	6 samples; range ND to 2 ppm; average = 0.66 ppm	None	6 samples; range ND to 0.26 ppm; average =0.35 ppm	None

As described in the Notification for the window replacement project, based on the results of the bulk testing, follow-up samples of interior CMU paint were collected from window walls in all three portions of the building to determine if another source of PCBs may be present in these spaces. Analytical results indicated that PCBs were present at concentrations ≥ 50 ppm in some areas of the 1961/62 portion of the building and at concentrations < 50 ppm in other portions of the 1961/62 area as well as within the 1971/72 and 1950 portions of the building.

A summary of the paint inspection and sampling results completed to date is presented below.

Visual inspections of painted masonry surfaces were conducted throughout the building and included documenting the types of paints present at 144 locations throughout all three portions of the building, including the scraping of paint to inspect for underlying coatings. A summary of the observations in each of the three construction periods of the building is provided on Table 4 and presented below.

1961/62 Area – Building perimeter window caulking and glazing sealants have been identified as containing PCBs at concentrations up to 660,000 ppm. A summary of the paint sampling and inspection results is as follows:

- Visual inspections of the painted surfaces, including scraping of paint to identify number and color of underlying layers was conducted at 104 locations throughout this portion of the building. Results indicated that the majority of surfaces were covered with white paint or multiple layers of white and off-white/beige paint; at select locations, primarily in the rooms along the building perimeter, an underlying pale green paint was observed beneath the white or off-white top coat of CMU block wall paint on the 1st, 2nd, and 3rd floors;

- A total of 10 paint samples were collected from painted surfaces within this portion of the building and submitted for PCB analyses;
- Results from eight paint samples collected from classrooms with the underlying pale green paint reported PCBs at concentrations of 30, 61, 87, 99, 150, 390, 470, and 580 ppm;
- Visual observations of paint in other building perimeter spaces (non-pale green paint) indicated that the CMU and concrete walls were covered primarily with white paint and an underlying off-white/beige layer with limited areas of other colored paints. Two samples of paint from these spaces were submitted for PCB analysis and reported PCB concentrations of 39 and 45 ppm.
- With regard to the extent of these two types of painted surfaces in the perimeter spaces (classrooms, offices, etc.), there was approximately 36,000 square feet (sq ft) of white or other color paint with an underlying off-white/beige layer (< 50 ppm paint) and approximately 25,000 sq ft of white paint with an underlying pale green paint (≥ 50 ppm paint).
- A further breakdown of this underlying ≥ 50 ppm pale green paint follows:
    - Lower Level – none observed;
    - First Floor (2 spaces) – Room 115 and adjacent storage room;
    - Second Floor (19 spaces) – including 14 classrooms and lab spaces along the south sides of the building and on the east side of the east courtyard and the nurse's suite; and
    - Third Floor (17 spaces) – 15 classrooms and lab spaces on the south side of the building and along the east side of the east courtyard and an equipment storage space and utility room on the east courtyard.
- Visual observations of paint in other more transitory spaces (e.g., hallways, cafeteria, gymnasium, etc.) indicated that the masonry paint typically consisted of a white paint or a layer of white paint over an off-white or beige layer (pale green paint not observed):
    - Cafeteria – masonry surfaces were primarily white with some areas of green (different than the pale green paint) or blue and represented approximately 11,000 sq ft of painted masonry; this paint is part of the recent cafeteria renovations conducted in 2015.
    - Gymnasium – approximately 10,000 sq ft of masonry was painted white with either beige or black paint underneath;
    - Hallways – approximately 64,000 sq ft of masonry was painted with a white paint;
    - Lower Level – approximately 24,000 sq ft of painted masonry surfaces in this area were observed to be primarily white paint with some isolated walls of differing colors; and
    - While this survey did not include drywall or other non-masonry surfaces, visual observations did indicate that such materials were present in the 1961/62 areas.

<u>1971/72 Area</u> - Building perimeter window caulking and glazing sealants have been identified as containing PCBs at concentrations up to 175,000 ppm. No ≥ 50 ppm PCB paint was detected nor was the pale green paint observed in the 1961/62 portion of the building observed in the 1971/72 portions of the building. A summary of the sampling and inspection results is as follows:

- 25 locations were visually inspected and paint scraped to determine the number of layers and color of paints. The suspect underlying pale green layer (from the 1961/1962 portion) was not observed at any of the inspection locations. The majority of locations inspected had a white paint over the masonry surfaces on all three levels (given the similarity of the color, it was difficult to ascertain if multiple applications had been applied over time; although School representatives indicate that routine maintenance painting occurs frequently).
- Building Perimeter Spaces – the survey indicated that approximately 30,000 sq ft of white painted CMU surfaces were present in these spaces. Five samples of the white paint were collected from classroom locations and reported PCBs concentrations of 6.8, 6.9, 7.3, 7.9, and 9.2 ppm.
- Visual observations of paint in other more transitory spaces (e.g., hallways, basement, gymnasium, etc.) is summarized below (pale green paint not observed):
  - Gymnasium - Approximately 9,000 sq ft of masonry walls within the gymnasium were observed to be a grey layer over an underlying white layer of paint.
  - Hallways – Approximately 18,000 sq ft of painted masonry is present in the hallways of the 1971/1972 area. These surfaces are coated with white paint visually similar to that observed in the rooms.
  - Lower Level – Approximately 15,000 sq ft of painted masonry surfaces are present in the lower level of this portion of the building. Paint was typically white in color with isolated areas of differing colors observed.
- While this survey did not include drywall or other non-masonry surfaces, visual observations did indicate that such materials were present in the building perimeter spaces, primarily on walls separating the rooms from one another.

<u>1950 Area</u> - Building perimeter window caulking and glazing sealants have been identified as containing PCBs at concentrations up to 17 ppm. No ≥ 50 ppm PCB paint was detected nor was the pale green paint observed in the 1961/62 portion of the building observed in the 1950 portion of the building. A summary of the sampling and inspection results is as follows:

- 15 locations were visually inspected and paint scraped to determine the number of layers and color of paints. The suspect underlying pale green layer (from the 1961/1962 portion) was not observed at any of the inspection locations. The majority of locations observed contained white paint on masonry surfaces with some areas containing an off-white layer beneath the top coat.
- Building Perimeter Spaces – Approximately 11,000 sq ft of painted CMU block surfaces is present in these spaces. These surfaces are coated primarily with white paint with isolated areas of differing colors observed. Four samples of white paint were collected and reported PCBs concentrations of 1.2, 3.0, 3.3, and 10 ppm.
- Visual observations of paint in other more transitory spaces (e.g., hallways, auditorium, etc.) indicated that the masonry paint typically consisted of a white paint or different color top coat over white paint (pale green paint not observed):
  - Hallways – approximately 14,000 sq ft of masonry was painted with a white paint;
  - Auditorium – approximately 11,000 sq ft of masonry was painted black;
  - Lower level storage areas – approximately 5,000 sq ft of masonry was painted grey over white;
  - Lower level mechanical room – approximately 2,000 sq ft of painted masonry surfaces in this area were observed to be painted white with an additional blue topcoat over the upper sections of the walls; and

- While this survey did not include drywall or other non-masonry surfaces, visual observations did indicate that such materials (drywall, glazed tile) were present in the 1950 areas.

In summary, a pale green paint was observed beneath the top coat(s) of paint on CMU block walls within the majority of the perimeter rooms of the first, second, and third floors of the 1961/62 portions of the building and it is presumed that this paint was manufactured with ≥ 50 ppm PCBs. This pale green paint was not observed in other areas of the 1961/62 construction area nor was it observed in any portion of the building constructed in 1950 or in 1971/72. Also of note, this pale green paint was only observed beneath an existing paint (i.e., it was not observed on any accessible painted walls/surfaces). PCB concentrations < 50 ppm were reported in paints located in the 1971/72 and 1950 portions of the building.

3. CONCEPTUAL SITE MODEL – INTERIOR PAINTS

Based on the field observations and the correlation between inspection locations, analytical testing results from samples of paint submitted for PCB analysis, and the ongoing window and door replacement project, a conceptual site model has been developed for interior painted surfaces to be evaluated in this Feasibility Study and to meet the Approval conditions. These areas include painted surfaces in rooms associated with more frequent use by occupants (classrooms, labs, offices, specialty rooms, etc.). Coincidently, the majority of these rooms are located along the perimeter of the building and contain perimeter windows that are scheduled to be replaced during the ongoing window replacement project. A summary of the conceptual site model and regulatory classification for paints in these spaces is provided in the following sections.

Areas associated with more transitory uses, such as hallways, stairwells, storage rooms, custodial closets, restrooms, gymnasium, cafeteria, etc. have not been included in this conceptual site model and interior paint Feasibility Study because the ≥ 50 ppm pale green paint was not observed at any of these locations and because none of these transitory spaces are included in any current or foreseeable future renovation plans for the School (as such, no paint samples from these areas have been collected for PCB analyses). However, these spaces have been included in the overall assessment of interior conditions with respect to potential exposures (as described previously). Results of the sampling indicated that PCBs are not present on the surface of the painted surfaces (results from the surface wipe samples were non-detect for PCBs) and are not present in indoor air at concentrations above EPA's published levels for the evaluation of PCBs in school air in these transitory spaces (of note, the same condition is also the case for the more frequent use rooms).

3.1 ≥ 50 ppm Pale Green Paint – 1961/62 Areas

Pale green paint underlying the white paint on approximately 25,000 sq ft of walls on the 1st, 2nd, and 3rd floors in the 1961/1962 portion has been identified as containing ≥ 50 ppm PCBs. Spaces identified with the pale green paint include certain classrooms and lab spaces along the north and south sides of the building and along the east side of the eastern courtyard, the nurse's suite on the 2nd floor, and storage areas on the 1st and 3rd floors. The paint is currently coated with additional layers of interior paint that have been applied over the life of the building. The locations of the walls with the pale green paint are depicted on Figures 1 through 3.

The paint containing ≥ 50 ppm PCBs represents an unauthorized use of PCBs in accordance with 40 CFR 761. Based on the data collected to date, the pale green paint would be considered a PCB Bulk Product Waste at the time of designation for disposal in accordance with 40 CFR 761 and managed in accordance with 40 CFR 761.62.

Evaluation of potential transfer/exposure pathways for building occupants included the collection of twelve wipe samples from the painted surfaces of walls and the collection of nine indoor air samples from rooms with the identified underlying pale green paint. Results of the sampling indicated that PCBs are not present on the surface of the painted surfaces (results from the twelve samples were non-detect for PCBs) and are not present in indoor air at concentrations above EPA's published levels for the evaluation of PCBs in school air (average of 59.9 ng/m^3 in the 9 samples with a reported range of 11 to 245 ng/m^3) in rooms with ≥ 50 ppm pale green paint. It is also noted that during the April event, each room with the underlying pale green paint contained > 50 ppm window caulking and that during the December event, the caulking had been abated in all of the spaces sampled with the exception of Room 115.

3.2 > 1 and < 50 ppm PCB Paints – 1961/62 and 1971/72 Areas

Paint on approximately 66,000 sq ft of masonry wall surfaces within the subject area (e.g., higher frequency use rooms, such as classrooms, labs, offices, etc.) have been identified as containing PCBs > 1 and < 50 ppm. The locations of these painted walls are depicted on Figures 1 through 4.

The source of PCBs in the paint in these areas has not been conclusively determined; however, the data collected indicates that the paint does not contain PCB concentrations ≥ 50 ppm and given the data and published studies on PCBs in the interior environment, a probable source is the PCB containing window caulking in these rooms. All of the subject rooms with these lower levels of PCBs in the paint also contained a window with ≥ 50 ppm PCB containing caulking, at some point in time. Given that this probable source contains ≥ 50 ppm PCBs, the lower levels of PCBs detected in this paint is considered a PCB Remediation Waste per 40 CFR 761 and will be managed in accordance with 40 CFR 761.61.

Evaluation of potential transfer/exposure pathways for building occupants included the collection of 15 wipe samples from the painted surfaces of walls and the collection of 13 indoor air samples from these rooms. Results of the sampling indicated that PCBs are not present on the surface of the painted surfaces (results from the wipe samples collected from these surfaces were non-detect for PCBs) and are not present in indoor air at concentrations above EPA's published levels for the evaluation of PCBs in school air. For samples collected within the 1961/62 area, PCBs were reported as non-detect in two samples and present at concentrations ranging from 7.7 to 65 ng/m^3 in six samples with an average reported concentration of 30.5 ng/m^3. For samples collected within the 1971/72 areas, PCBs were reported as non-detect in two samples and present in three samples at concentrations of 7.9, 18, and 51 ng/m^3 (average concentration of 25.6 ng/m^3).

3.3 > 1 and < 50 ppm PCB Paints – 1950 Areas

Paint on approximately 11,000 sq ft of masonry wall surfaces within the 1950 portion (e.g., higher frequency use rooms, such as classrooms, labs, offices, etc.) have been identified as containing PCBs > 1 and < 50 ppm. The locations of walls with these paints are depicted on Figures 1 through 3.

The source of PCBs in the paint in these areas has not been conclusively determined; however, the data collected indicates that the paint does not contain concentrations ≥ 50 ppm and given that no window caulking was detected in excess of 50 ppm from the 1950 portion of the building (unlike the 1971/72 portion), both the window caulking and paints within these areas have been considered Excluded PCB Products per 40 CFR 761.3.

Although excluded from 40 CFR 761, based on the presence of PCBs > 1 ppm, the management of these paints, as well as the window caulking, will be conducted consistent with CTDEEP Regulations and the March 5, 2013 PCB Program Guidance.

4. REMEDIAL ACTION OBJECTIVES

The purpose of this Feasibility Study is to identify and evaluate remedial action alternatives which are reasonably likely to achieve a set of remedial action objectives (RAOs) developed in accordance with regulatory and risk-based requirements. RAOs have been developed for the three classifications of paints present in the high frequency use rooms of the School as described in the Conceptual Site Model. These paints have the following classifications:

- ≥ 50 ppm Paint (underlying pale green paint) - paint present on approximately 25,000 sq ft of painted masonry located in 38 perimeter rooms on the 1st, 2nd, and 3rd floors of the 1961/62 portion of the building.
- PCB Remediation Waste - < 50 ppm paint – present on approximately 66,000 sq ft of painted masonry located in 64 perimeter classrooms, laboratories, and administrative/office areas in the 1961/62 and 1971/72 portions of the building.
- Excluded PCB Product - < 50 ppm paint present on approximately 11,000 sq ft of painted masonry located in 16 perimeter classrooms, laboratories, and administrative/office areas in the 1950 portion of the building.

It is important to note that the indoor air and surface wipe data collected to date to evaluate the inhalation and dermal contact exposure routes indicate that current conditions do not pose an unreasonable risk to human health given that surface wipe samples were non-detect for PCBs and all indoor air samples were below EPA published exposure levels of concern for the school environment.

In consideration of the applicable regulatory and risk-based requirements, the overall remedial action objectives for each of the three classifications of paint are to:

- Protect human health and the environment from potential risks associated with PCBs in the paint.
- Comply with both Federal and State regulations governing PCBs in paint.

Specific objectives and findings for each paint classification is provided below:

- ≥ 50 ppm PCB Pale Green Paint – approx. 25,000 sq ft in 1961/1962 portion
  - Under Federal EPA regulatory requirements, ≥ 50 ppm PCB paint constitutes an unauthorized use; however, the subject pale green paint could be considered no longer in "use" as it was determined to be no longer in a usable state and required to be re-coated/painted with another top coating (i.e., the pale green paint could be considered no longer in service and could meet the definition of a "waste");
  - Current EPA guidance indicates that best management practices should be followed to reduce exposures in the interim until the material is removed during renovation projects that disturb the subject material; the School has no current plans to renovate the painted walls, aside from encapsulation of wall segments immediately adjacent to the windows that are being removed as part of the ongoing window renovation project;
  - The subject paint is currently encapsulated by outer coatings and PCBs are not present (non-detect on multiple surface wipe samples) on the surface of the overlying coatings;
  - Indoor air levels in rooms with this paint are all well below EPA published exposure levels;
- < 50 ppm PCB Remediation Waste (paint - approx. 66,000 sq ft in 1961/1962 and 1971/1972 portion)
  - The source of PCBs in the paint in these areas has not been conclusively determined; however, the data collected indicates that the paint does not contain concentrations ≥ 50 ppm and given the data and published studies on PCBs in the interior environment, a probable source for the PCBs is the PCB containing window caulking in these rooms;

- o Given that this probable source contains ≥ 50 ppm PCBs, the lower levels of PCBs detected in this paint are considered a PCB Remediation Waste per 40 CFR 761 and will be managed in accordance with 40 CFR 761.61;
  - o PCBs are not present (non-detect on multiple surface wipe samples) on the surface of the current paints;
  - o Indoor air levels in these rooms are all well below EPA published exposure levels;
- Excluded PCB Product (paint - approx. 11,000 sq ft in 1950 portion)
  - o The source of PCBs in the paint in these areas has not been conclusively determined; however, the data collected indicates that the paint does not contain concentrations ≥ 50 ppm and given that no window caulking was detected in excess of 50 ppm from the 1950 portion of the building (unlike the 1971/72 portion), both the window caulking and paints within these areas have been considered Excluded PCB Products per 40 CFR 761.3.
  - o PCBs are not present (non-detect on multiple surface wipe samples) on the surface of the current paints
  - o Indoor air levels in these rooms are all well below EPA published exposure levels;

Remedial approaches evaluated included removal, source modifications, and continued interim in place management (encapsulation) with administrative/institutional controls. Associated technologies with these approaches were initially screened in Section 5 with a detailed evaluation and selection of a proposed remedial action alternative presented in Section 6.

5. INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

Remedial technologies, both proven and innovative, were identified and evaluated for possible application at the building. The evaluation was based on a review of available literature, discussions with contractors, and experience with these technologies. Each of these technologies may be considered as stand-alone remedies or as part of an integrated remedial approach. Each technology was initially screened on the basis of its effectiveness, implementability, and relative cost. Descriptions of these criteria and how they were used in the initial screening are summarized below:

- **Effectiveness**. Each remedial technology was evaluated on: 1) its effectiveness and timeframe to meet site RAOs; 2) how proven and reliable the process is to remediate the media in question; and 3) potential impacts to human health and the environment during the implementation of the remedial approach.

- **Implementability**. Under this criterion, both the technical and administrative feasibility of implementing a remedial technology was evaluated.

- **Relative Cost**. Each technology was evaluated based on its relative cost as compared to other technologies (i.e. low, medium, or high).

A remedial technology that is retained through this screening was then formulated into a remedial alternative(s) for the detailed evaluation conducted in Section 6.

5.1 Site-Specific Considerations

Remedial actions at the site must also take into consideration the physical conditions of the building and the current use. A list of several important site-specific conditions that must be considered when evaluating various remedial technologies and alternatives is presented below:

- The school is actively occupied for approximately ten months per year with partial use in the remaining two months. Given the area of painted surfaces under evaluation, a selected remedial alternative would most likely need to be implemented during the summer months only, when school is not in full session. Implementation of such large-scale remediation activities would also cause disruption of normal maintenance and use of the building during the summer break periods (camps, summer school, etc.).

- The school is furnished and a variety of fixtures are installed on the walls (blackboards, cabinets, lockers, etc.). A paint removal remedial alternative would require removal and reinstallation of these fixtures in the impacted areas.

- CMU block walls typically consist of a 1.25-inch thick face shell over a hollow core; any remedial alternative that includes partial removal of the masonry substrate under the paint would be limited to only surficial removal and could jeopardize the structural integrity of the walls.

As indicated in Section 4, the remedial technologies identified for screening to achieve the RAOs for the three categories of paints included physical removals, source modification, and in-place management with administrative / institutional controls. A summary of the screening results is presented in the following sections with a remedial technology screening matrix provided as Table 5.

5.2 Physical Removal

The physical removal of paint would achieve the RAOs by removal of the ≥ 50 ppm paint as PCB Bulk Product Waste in accordance with 40 CFR 761.62; or removal of PCBs that have come to be located in the paint from a ≥ 50 ppm source (caulking) as a PCB Remediation Waste; or removal of PCBs that have come to be located in the paint at concentrations > 1 ppm (from < 50 ppm source).

If residual PCBs > 1 ppm remain in the masonry after paint removal, which is probable, then given the structural limitations of the walls, the residual PCBs would most likely need to be encapsulated with a paint/coating, in effect replicating the existing condition of a coating over the current PCB-containing paints. Agency approval of a long-term monitoring and maintenance program under the risk-based disposal provisions of 40 CFR 761.61 (c) or CTDEEP PCB Program Guidance would be required for any encapsulated residual PCBs following paint removal similar to that which will be developed following the window and door replacement project.

Several methods of physical paint removal were evaluated as part of the initial screening including the use of various blast media (shot, water, dry ice), hand removals (scraping/grinding), and chemical removal. Of these, the use of a dry blast media was retained based on its relative effectiveness in removing the paint and implementability in comparison to the other removal technologies and discussion with contractors (refer to Table 5).

5.3 Source Modification

Source modification alters the chemical makeup of the materials (paint) to reduce the concentrations of PCBs. Several source modification technologies were evaluated (dechlorination / dehalogenation technologies) to potentially reduce the concentrations of PCBs in the paint. One limiting factor in this specific setting is the presence of non-PCB coatings applied over the PCB-containing paints and the effect this may have on the technology's ability to reduce PCB concentrations in the underlying paint.

Furthermore, unless the modification was successful in reducing the concentrations of PCBs to < 1 ppm, the materials would still be subject to regulatory requirements and require further remediation (most likely via encapsulation – again replicating the existing condition, as described above under the removal option).

Finally, these types of products have not been approved by EPA and are currently not permitted to treat/destroy PCBs, thus, achieving EPA approval for these technologies is unlikely in a timely manner.

The source modification alternative was not retained for detailed evaluation based on the uncertainty regarding effectiveness in this project setting (most likely will require encapsulation and therefore, the added step of applying the source modification product is not cost-effective if in-place management would be required anyways), and the lack of regulatory approval for their use to treat PCBs in paint.

5.4 In-Place Management with Administrative/Institutional Controls

Indoor air and surface wipe data collected to date to evaluate the inhalation and dermal contact exposure routes indicate that current conditions do not pose an unreasonable risk to human health or the environment given that surface wipe samples were non-detect for PCBs and all indoor air samples were below EPA published exposure levels of concern for the school environment.

A combination of continued monitoring, a maintenance and communications program, deed restriction, and/or application of additional coatings could be used for long-term management of the PCB-containing paints until they were removed during future renovation or demolition projects that would impact the painted surfaces. For those areas subject to 40 CFR 761, this approach would be implemented in accordance with the risk-based disposal requirements.

This option has been retained based on current conditions.

6. DETAILED EVALUATION OF REMEDIAL ALTERNATIVES

As described in Section 5, two remedial technologies from the initial screening have been retained for detailed evaluation and comparison for each of the three categories of paints. Each of these technologies are considered stand-alone remedial alternatives in this evaluation. The two alternatives evaluated are summarized below:

- Physical Removal of Paint by Dry Blast Techniques
  - Physical removal by blasting with a dry abrasive media such as sand, grit, or other dry abrasive blast media;
  - Full containment and controls would be required in each room and all furniture and wall coverings removed; in-room ventilation systems would be covered/controlled;
  - Work could not be done during occupancy in the specific portion of the building;
  - Contractors assumed that one crew could do one typical room in 10 days (2 weeks). Based on a typical 8 week summer break period this projects to 3 to 4 rooms per crew. Given the need to maintain building use in some parts of the school over each summer break, it has been assumed that paint removal by dry blast techniques would be limited to one floor of each building area per year and completed by multiple crews as follows:
    - PCB Bulk Product Waste (pale green paint in 38 rooms) – 5 years based on up to 2 crews per year working in one wing at a time and one floor per year (some overlap between 1st and 2nd floors in the east area due to limited number of spaces on the 1st floor).
    - PCB Remediation Waste (64 rooms) – 8 years based on 3 years for the 1971/72 west wing (1 floor per year), 3 years for the 1961/62 west wing (1 floor per year), 1 year for the 1961/62 east wing (multiple floors in a single year due to limited number of spaces), and 1 year for the lower level spaces.
    - Excluded PCB Product (16 rooms) – 3 years based on 1 year for the 3rd floor, 2 years for the 2nd floor with overlap into the 1st floor during the final year.
  - Given the above sequencing, it is assumed that paint removal would need to occur over continuous summer break sessions for 16 years to achieve removal of the subject paint in the high frequency use rooms.
  - Waste generated would be a dry solid waste (paint and blast media) to be disposed of as PCB Bulk Product Waste, PCB Remediation Waste, or < 50 ppm Excluded PCB Product, depending on the subject room;
  - It is likely that residual PCBs may be present in the underlying masonry substrates at concentrations > 1 ppm and therefore, the replacement paint would need to be considered an in-placement management alternative, in essence re-creating the current condition of PCBs underlying and existing top coat of paint.
- In- Place Management with Administrative/Institutional Controls
  - Paint inspections indicate that the paint considered PCB Bulk Product Waste is covered/encapsulated by outer coatings in all areas;

- o Multiple layers of paint were observed in the majority of areas inspected (≥ 50 or < 50 ppm areas) and the School as indicated that routine maintenance painting occurs frequently;
- o Surface wipe data from multiple locations and painted surfaces indicates no-detectable levels of PCBs are present on the exposed paint surfaces;
- o These conditions, in effect, meet the targeted objectives for typical in-place management (encapsulation) remedial methods, as such it is not proposed that any new paints or coatings be applied to the subject painted surfaces until these surfaces are removed during future renovation or demolition projects that would impact the painted surfaces;
- o This alternative would also include administrative and institutional controls, including a deed restriction, to ensure these conditions are maintained in the future by developing and implementing communication plans; operations, maintenance, and waste management plans for when painted areas are to be disturbed; and a long-term interior environment monitoring and sampling program.
- o Under Federal EPA regulatory requirements, ≥ 50 ppm PCB paint constitutes an unauthorized use; however, the subject pale green paint could be considered no longer in "use" as it was determined to be no longer in a usable state and required to be re-coated/painted with another top coating (i.e., the pale green paint could be considered no longer in service and could meet the definition of a "waste"). For those areas subject to 40 CFR 761, this approach would be implemented in accordance with the risk-based disposal requirements.

6.1 Evaluation Criteria

The detailed evaluation and comparison was conducted in consideration of the following criteria:

- **Threshold Criteria** – each alternative was evaluated based on the protection of human health and the environment and the ability to achieve regulatory compliance (e.g., achieve the RAOs).
- **Short-Term Effectiveness** – each remedial alternative was evaluated using four criteria: 1) protection of the School occupants and community during implementation; 2) protection of workers during implementation of applicable remedial actions; 3) potential environmental impacts from the alternative; and 4) the anticipated timeframe required to complete the alternative.
- **Long-Term Effectiveness** – each alternative was evaluated based on the magnitude of residual risk to building occupants and the environment and the anticipated long-term adequacy and reliability of the controls associated with that alternative.
- **Community and Occupant Acceptance** – an evaluation of building occupants, users, and community acceptance of each alternative was made as part of the detailed evaluation.
- **Implementability** – the ability to effectively implement and complete each alternative was evaluated using several criteria ranging from reliability of the alternative, the anticipated ability to obtain regulatory approvals from the EPA and/or CTDEEP, and the availability of the materials, labor, and resources needed to implement the alternative.
- **Cost** – each alternative was evaluated based on estimated costs to complete the alternative. Estimate costs were developed based on the quantity of materials associated with each area of the building (the three categories of paints in question), typical unit rates for each component of the alternative (e.g., dry shot blasting painted surfaces, square foot painting costs, etc.) and annual O&M costs that would be associated with the

implementation of a long-term monitoring and maintenance plan in either the paints or residual PCBs in the substrates following paint removal.

The detailed evaluation and comparison for the three categories of paint, including a proposed selected remedial alternative, are provided in the following sections. Estimated cost breakdown tables are provided in Appendix A.

6.2 Comparison and Selection of the Proposed Remedial Alternative

A key factor in this evaluation is the current condition of the PCB paint (intact and mostly covered by another coating) and the results of the interior environment assessment. Indoor air and surface wipe data collected to date to evaluate the inhalation and dermal contact exposure routes indicate that current conditions do not pose an unreasonable risk to human health or the environment given that surface wipe samples were non-detect for PCBs and all indoor air samples were below EPA published exposure levels of concern for the school environment. As such, the in-place management alternative meets the criterion for protection of human health and the environment. It is likely that the physical removal of the paint will also meet this criterion; however, as discussed below there may be some short-term issues given the magnitude of disruption associated with removal techniques.

Under Federal EPA regulatory requirements, ≥ 50 ppm PCB paint constitutes an unauthorized use; however, the subject pale green paint could be considered no longer in "use" as it was determined to be no longer in a usable state and required to be re-coated/painted with another top coating (i.e., the pale green paint could be considered no longer in service and could meet the definition of a "waste"). The physical removal alternative would remove the paint, thereby meeting the objective (of note it may take up to 16 years to remove all subject PCB paint and achieve this objective given access restraints and operating logistics of the School). The in-place management alternative would meet this criterion for all paint classifications; however, if the pale green paint is not considered a waste, then full compliance for this PCB paint and potentially < 50 ppm (non-PCB Remediation Waste paint) would be deferred until a renovation or demolition project that would disturb the paint; therefore, this alternative has been considered partially meeting the criterion for this paint. Either option for the paint considered PCB Remediation Waste would meet the regulatory requirements, as most likely the selected remedial method would be a risk-based approach under 40 CFR 761.61(c) and demonstrate that the method will not pose an unreasonable risk of injury to health or the environment.

There is a level of uncertainty with the physical paint removal alternative with regard to short-term effectiveness and protection given the disruptive nature of sand/grit blasting of paint from CMU walls in an interior room setting and the need for extensive containments and controls. Any breach in these containments may make conditions worse than they currently are given that the paint is intact, covered/encapsulated, and not creating any unreasonable risk to human health. The time to implement this alternative is also in question given the restricted access and logistical plans required for work in an occupied school setting. The in-place management alternative meets all criteria associated with short term effectiveness and protection provided the associated administrative plans are developed and implemented.

Both alternatives meet the criteria associated with long term effectiveness (magnitude of residual risk after implementation is low) and implementability (available workers and reliable technologies) provided the School administers the associated administrative controls and plans, which, as indicated above, would be necessary under both alternatives.

Given the amount of disruption (and costs, as indicated in the summary table below and detailed in Appendix A) associated with the paint removal alternative, building occupant and community acceptance may not be favorable for this option, given that a condition of no unreasonable risk to human health has been achieved without the need to remove the paint and the level of costs and inconvenience associated with the removal alternative.

As indicated above, the time to meet the evaluation criteria would be over 16 Summer break sessions for the removal option; whereas within 1 year for the in-place management option (with the exception of the deferment of the ≥ 50 ppm

PCB paint and Excluded PCB product removal to a planned School renovation or demolition project that would disturb the paint).

Because the PCB containing paint is continuing to function as intended and there is no unreasonable risk to human health or the environment as a result of its presence, and it has been, in effect, previously encapsulated by newer paints/coatings, the extensive cost and level of disruption associated with paint removal disproportionately outweighs any environmental benefit. There is also a concern that the removal and disruption process may exacerbate interior conditions, which currently indicate no unreasonable risk to human health.

In addition, an in-place management approach meets the criteria for several of the elements to be considered under EPA's Principles for Greener Cleanups. In-place management minimizes waste generation by continuing to use the existing building materials in place beneath encapsulation barriers. By minimizing the generation of waste material, this approach also minimizes the need for land disposal of this material, as well as total energy use and greenhouse gas emissions by eliminating the need to transport these waste materials off-site for disposal by conventional trucking methods.

Lastly, the exterior components of the building façade as well as areas around the perimeter of the windows (exterior and interior) will have been remediated following an EPA-approved in-place management remedial method and associated administrative and institutional controls (long term monitoring plans, deed restrictions, etc.) will be required for these conditions.

For these reasons, the in-place management with administrative and institutional controls has been selected as the proposed remedial alternative for the PCB containing paint in the interior of the building. A summary of the evaluation and comparison criteria is provided on the following page. Following regulatory review and if approved, a remedial action plan will be developed detailing the various components of the proposed remedy and submitted to EPA and CTDEEP for approval.

Evaluation Criteria	No Action (Baseline for all categories)	Bulk Product Waste (≥ 50 ppm paint)		< 50 ppm PCB Remediation Waste		Excluded PCB Product (<50 ppm)	
		Physical Paint Removal	In Place Management with Controls	Physical Paint Removal	In Place Management with Controls	Physical Paint Removal	In Place Management with Controls
Protects Human Health & Environment	×	☑	☑	☑	☑	☑	☑
Achieves Regulatory Compliance	×	☑	☑ (or achieves over time)	☑	☑	☑	☐ (achieves over time)
Effective at Providing Short Term Protection	×	☐ ?	☑	☐ ?	☑	☐ ?	☑
Effective at Providing Long Term Protection	×	☑	☑	☑	☑	☑	☑
Implementability	☑	☑	☑	☐ ?	☑	☑	☑
Acceptable to Community and Building Occupants	×	☐ ?	☑	☐ ?	☑	☐ ?	☑
Time to reach criteria	Will not meet	Multiple mobilizations over several Summer break sessions (5 years)	Within 1 year, except for the unauthorized use, which would be deferred	Multiple mobilizations over several Summer break sessions (8 years)	Within 1 year	Multiple mobilizations over several Summer break sessions (3 years)	Annual exemption until removal
Estimated Costs Capital	N/A	$1,552,500	$33,900	$3,729,700	$42,000	$734,600	$15,000
Long term	N/A	$140,900 NPV over 20 years applied for all 3 scenarios and the same for both alternatives					

☑ Meets or Exceeds Criterion
☐ Partially Meets Criterion; "?" indicates uncertainty depending on implementation results
× Does Not Meet Criterion
Shading Indicates Preferred Remedy
NPV = net present value

TABLES

Table 1
Summary of Surface Wipe Sampling Results - 2017

Fairfield Ludlowe High School

Building Area	April 2017				December 2017			
	Location	Wipe Sample ID	Sample Date	Total PCBs (µg/100cm^2)	Location	Painted Surface Wipe Sample ID	Sample Date	Total PCBs (µg/100cm^2)
1950 Area	Room 129 - 1st Floor	FLHS-VWP-001	4/8/2017	< 0.20				
	Office-Admin Area - 2nd Floor	FLHS-VWP-010	4/8/2017	< 0.20	Office-Admin Area - 2nd Floor	FLHS-VWP-118	12/2/2017	< 0.20
	Room 324 Textile Lab - 3rd Floor	FLHS-VWP-016	4/8/2017	< 0.20	Room 357 - 3rd Floor	FLHS-VWP-101	12/2/2017	< 0.20
1971-72 Area	West Wing; Room 151 - 1st Floor	FLHS-VWP-018	4/8/2017	< 0.20	West Wing; Room 149 - 1st Floor	FLHS-VWP-107	12/2/2017	< 0.20
	East Wing; East Side Hallway - 1st Floor	FLHS-VWP-002	4/8/2017	< 0.20	East Wing Hallway - 1st Floor	FLHS-VWP-109	12/2/2017	< 0.20
	West Wing; Room 248 - 2nd Floor	FLHS-VWP-011	4/8/2017	< 0.20	West Wing; Room 246 Conference Room - 2nd Floor	FLHS-VWP-114	12/2/2017	< 0.20
	West Wing; Room 345 - 3rd Floor	FLHS-VWP-014	4/8/2017	< 0.20	West Wing; Room 347 Lab - 3rd Floor	FLHS-VWP-106	12/2/2017	< 0.20
1961-62 Area					East Wing, Room 024; Lower Level	FLHS-VWP-108	12/2/2017	< 0.20
	East Wing; Room 112 (Computer Lab) - 1st Floor	FLHS-VWP-009	4/8/2017	< 0.20	East Wing; Room 115 - 1st Floor	FLHS-VWP-111	12/2/2017	< 0.20
					East Wing; Orchestra Rehearsal Room 121 - 1st Floor	FLHS-VWP-110	12/2/2017	< 0.20
	West Wing; Cafeteria - 1st Floor	FLHS-VWP-008	4/8/2017	< 0.20	West Wing; Kitchen Area - 1st Floor	FLHS-VWP-112	12/2/2017	< 0.20
	West Wing; Room 230 Classroom - 2nd Floor	FLHS-VWP-012	4/8/2017	< 0.20	West Wing; Room 230 Classroom - 2nd Floor	FLHS-VWP-113	12/2/2017	< 0.20
	West Wing; Room 237 Lab - 2nd Floor	FLHS-VWP-003	4/8/2017	< 0.20	West Wing; Room 224 Classroom - 2nd Floor	FLHS-VWP-115	12/2/2017	< 0.20
	East Wing; Room 213 Lab - 2nd Floor	FLHS-VWP-013	4/8/2017	< 0.20	East Wing; Room 213 Lab - 2nd Floor	FLHS-VWP-116	12/2/2017	< 0.20
	East Wing; Room 220 Classroom - 2nd Floor	FLHS-VWP-004	4/8/2017	< 0.20	East Wing; Room 202 Classroom - 2nd Floor	FLHS-VWP-117	12/2/2017	< 0.20
	West Wing; Room 320 Classroom - 3rd Floor	FLHS-VWP-015	4/8/2017	< 0.20	West Wing; Room 317 Classroom - 3rd Floor	FLHS-VWP-102	12/2/2017	< 0.20
	West Wing; Room 326 Classroom - 3rd Floor	FLHS-VWP-005	4/8/2017	< 0.20	West Wing; Room 324 Classroom - 3rd Floor	FLHS-VWP-103	12/2/2017	< 0.20
					West Wing; Room 329 Classroom - 3rd Floor	FLSH-VWP-104	12/2/2017	< 0.20
					West Wing; Room 338 Offices - 3rd Floor	FLHS-VWP-105	12/2/2017	< 0.20
	East Wing; Room 306 - 3rd Floor	FLHS-VWP-007	4/8/2017	< 0.20				
	East Wing; Room 368 - 3rd Floor	FLHS-VWP-017	4/8/2017	< 0.20	East Wing; Room 368 Offices - 3rd Floor	FLHS-VWP-100	12/2/2017	< 0.20

Notes:
Surface wipe samples collected using a hexane saturated gauze over a 100 cm2 area in accordance with the standard wipe test methodology of 40 CFR 761.123.

Table 2
Summary of Horizontal Surface Wipe Sampling Results

Fairfield Ludlowe High School

Building Area	December 2017			
	Location	Horizontal Surface Wipe Sample ID	Sample Date	Total PCBs ($\mu g/100cm^2$)
1971-72 Area	East Wing; Room 002 - Lower Level	FLHS-VWH-104	12/2/2017	< 0.20
	West Wing; Room 149 - 1st Floor	FLHS-VWH-102	12/2/2017	< 0.20
	West Wing; Room 246 Conference Room - 2nd Floor	FLHS-VWH-106	12/2/2017	< 0.20
	West Wing; Room 347 Lab - 3rd Floor	FLHS-VWH-101	12/2/2017	< 0.20
1961-62 Area	East Wing, Room 024; Lower Level	FLHS-VWH-103	12/2/2017	< 0.20
	East Wing; Room 115 - 1st Floor	FLHS-VWH-105	12/2/2017	< 0.20
	West Wing; Room 224 Classroom - 2nd Floor	FLHS-VWH-107	12/2/2017	< 0.20
	West Wing; Room 329 Classroom - 3rd Floor	FLHS-VWH-100	12/2/2017	< 0.20

Notes:
Surface wipe samples collected using a hexane saturated gauze over a 100 cm2 area in accordance with the standard wipe test methodology of 40 CFR 761.123.

Table 3
Summary of Indoor Air Sampling Results - 2017

Fairfield Ludlowe High School

Building Wing	Area Grouping	Rooms	April 2017				December 2017			
			Location	Air Sample ID	Sample Date	Total PCB Concentration (ng/m^3)	Location	Air Sample ID	Sample Date	Total PCB Concentration (ng/m^3)
1950 Area	2nd Floor Administrative Areas	Admin Suite, Guidance Suite, PPT Suite, Media Area, House Offices	Office-Admin Area -2nd Floor	FLHS-IAS-005	4/8/2017	< 4.9	Office-Admin Area - 2nd Floor	FLHS-IAS-208	12/2/2017	< 4.5
	Classrooms and Laboratories	1st Floor - Room 129, 127 2nd Floor - Wright Guidance Office, Room 221 3rd Floor - Rooms 315, 316, 324, 356, 357, 358, 359, 360	Room 324 Textile Lab - 3rd Floor	FLHS-IAS-012	4/8/2017	24	Room 357 - 3rd Floor	FLHS-IAS-219	12/2/2017	< 5.2
1971-1972 Area (no > 50 ppm paint present)	Areas without > 50 ppm Window Caulking	Transitory Spaces (gymnasium, hallways) and Rooms 150, 151, 152, 153	East Wing; East Side Hallway - 1st Floor	FLHS-IAS-003	4/8/2017	16	East Wing; East Side Hallway - 1st Floor	FLHS-IAS-210	12/2/2017	13
			West Wing; Room 151 - 1st Floor	FLHS-IAS-001	4/8/2017	< 4.9				
	Classrooms with > 50 ppm Window Caulking (Note 1)	Lower Level - Rooms 002, 004 1st Floor - Rooms 145, 146, 147, 148, 149 2nd Floor - Rooms 243, 244, 249, 250, 251, 252, 253, 254, 255, 256, 257, 262 3rd Floor Rooms - 343, 344, 345,347, 349, 373, 375	West Wing; Room 345 - 3rd Floor	FLHS-IAS-010	4/8/2017	18	West Wing; Room 149 - 1st Floor	FLHS-IAS-204	12/2/2017	< 5.3
							West Wing; Room 347 Lab - 3rd Floor	FLHS-IAS-203	12/2/2017	7.9
	Administrative and Support Rooms with > 50 ppm Window Caulking (Note 1)	1st Floor - Rooms 142, 142A 2nd Floor - 245 Suite, Room 246, 247 Suite, Room 248 3rd Floor Rooms - 342 Suite	West Wing; Room 248 - 2nd Floor	FLHS-IAS-007	4/8/2017	< 5.0	West Wing; Room 246 Conference Room - 2nd Floor	FLHS-IAS-201	12/2/2017	51
1961-1962 Areas	Areas without Pale Green Paint or > 50 ppm Window Caulking	Transitory Spaces (cafeteria, gymnasium, hallways) and Rooms without > 50 ppm paint or > 50 ppm caulking	West Wing; Cafeteria - 1st Floor	FLHS-IAS-002	4/8/2017	4.4				
			East Wing; Room 112 (Computer Lab) - 1st Floor	FLHS-IAS-004	4/8/2017	6.5				
			West Side Hallway - 2nd Floor	FLHS-IAS-006	4/8/2017	7.4				
	Rooms without Pale Green Paint and Containing > 50 ppm Window Caulking (Note 1)	Lower Level - Rooms 015, 024, 030					East Wing; Room 024 - Lower Level	FLHS-IAS-221	12/2/2017	< 4.8
		1st Floor East - Room 121, 122, 125, 126, Office Space					East Wing; Rehearsal Room 121 - 1st Floor	FLHS-IAS-209	12/2/2017	< 4.7
		1st Floor West Wing - Kitchen Area, Rooms 130, 133					West Wing; Kitchen Area - 1st Floor	FLHS-IAS-202	12/2/2017	7.7
		2nd Floor East Wing - Rooms 201, 202, 203, 204					East Wing; Room 202 Classroom - 2nd Floor	FLHS-IAS-212	12/2/2017	16
		2nd Floor West Wing - Rooms 234, 235, 236, 237								
		3rd Floor East Wing - Rooms 301, 302, 368, 369, 370	East Wing; Room 368 Offices - 3rd Floor	FLHS-IAS-013	4/8/2017	65	East Wing; Room 368 Offices - 3rd Floor	FLHS-IAS-214	12/2/2017	48
		3rd Floor West Wing - Rooms 328, 329, 331, 333, Office Suite 338					West Wing; Room 338 Offices - 3rd Floor	FLHS-IAS-215	12/2/2017	24
							West Wing; Room 329 Classroom - 3rd Floor	FLHS-IAS-216	12/2/2017	22

Table 3
Summary of Indoor Air Sampling Results - 2017

Fairfield Ludlowe High School

Building Wing	Area Grouping	Rooms	Location	Air Sample ID	Sample Date	Total PCB Concentration (ng/m^3)	Location	Air Sample ID	Sample Date	Total PCB Concentration (ng/m^3)
1961-1962 Areas cont'd	Rooms with Pale Green Paint and Containing > 50 ppm Window Caulking (Note 1)	1st Floor East Wing - Room 115 and adjacent Storage					East Wing; Room 115 - 1st Floor	FLHS-IAS-207	12/2/2017	11
		2nd Floor West Wing - Rooms 223, 224, 225, 226, 227, 228, 230, 232, 233	West Wing: Room 230 Classroom - 2nd Floor	FLHS-IAS-008	4/8/2017	245	West Wing; Room 230 Classroom - 2nd Floor	FLHS-IAS-206	12/2/2017	47
							West Wing; Room 224 Classroom - 2nd Floor	FLHS-IAS-205	12/2/2017	25
		2nd Floor East Wing - Rooms 205, 211, 213, 214, 215, 220 and Nurses Suite	East Wing; Room 213 Chemistry Lab - 2nd	FLHS-IAS-009	4/8/2017	98	East Wing; Room 213 Chemistry Lab - 2nd Floor	FLHS-IAS-211	12/2/2017	20
		3rd Floor West Wing - Rooms 317, 318, 319, 320 ,321, 322, 324, 325, 326, 327	West Wing; Room 320 Classroom - 3rd Floor	FLHS-IAS-011	4/8/2017	38	West Wing; Room 317 Classroom - 3rd Floor	FLHS-IAS-213	12/2/2017	32
							West Wing; Room 324 Classroom - 3rd Floor	FLHS-IAS-217	12/2/2017	23
		3rd Floor East Wing - Rooms 303, 304, 305, 306, 312, 313, 314								
Ambient/ Outside	N/A	N/A	West Courtyard	FLHS-IAS-014	4/8/2017	< 4.7	West Courtyard	FLHS-IAS-220	12/2/2017	< 5.3

Notes:
1. > 50 Caulking removed from these spaces in 2017 after the April sampling event and prior to the December sampling event with the exception of Rooms 115, 202, and 368 in the 1960s east wing where caulking was still present during the December sampling event and is scheduled to be removed in 2018.
Air samples collected in accordance with USEPA Compendium Method TO-10A over a minimum of 6 hours and submitted to the laboratory for PCB homolog analysis.
Total PCB concentration is the total PCB homologs reported by the laboratory (ng/cartridge) corrected for the sample volume.

Table 4
Summary of Painted Masonry Surfaces

Fairfield Ludlowe High School

Surface Type	Paint Description	Existing Data	Square Footage	Notes
1961/1962 East Area				
Classroom, Laboratory, and Office Spaces				
Masonry Surfaces in Rooms - Pale Green Paint	pale green paint underlying white/off-white top coat	4 samples from 3 rooms - total PCBs reported at concentrations of 87, 150, 390, and 580 ppm	6,000	Observed on CMU block walls along perimeter walls in select portions of the 1st, 2nd, and 3rd floors
Masonry Surfaces in Rooms	typically white paint with underlying off-white/beige; limited areas of different color topcoats observed	2 samples from 2 rooms - total PCBs reported at concentrations of 39 and 45 ppm	28,000	
Transitory Spaces				
Hallway Surfaces	white paint or white with underlying off-white/beige	None	29,000	
Gymnasium	white outer layer over either beige (0 to 7 ft.) or black (> 7 ft.)	None	10,000	
Lower Level	white paint with limited areas of different colors	None	24,000	
1961/1962 West Area				
Classroom, Laboratory, and Office Spaces				
Masonry Surfaces in Rooms - Pale Green Paint	pale green paint underlying white/off-white top coat	4 samples from 3 rooms - total PCBs reported at concentrations of 30, 61, 99, and 470 ppm	19,000	Observed on CMU block walls along perimeter walls in select portions of the 2nd and 3rd floors
Masonry Surfaces in Rooms	typically white paint; limited areas of blue or green paint overtop of white	None - paint similar in physical appearance to that observed on masonry in east area	8,000	
Transitory Spaces				
Hallway Surfaces	white paint or white with underlying off-white/beige	None	35,000	
Cafeteria and Kitchen	white, blue, or green paint	None	11,000	New application of paint assumed to be associated with 2015 renovations to cafeteria

Table 4
Summary of Painted Masonry Surfaces

Fairfield Ludlowe High School

Surface Type	Paint Description	Existing Data	Square Footage	Notes
1971/1972 Area				
Classroom, Laboratory, and Office Spaces				
Masonry Surfaces in Rooms	white paint	5 samples from 3 locations - total PCBs reported at concentrations of 6.8, 6.9, 7.3, 7.9, and 9.2 ppm	30,000	
Transitory Spaces				
Hallway Surfaces	white paint	None - paint similar in physical appearance to that observed on masonry in classrooms	18,000	
Gymnasium	grey paint over white paint on masonry surfaces	None - underlying white paint is similar in physical appearance to that observed on classroom masonry walls.	9,000	
Lower Level	white paint with limited areas of different colors	None	15,000	
1950 Area				
Classroom, Laboratory, and Office Spaces				
Masonry Surfaces in Rooms	white paint with areas of underlying off-white paint; limited areas of differing color top coat	4 samples from 4 locations - total PCBs reported at concentrations of 1.2, 3.0, 3.3, and 10 ppm	11,000	
Transitory Spaces				
Hallway Surfaces	single layer of white paint on masonry surfaces	None	14,000	
Auditorium Masonry Surfaces	black paint on masonry	None	11,000	
First Floor Storage	single layer grey over white	None	5,000	
First Floor Mechanical Room	blue paint on upper sections of walls (white below and behind)	None	2,000	

Notes:
1. Square footages represents all floors including lower level (where applicable) and calculated based on field observations and existing floor plans for linear footage of surfaces with assumed height of 10 feet. Total square footages presented includes a 10% contingency and have been rounded up to the nearest 1,000 square foot increment.

Table 5
Initial Screening of Remedial Technologies - PCBs in Paint

Fairfield Ludlowe High School

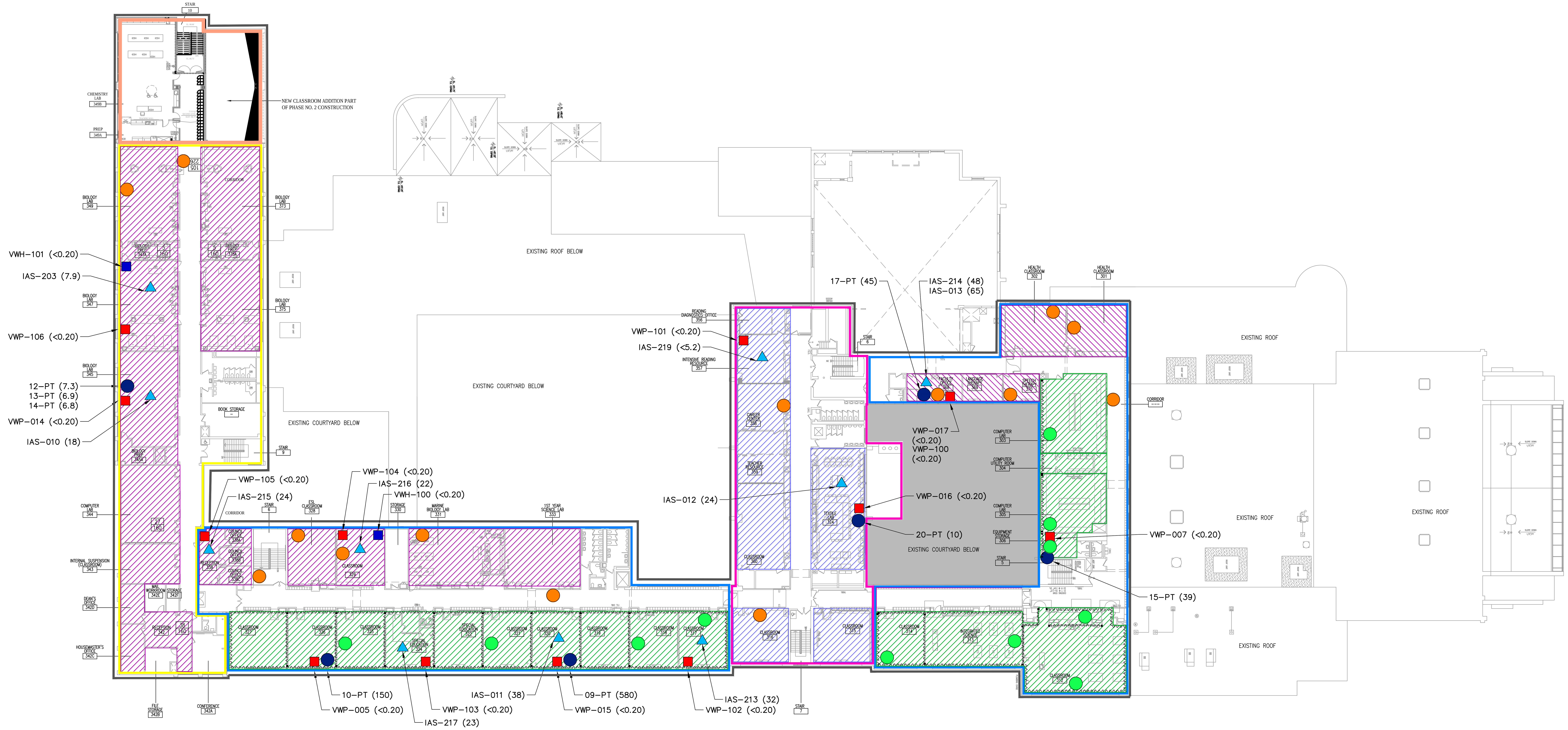
Technology Category	Remedial Alternative	Description	Effectiveness *- achievement of RAOs; timeframe to achieve RAOs - proven technology / reliability - health / environmental impacts - source control effectiveness*	Implementability *technical and administrative feasibility; schedule feasibility*	Relative Cost *as compared to other technologies evaluated in initial screening*	Screening Evaluation Result
Removal via Blasting	Physical Removal by Dry Methods	Physical removal by blasting with a dry abrasive media such as sand, steel shot or grit, glass or plastic beads, ceramic grit, dry organic materials, or other dry abrasive blast media; the waste generated from this process is a dry solid waste (paint and blast media).	- Removal of source (paint) can be achieved by this method, which is a readily available and proven technology; - Environmental impacts include generation, management, and off-site T&D of PCB waste (higher volume of waste by wet blasting methods [in addition to water disposal and management], lower volume of waste by dry ice methods); - Potential health risk of exposure to PCB-laden dust if containments are breached or cleanup is insufficient;	- Materials and qualified labor are readily available; - Removal is relatively feasible; however, assume that a small fraction of the surfaces are inaccessible behind permanent features installed after the walls were painted (e.g., new window casings, conduit/piping, lab benches, sinks, etc.) - Substrate removal to achieve PCBs ≤ 1 ppm may require large incremental effort and will disproportionately affect schedule to remove and restore this surface; may cause structural concerns; 1 ppm cleanup level may not be achieved at a depth shallower than the full 1.25-inch thickness of the CMU face shell over the hollow core	High	**Physical removal through dry blasting methods is retained for further consideration due to overall effectiveness and implementability compared to other removal methods**
	Physical Removal by Dry Ice Blasting	Physical removal by dry ice accelerated in a pressurized air stream; the waste generated from this process is a dry solid waste (paint).				Physical removal through dry ice blasting has not been retained due to implementability issues associated with labor and materials and discussions with contractors that dry blasting would be not preferred due to effectiveness and cost considerations.
	Physical Removal by Wet Methods	Physical removal by wet methods including hydroblasting (application of water at high pressure without abrasives) or water-induced abrasive blasting (any of the abrasives listed above, applied with pressurized water); the waste generated from this process is a solid/liquid slurry (paint, water, and blast media).		- Same as above, plus the use of water in a multi-floor school setting is impracticable due to potential for water damage to building materials, potential mold issues if containments are breached, etc.		Physical removal through water blasting has not been retained due to implementability issues associated with high volumes of water to be contained and controlled in a multiple floor occupied building intended for continued use as a school.
Mechanical Removal	Physical Removal by Mechanical Means	Physical removal by scraping, grinding, bristle blasting, or scarifying; use of hand tools and/or mechanical equipment	- Removal of paint can be achieved by this method, which is a proven technology; - Environmental impacts include generation, management, and off-site T&D of PCB (higher volume of waste than blasting methods due to add'l substrate removal); - Significantly more dust generated if scarification is used - Potential health risk of exposure to PCB-laden dust if containments are breached or cleanup is insufficient;	- Materials and qualified labor are readily available; - Removal is relatively feasible; - Substrate removal to achieve PCBs ≤ 1 ppm may require large incremental effort and will disproportionately affect schedule to remove and restore this surface; may cause structural concerns; 1 ppm cleanup level may not be achieved at a depth shallower than the full 1.25-inch thickness of the CMU face shell over the hollow core; removal depth is more difficult to control by mechanical methods vs. blasting methods - Pace of work is slower than blasting due to higher labor intensity	High	Not retained for further consideration due to significant increase in labor associated with hand removal and discussions with contractors that blast technologies would be preferred
Chemical Removal	Chemical Removal by PeelAway® or equivalent paint stripping product	Physical removal by use of commercially available paint stripping methods that utilize chemicals to facilitate removal	- Effectiveness of removal of multiple layers of paint from porous surface through chemical removal methods may be limited; - Environmental impacts include generation, management and off-site T&D of PCB wastes (potentially lower volume of waste but additional waste disposal considerations may be required due to the chemical composition of the selected product)	- Materials and qualified labor are readily available; - Use of this method for removal from CMU block not recommended by Contractors - Pace of work is slower than blasting due to potential need to perform multiple rounds of removals	Moderate	Not retained for further consideration due to lower efficiency of removal and potential to create different waste streams and discussions with contractors indicating that blast removal would be preferred

Table 5
Initial Screening of Remedial Technologies - PCBs in Paint

Fairfield Ludlowe High School

Technology Category	**Remedial Alternative**	**Description**	**Effectiveness** *- achievement of RAOs; timeframe to achieve RAOs* *- proven technology / reliability* *- health / environmental impacts* *- source control effectiveness*	**Implementability** *technical and administrative feasibility; schedule feasibility*	**Relative Cost** *as compared to other technologies evaluated in initial screening*	**Screening Evaluation Result**
Source Modification	Activated Metal Treatment System	An activated metal within a solvent system and a thickening agent to form a paste. The technology extracts PCBs from materials such as paints. The extracted PCBs react with the activated metal and are degraded into by-products.	- Effectiveness of these technologies to reduce PCBs to concentrations < 50 ppm and/or < 1 ppm in multiple layers of paint on porous surfaces is not known - Processes involve use of potentially hazardous chemicals in a school setting - Effect of top coating of non-PCB paint is not known and may require removal (which would not be cost effective)	- Materials and qualified labor are not readily available - Technologies are not approved by EPA for remediation of PCBs under40 CFR 761 (> 50 ppm paints or < 50 PCB Remediation Wastes); approval not anticipated to be achieved in a timely manner	High	Not retained for further consideration based on unproven effectiveness to achieve RAOs, lack of current approval by regulatory agencies for use in remediation of PCBs under 40 CFR 761, and costs.
	Amstar Dechlorination Liquid	Nucleophilic substitution reaction that removes the chlorine from the PCBs without heat				
	Reductive Dechlorination	Catalytic hydrodechlorination with H(2), Fe-based reductive dechlorination, and other reductive dechlorination methods (e.g., hydrogen-transfer dechlorination, base-catalyzed dechlorination, and sodium dispersion)				
	Reductive Dehalination	Dehalogenation processes (base catalyzed decomposition)				
In-Place Management	Manage In Place: Encapsulation / Barrier Installation with Administrative / Institutional Controls	Includes approval from EPA and CTDEEP for the in-place management of PCB containing paints. Administrative/Institutional controls include development and implementation of long term monitoring and maintenance program for the painted surfaces, training of building occupants and users, and deed restrictions regarding presence of PCBs in these surfaces. Will require continued monitoring to demonstrate interior conditions remain stable with no unreasonable risk to building occupants and users (e.g., indoor air and surface wipe testing).	- Based on existing data from stabilized conditions testing, alternative would be protective of human health and the environment. - Effectively controls source of PCBs by demonstrating materials are encapsulated or bound in the media (paint and substrate) - Consistent approach with regard to risk from PCBs given current agency approval for in-place management of residual PCBs in interior masonry associated with the window and door replacement project. - Would defer the removal of those PCBs at $\geq$ 50 ppm concentrations until a planned renovation or demolition project	Implementability done through administrative methods plus routine monitoring and/or new coating applications similar to what is required as part of the in-place management of residual PCBs associated with the window and door replacement project.	Low	**This alternative has been retained for further evaluation**

FIGURES



NOTES

1. HIGH FREQUENCY SPACES INCLUDE CLASSROOMS, LABORATORIES, OFFICE/ADMINISTRATIVE SPACES, WHICH ARE OCCUPIED ON AN ALMOST CONTINUOUS BASIS DURING A TYPICAL SCHOOL DAY.
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3. HIGH FREQUENCY SPACES IDENTIFIED AS CONTAINING >1 AND <50 PPM PCB PAINT IN THE 1960's AND 1970's AREAS BASED ON VISUAL INSPECTIONS OF REPRESENTATIVE LOCATION IN THOSE SPACES (e.g. PAINT COLORS AND LAYERS) AND ANALYTICAL DATA, AS APPLICABLE.
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LEGEND

- 1950 CONSTRUCTION
- 1961–62 CONSTRUCTION
- 1971–72 CONSTRUCTION
- 2005 CONSTRUCTION
- EDGE OF BUILDING
- PAINT SCRAPING LOCATION – PALE GREEN PAINT, NOT OBSERVED
- PAINT SCRAPING LOCATION – PALE GREEN PAINT, OBSERVED
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30' 0 30' 60'
BAR SCALE
1" = 30'
CHECK GRAPHIC SCALE BEFORE USING

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DESIGNED BY: GJF CHECKED BY: GJF
DRAWN BY: MRM 228875 FAIRFIELD CT_LUDF.dwg

THIRD LEVEL FLOOR PLAN

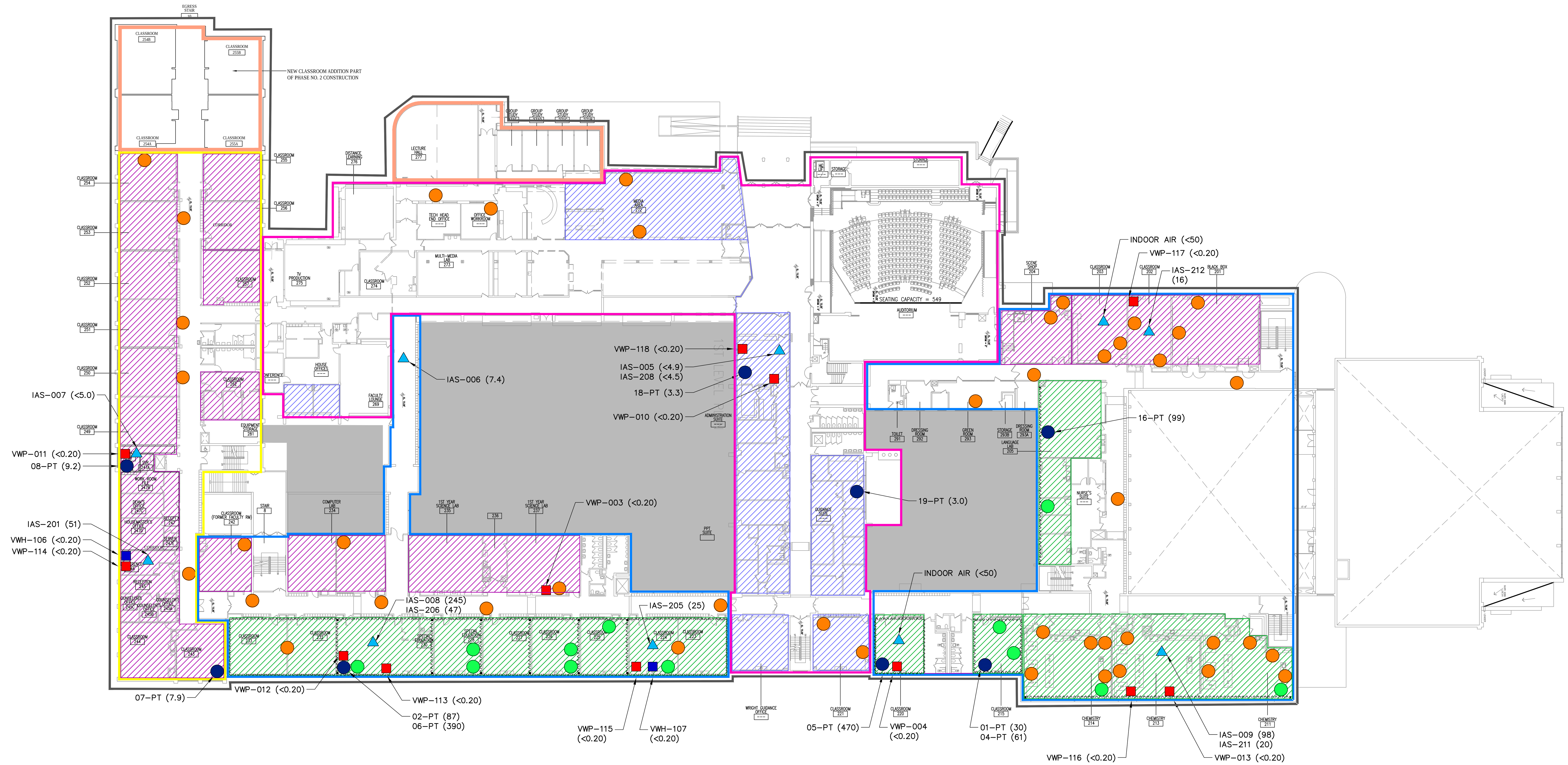
FAIRFIELD PUBLIC SCHOOLS
LUDLOWE HIGH SCHOOL

FEASIBILITY STUDY

JOB NO.: 228875.02
DATE: DEC 2017
SCALE: 1" = 30'
SHEET: 1 OF 1

FIG. 1

22x34 SHEET
1:1



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DRAWN BY: MRM
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SECOND LEVEL FLOOR PLAN

FAIRFIELD PUBLIC SCHOOLS
LUDLOWE HIGH SCHOOL

FEASIBILITY STUDY

JOB NO.: 228875.02
DATE: DEC 2017
SCALE: 1" = 30'
SHEET: 1 OF 1

FIG. 2

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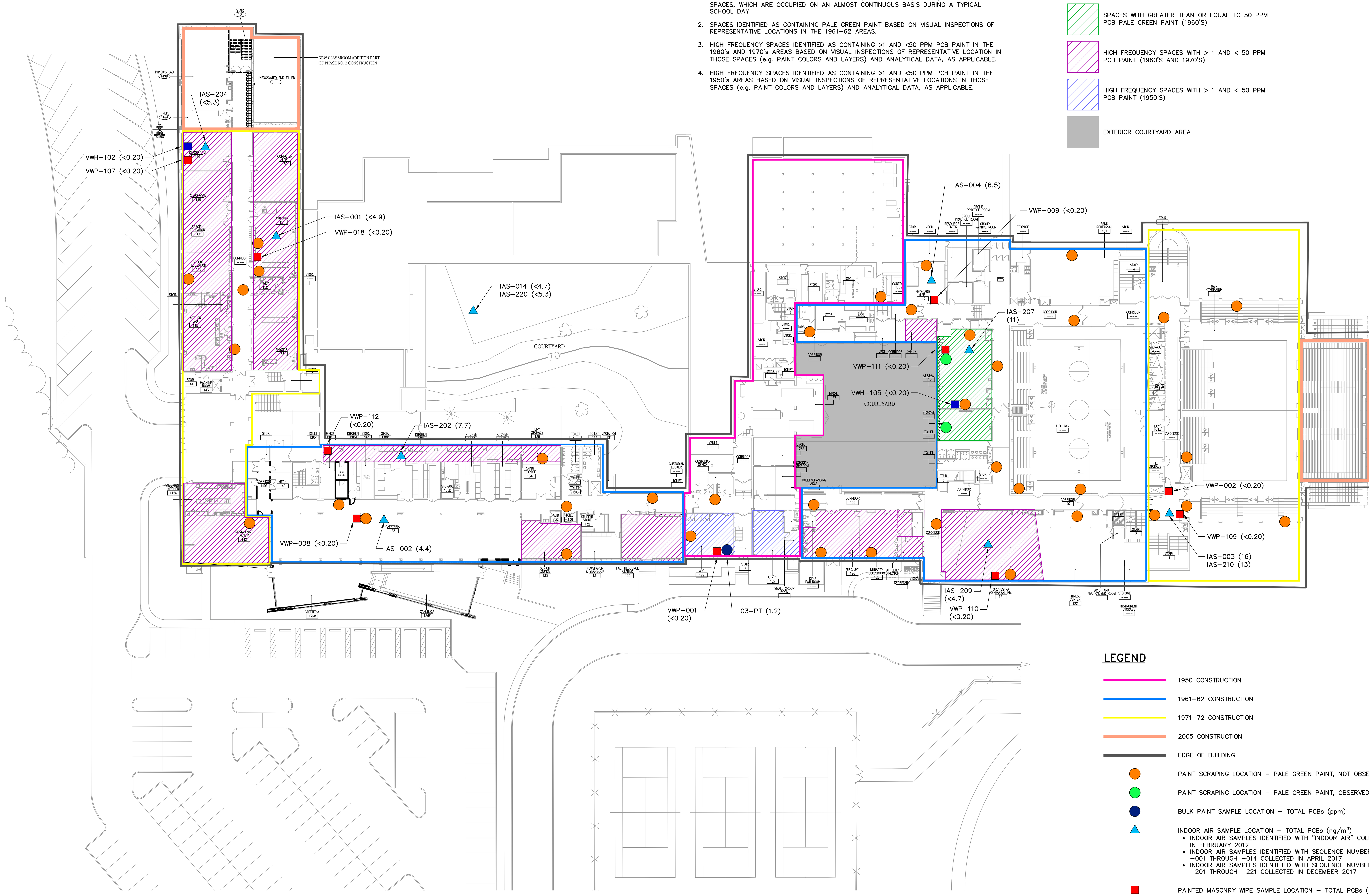

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DRAWN BY: MRM | 228875 FAIRFIELD CT_LUD*.dwg

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LUDLOWE HIGH SCHOOL

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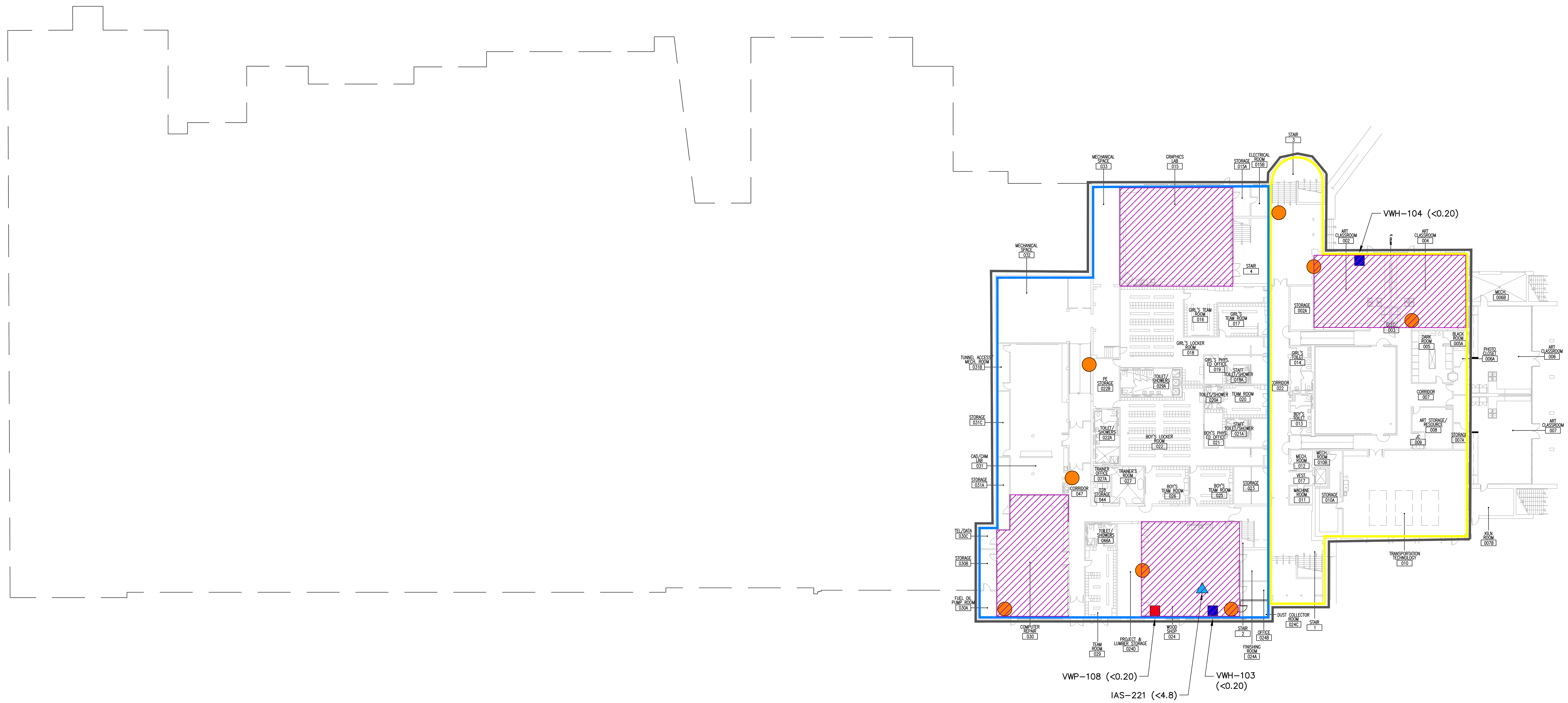
SHEET: 1 OF 1

FIG. 3



NOTES

1. HIGH FREQUENCY SPACES INCLUDE CLASSROOMS, LABORATORIES, OFFICE/ADMINISTRATIVE SPACES, WHICH ARE OCCUPIED ON AN ALMOST CONTINUOUS BASIS DURING A TYPICAL SCHOOL DAY.
2. SPACES IDENTIFIED AS CONTAINING PALE GREEN PAINT BASED ON VISUAL INSPECTIONS OF REPRESENTATIVE LOCATIONS IN THE 1961–62 AREAS.
3. HIGH FREQUENCY SPACES IDENTIFIED AS CONTAINING >1 AND <50 PPM PCB PAINT IN THE 1960's AND 1970's AREAS BASED ON VISUAL INSPECTIONS OF REPRESENTATIVE LOCATION IN THOSE SPACES (e.g. PAINT COLORS AND LAYERS) AND ANALYTICAL DATA, AS APPLICABLE.
4. HIGH FREQUENCY SPACES IDENTIFIED AS CONTAINING >1 AND <50 PPM PCB PAINT IN THE 1950's AREAS BASED ON VISUAL INSPECTIONS OF REPRESENTATIVE LOCATIONS IN THOSE SPACES (e.g. PAINT COLORS AND LAYERS) AND ANALYTICAL DATA, AS APPLICABLE.

LEGEND

- 1961–62 CONSTRUCTION
- 1971–72 CONSTRUCTION
- EDGE OF BUILDING
- PAINT SCRAPING LOCATION – PALE GREEN PAINT, NOT OBSERVED
- PAINT SCRAPING LOCATION – PALE GREEN PAINT, OBSERVED
- INDOOR AIR SAMPLE LOCATION – TOTAL PCBs (ng/m^3)
  - INDOOR AIR SAMPLES IDENTIFIED WITH "INDOOR AIR" COLLECTED IN FEBRUARY 2012
  - INDOOR AIR SAMPLES IDENTIFIED WITH SEQUENCE NUMBERS –001 THROUGH –014 COLLECTED IN APRIL 2017
  - INDOOR AIR SAMPLES IDENTIFIED WITH SEQUENCE NUMBERS –201 THROUGH –221 COLLECTED IN DECEMBER 2017
- PAINTED MASONRY WIPE SAMPLE LOCATION – TOTAL PCBs (ug/100 cm^2)
- HORIZONTAL SURFACE WIPE SAMPLE LOCATION – TOTAL PCBs (ug/100 cm^2)
- HIGH FREQUENCY SPACES WITH > 1 AND < 50 PPM PCB PAINT (1960'S AND 1970'S)

30' 0 30' 60'
BAR SCALE
1" = 30'
CHECK GRAPHIC SCALE BEFORE USING

22x34 SHEET
1:1

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DESIGNED BY: GJF
CHECKED BY: GJF
DRAWN BY: MRM
228875 FAIRFIELD CT_LUD*.dwg

LOWER LEVEL FLOOR PLAN

FAIRFIELD PUBLIC SCHOOLS
LUDLOWE HIGH SCHOOL

FEASIBILITY STUDY

JOB NO.: 228875.02
DATE: DEC 2017
SCALE: 1" = 30'
SHEET: 1 OF 1

FIG. 4

APPENDIX A: REMEDIAL ALTERNATIVE COST BREAKDOWNS

APPENDIX A1: REMOVAL COST ESTIMATE

SUMMARY OF COSTS
FLHS Remedial Alternative

CAPITAL COSTS - PHYSICAL PAINT REMOVAL	PCB Bulk Product Waste (1960s Areas)		< 50 PCB Remediation Waste (1960s and 1970s Areas)		Excluded PCB Product - < 50 (1950s Areas)	
Construction Activities						
Mobilization/Demobilization	$	5,000	$	5,000	$	5,000
Removal and Restoration	$	825,000	$	2,178,000	$	363,000
Verification and Monitoring	$	189,000	$	298,300	$	118,600
Institutional Controls	$	20,000	$	15,000	$	5,000
SUBTOTAL - CONSTRUCTION ACTIVITIES	$	1,039,000	$	2,496,300	$	491,600
Contingency (20%)	$	207,800	$	499,300	$	98,400
TOTAL CONSTRUCTION ACTIVITIES	**$**	**1,246,800**	**$**	**2,995,600**	**$**	**590,000**
Professional/ Technical Services						
Project Management	$	99,800	$	239,700	$	47,200
Remedial Design	$	62,400	$	149,800	$	29,500
Construction Management	$	124,700	$	299,600	$	59,000
Health and Safety	$	18,800	$	45,000	$	8,900
TOTAL PROFESSIONAL/ TECHNICAL SERVICES	**$**	**305,700**	**$**	**734,100**	**$**	**144,600**
TOTAL CAPITAL COSTS	**$**	**1,552,500**	**$**	**3,729,700**	**$**	**734,600**

ANNUAL MONITORING AND MAINTENANCE COSTS - ALL SURFACES (annually for 10 years then bi-annually for 10 years)

Performance Monitoring	$	15,023
Contingency	$	3,005
Total Per-Event Monitoring Costs	$	18,028
Total Present Value Monitoring and Maintenance Costs	**$**	**140,900**

CAPITAL COSTS
> 50 PCB Paint
FLHS Remedial Alternative

Assumptions:

Square Footage of Walls w/> 50 Paints	25,000	SF	Linear footages of surfaces with assumed height of 10 ft. Includes 10% contingency and rounded up to the nearest 1,000 SF
Duration of Removal	5	years	See Section 6 for assumed schedule
Weeks per Construction Season	8	weeks	mid-June through mid-August based on 2017 window replacement construction schedule
Shifts per Construction Season	40	shifts	Monday through Friday, standard shifts

Verification and Inspection
Full-time monitoring during paint removal for containment and control inspections, perimeter monitoring, visual inspections, etc.
Perimeter monitoring to include total dust monitoring and PCB monitoring
Post-removal verification sampling to be conducted at a minimum frequency of 1 sample per 500 SF of removal

		QTY	UNIT	UNIT COST	TOTAL	NOTES
Construction Activities						
Mobilization/Demobilization						
Mobe/ Demobe		1	LS	$ 5,000	$ 5,000	
	SUBTOTAL:				$ 5,000	
Removal and Restoration						
Preparation/Containments		25,000	SF	$ 3	$ 75,000	
Removal - Sandblasting		25,000	SF	$ 20	$ 500,000	
Repainting Surfaces		25,000	SF	$ 2	$ 50,000	
Restoration of Rooms		25,000	SF	$ 3	$ 75,000	
Waste Disposal		25,000	SF	$ 5	$ 125,000	
	SUBTOTAL:				$ 825,000	
Verification and Monitoring						
Work Plan Preparation		1	LS	$ 10,000	$ 10,000	
Field Labor		200	Shifts	$ 700	$ 140,000	
Laboratory		60	samples	$ 74	$ 4,452	PCBs via USEPA 8082 w/Soxhlet Extraction; includes 20% contingency
Dust and Perimeter Monitoring		40	months	$ 750	$ 30,000	Assumes 4 dust monitoring stations with telemetry; equipment rental costs estimated from Pine Environmental
Reporting		1	LS	$ 4,500	$ 4,500	
	SUBTOTAL:				$ 189,000	
Institutional Controls		1	LS	$ 20,000	$ 20,000	Deed Notice and MMIP plan preparation
	SUBTOTAL:				$ 20,000	
				SUBTOTAL - CONSTRUCTION ACTIVITIES	**$ 1,039,000**	
				Contingency (20%)	**$ 207,800**	
TOTAL CONSTRUCTION ACTIVITIES - REMOVAL OF PAINT					**$ 1,246,800**	
Professional/ Technical Services						
Project Management		8%			$ 99,800	per USACE and USEPA, 2000
Remedial Design		5%			$ 62,400	
Construction Management		10%			$ 124,700	
Health and Safety		1.5%			$ 18,800	
TOTAL PROFESSIONAL/ TECHNICAL SERVICES					**$ 305,700**	
TOTAL - CAPITAL COSTS					**$ 1,552,500**	

CAPITAL COSTS
> 1 and < 50 PCB Paint - 1961/62 and 1971/72 Areas
FLHS Remedial Alternative

Assumptions:

Square Footage of Walls w/> 1 and < 50 PCB Paints	66,000	SF	Linear footages of surfaces with assumed height of 10 ft. Includes 10% contingency and rounded up to the nearest 1,000 SF
Duration of Removal	8	years	See Section 6 for assumed schedule
Weeks per Construction Season	8	weeks	mid-June through mid-August based on 2017 window replacement construction schedule
Shifts per Construction Season	40	shifts	Monday through Friday, standard shifts

Verification and Inspection
Full-time monitoring during paint removal for containment and control inspections, perimeter monitoring, visual inspections, etc.
Perimeter monitoring to include total dust monitoring as surrogate for PCB monitoring
Post-removal verification sampling to be conducted at a frequency of 1 sample per 500 SF

	QTY	UNIT	UNIT COST	TOTAL	NOTES
Construction Activities					
Mobilization/Demobilization					
Mobe/ Demobe	1	LS	$ 5,000	$ 5,000	
SUBTOTAL:				$ 5,000	
Removal and Restoration					
Preparation/Containments	66,000	SF	$ 3	$ 198,000	
Removal - Sandblasting	66,000	SF	$ 20	$ 1,320,000	
Repainting Surfaces	66,000	SF	$ 2	$ 132,000	
Restoration of Rooms	66,000	SF	$ 3	$ 198,000	
Waste Disposal	66,000	SF	$ 5	$ 330,000	
SUBTOTAL:				$ 2,178,000	
Verification and Monitoring					
Work Plan Preparation	1	LS	$ 10,000	$ 10,000	
Field Labor	320	Shifts	$ 700	$ 224,000	
Laboratory	158	samples	$ 74	$ 11,753	PCBs via USEPA 8082 w/Soxhlet Extraction; includes 20% contingency
Dust and Perimeter Monitoring	64	months	$ 750	$ 48,000	Assumes 4 dust monitoring stations with telemetry for duration of work
Reporting	1	LS	$ 4,500	$ 4,500	
SUBTOTAL:				$ 298,300	
Institutional Controls	1	LS	$ 15,000	$ 15,000	Deed Notice and MMIP plan preparation
SUBTOTAL:				$ 15,000	
			SUBTOTAL - CONSTRUCTION ACTIVITIES	**$ 2,496,300**	
			Contingency (20%)	**$ 499,300**	
TOTAL CONSTRUCTION ACTIVITIES - REMOVAL OF PAINT				**$ 2,995,600**	
Professional/ Technical Services					
Project Management	8%			$ 239,700	per USACE and USEPA, 2000
Remedial Design	5%			$ 149,800	
Construction Management	10%			$ 299,600	
Health and Safety	1.5%			$ 45,000	
TOTAL PROFESSIONAL/ TECHNICAL SERVICES				**$ 734,100**	
TOTAL - CAPITAL COSTS				**$ 3,729,700**	

CAPITAL COSTS
> 1 and < 50 PCB Paint - 1950 Areas
FLHS Remedial Alternative

Assumptions:

Square Footage of Walls w/> 50 Paints	11,000	SF	Linear footages of surfaces with assumed height of 10 ft. Includes 10% contingency and rounded up to the nearest 1,000 SF
Duration of Removal	3	years	See Section 6 for assumed schedule
Weeks per Construction Season	8	weeks	mid-June through mid-August based on 2017 window replacement construction schedule
Shifts per Construction Season	40	shifts	Monday through Friday, standard shifts

Verification and Inspection
Full-time monitoring during paint removal for containment and control inspections, perimeter monitoring, visual inspections, etc.
Perimeter monitoring to include total dust monitoring as surrogate for PCB monitoring
Post-removal verification sampling to be conducted at a frequency of 1 sample per 500 SF

	QTY	UNIT	UNIT COST	TOTAL	NOTES
Construction Activities					
Mobilization/Demobilization					
Mobe/ Demobe	1	LS	$ 5,000	$ 5,000	
SUBTOTAL:				$ 5,000	
Removal and Restoration					
Preparation/Containments	11,000	SF	$ 3	$ 33,000	
Removal - Sandblasting	11,000	SF	$ 20	$ 220,000	
Repainting Surfaces	11,000	SF	$ 2	$ 22,000	
Restoration of Rooms	11,000	SF	$ 3	$ 33,000	
Waste Disposal	11,000	SF	$ 5	$ 55,000	
SUBTOTAL:				$ 363,000	
Verification and Monitoring					
Work Plan Preparation	1	LS	$ 10,000	$ 10,000	
Field Labor	120	Shifts	$ 700	$ 84,000	
Laboratory	27	samples	$ 74	$ 2,003	PCBs via USEPA 8082 w/Soxhlet Extraction; includes 20% contingency
Dust and Perimeter Monitoring	24	months	$ 750	$ 18,000	Assumes 4 dust monitoring stations with telemetry for duration of work
Reporting	1	LS	$ 4,500	$ 4,500	
SUBTOTAL:				$ 118,600	
Institutional Controls	1	LS	$ 5,000	$ 5,000	annual exemption filing with CTDEEP
SUBTOTAL:				$ 5,000	
			SUBTOTAL - CONSTRUCTION ACTIVITIES	**$ 491,600**	
			Contingency (20%)	**$ 98,400**	
TOTAL CONSTRUCTION ACTIVITIES - REMOVAL OF PAINT				**$ 590,000**	
Professional/ Technical Services					
Project Management	8%			$ 47,200	per USACE and USEPA, 2000
Remedial Design	5%			$ 29,500	
Construction Management	10%			$ 59,000	
Health and Safety	1.5%			$ 8,900	
TOTAL PROFESSIONAL/ TECHNICAL SERVICES				**$ 144,600**	
TOTAL - CAPITAL COSTS				**$ 734,600**	

LONG TERM MONITORING COSTS
PCB Paint
FLHS Remedial Alternative

Assumptions:

1. Long term monitoring assumed to be required for all identified PCB Containing paints.
2. Assumes long term monitoring will be required for either remedial alternative under assumption that residual PCBs > 1ppm will remain in masonry following paint removals.
3. Assumes annual monitoring for the first 10 years and bi-annual monitoring thereafter for a total duration of 20 years.
4. Assumes limited touch up paints.
5. Assumes long term monitoring sampling event consistent with proposed IAS and wipe sampling proposed in Dec 2017.
6. Costs based on standard 2017 laboratory and labor rates.

	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
Performance Monitoring	Yrs 2-20					
Laboratory		1	LS/ EVENT	$7,623.00	$ 7,623	based on 2017 cost estimate, 18 IAS, 18 SW samples; 1 time per year
Field Labor and Misc. Expenses		1	LS/ EVENT	$3,920.00	$ 3,920	based on 2017 cost estimates; 2 people 1 day per event
Paint maintenance and repair		1	LS/ EVENT	$1,000.00	$ 1,000	based on assumed $1,000 per year for touch-up of coatings
Reporting and Project Management		1	LS/ EVENT	$2,480.00	$ 2,480	based on 2017 cost estimate
SUBTOTAL:					$ 15,023	
O&M SUBTOTAL:					$ 15,023	
Contingency (20%)					$ 3,005	
Per Event Monitoring Costs (Annually for 1st 10 years then bi-annually)					**$ 18,028**	
TOTAL - PRESENT VALUE MONITORING COSTS (7%, 20 Years)					**$ 140,900**	

APPENDIX A2: IN PLACE MANAGEMENT COST ESTIMATE

SUMMARY OF COSTS
FLHS Remedial Alternative

CAPITAL COSTS - IN-PLACE MANAGEMENT WITH CONTROLS		PCB Bulk Product Waste (1960s Areas)		< 50 PCB Remediation Waste (1960s and 1970s Areas)		Excluded PCB Product - < 50 (1950s Areas)
Construction Activities						
Mobilization/Demobilization	$	2,000	$	2,000	$	2,000
Removal and Restoration	$	3,000	$	6,000	$	3,000
Verification and Monitoring	$	-	$	-	$	-
Institutional Controls	$	20,000	$	20,000	$	5,000
SUBTOTAL - CONSTRUCTION ACTIVITIES	$	25,000	$	28,000	$	10,000
Contingency (20%)	$	5,000	$	5,600	$	2,000
TOTAL CONSTRUCTION ACTIVITIES	**$**	**30,000**	**$**	**33,600**	**$**	**12,000**
Professional/ Technical Services						
Project Management	$	2,400	$	2,700	$	1,000
Remedial Design	$	1,500	$	1,700	$	600
Construction Management	$	-	$	3,400	$	1,200
Health and Safety	$	-	$	600	$	200
TOTAL PROFESSIONAL/ TECHNICAL SERVICES	**$**	**3,900**	**$**	**8,400**	**$**	**3,000**
TOTAL CAPITAL COSTS	**$**	**33,900**	**$**	**42,000**	**$**	**15,000**

ANNUAL MONITORING AND MAINTENANCE COSTS - ALL SURFACES (annually for 10 years then bi-annually for 10 years)		
Performance Monitoring	$	15,023
Contingency	$	3,005
Total Per-Event Monitoring Costs	$	18,028
Total Present Value Monitoring and Maintenance Costs	**$**	**140,900**

CAPITAL COSTS
≥ 50 PCB Paint
FLHS Remedial Alternative

Assumptions:

No extensive paint removal or new coatings would be required; touch up painting after inspections.

		QTY	UNIT	UNIT COST	TOTAL	NOTES
Construction Activities						
Mobilization/Demobilization						
Mobe/ Demobe		1	LS	$ 2,000	$ 2,000	
	SUBTOTAL:				$ 2,000	
Removal and Restoration					$ -	
Repainting Surfaces		1000	SF	$ 3	$ 3,000	
	SUBTOTAL:				$ 3,000	
Verification and Monitoring						
	SUBTOTAL:				$ -	
Institutional Controls		1	LS	$ 20,000	$ 20,000	Deed Notice and MMIP plan preparation
	SUBTOTAL:				$ 20,000	
				SUBTOTAL - CONSTRUCTION ACTIVITIES	**$ 25,000**	
				Contingency (20%)	**$ 5,000**	
TOTAL CONSTRUCTION ACTIVITIES - REMOVAL OF PAINT					**$ 30,000**	
Professional/ Technical Services						
Project Management		8%			$ 2,400	per USACE and USEPA, 2000
Remedial Design		5%			$ 1,500	
Construction Management		0%			$ -	
Health and Safety		0.0%			$ -	
TOTAL PROFESSIONAL/ TECHNICAL SERVICES					**$ 3,900**	
TOTAL - CAPITAL COSTS					**$ 33,900**	

CAPITAL COSTS
> 1 and < 50 PCB Paint - 1961/62 and 1971/72 Areas
FLHS Remedial Alternative

Assumptions:

No extensive paint removal or new coatings would be required; touch up painting after inspections.

		QTY	UNIT	UNIT COST	TOTAL	NOTES
Construction Activities						
Mobilization/Demobilization						
Mobe/ Demobe		1	LS	$ 2,000	$ 2,000	
	SUBTOTAL:				$ 2,000	
Removal and Restoration						
Repainting Surfaces		2,000	SF	$ 3	$ 6,000	
	SUBTOTAL:				$ 6,000	
Verification and Monitoring						
	SUBTOTAL:				$ -	
Institutional Controls		1	LS	$ 20,000	$ 20,000	Deed Notice and MMIP plan preparation
	SUBTOTAL:				$ 20,000	
				SUBTOTAL - CONSTRUCTION ACTIVITIES	**$ 28,000**	
				Contingency (20%)	**$ 5,600**	
TOTAL CONSTRUCTION ACTIVITIES - REMOVAL OF PAINT					**$ 33,600**	
Professional/ Technical Services						
Project Management		8%			$ 2,700	per USACE and USEPA, 2000
Remedial Design		5%			$ 1,700	
Construction Management		10%			$ 3,400	
Health and Safety		1.5%			$ 600	
TOTAL PROFESSIONAL/ TECHNICAL SERVICES					**$ 8,400**	
TOTAL - CAPITAL COSTS					**$ 42,000**	

CAPITAL COSTS
> 1 and < 50 PCB Paint - 1950 Areas
FLHS Remedial Alternative

Assumptions:

No extensive paint removal or new coatings would be required; touch up painting after inspections.

		QTY	UNIT	UNIT COST	TOTAL	NOTES
Construction Activities						
Mobilization/Demobilization						
Mobe/ Demobe		1	LS	$ 2,000	$ 2,000	
	SUBTOTAL:				$ 2,000	
Removal and Restoration						
Repainting Surfaces		1,000	SF	$ 3	$ 3,000	
	SUBTOTAL:				$ 3,000	
Verification and Monitoring						
	SUBTOTAL:				$ -	
Institutional Controls		1	LS	$ 5,000	$ 5,000	annual exemption filing with CTDEEP
	SUBTOTAL:				$ 5,000	
				SUBTOTAL - CONSTRUCTION ACTIVITIES	**$ 10,000**	
				Contingency (20%)	**$ 2,000**	
TOTAL CONSTRUCTION ACTIVITIES - REMOVAL OF PAINT					**$ 12,000**	
Professional/ Technical Services						
Project Management		8%			$ 1,000	per USACE and USEPA, 2000
Remedial Design		5%			$ 600	
Construction Management		10%			$ 1,200	
Health and Safety		1.5%			$ 200	
TOTAL PROFESSIONAL/ TECHNICAL SERVICES					**$ 3,000**	
TOTAL - CAPITAL COSTS					**$ 15,000**	

APPENDIX A2: IN-PLACE MANAGEMENT WITH CONTROLS

LONG TERM MONITORING COSTS

PCB Paint

FLHS Remedial Alternative

Assumptions:

1. Long term monitoring assumed to be required for all identified PCB Containing paints.
2. Assumes long term monitoring will be required for either remedial alternative under assumption that residual PCBs > 1ppm will remain in masonry following paint removals.
3. Assumes annual monitoring for the first 10 years and bi-annual monitoring thereafter for a total duration of 20 years.
4. Assumes limited touch up paints.
5. Assumes long term monitoring sampling event consistent with proposed IAS and wipe sampling proposed in Dec 2017.
6. Costs based on standard 2017 laboratory and labor rates.

	YEAR	QTY	UNIT	UNIT COST	TOTAL	NOTES
Performance Monitoring	Yrs 2-20					
Laboratory		1	LS/ EVENT	$7,623.00	$ 7,623	based on 2017 cost estimate, 18 IAS, 18 SW samples; 1 time per year
Field Labor and Misc. Expenses		1	LS/ EVENT	$3,920.00	$ 3,920	based on 2017 cost estimates; 2 people 1 day per event
Paint maintenance and repair		1	LS/ EVENT	$1,000.00	$ 1,000	based on assumed $1,000 per year for touch-up of coatings
Reporting and Project Management		1	LS/ EVENT	$2,480.00	$ 2,480	based on 2017 cost estimate
SUBTOTAL:					$ 15,023	
O&M SUBTOTAL:					$ 15,023	
Contingency (20%)					$ 3,005	
Per Event Monitoring Costs (Annually for 1st 10 years then bi-annually)					**$ 18,028**	
TOTAL - PRESENT VALUE MONITORING COSTS (7%, 20 Years)					**$ 140,900**	

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