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NEW YORK STATE SUPERFUND CONTRACT

Focus Feasibility Study
United Plating Building

United Plating Site
Remedial Investigation/Feasibility Study

Site No. 447018

Work Assignment No. D002676-10

DATE: April 1996

DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

Prepared for:

New York State
Department of
Environmental Conservation

50 Wolf Road, Albany, New York 12233
Michael Zagata, *Commissioner*

Division of Hazardous Waste Remediation
Michael J. O'Toole, Jr., P.E., *Director*

By:

Lawler, Matusky & Skelly Engineers LLP

NEW YORK STATE SUPERFUND CONTRACT

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LAWLER, MATUSKY & SKELLY ENGINEERS LLP
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One Blue Hill Plaza
Pearl River, New York 10965

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CHAPTER 1

INTRODUCTION AND BACKGROUND

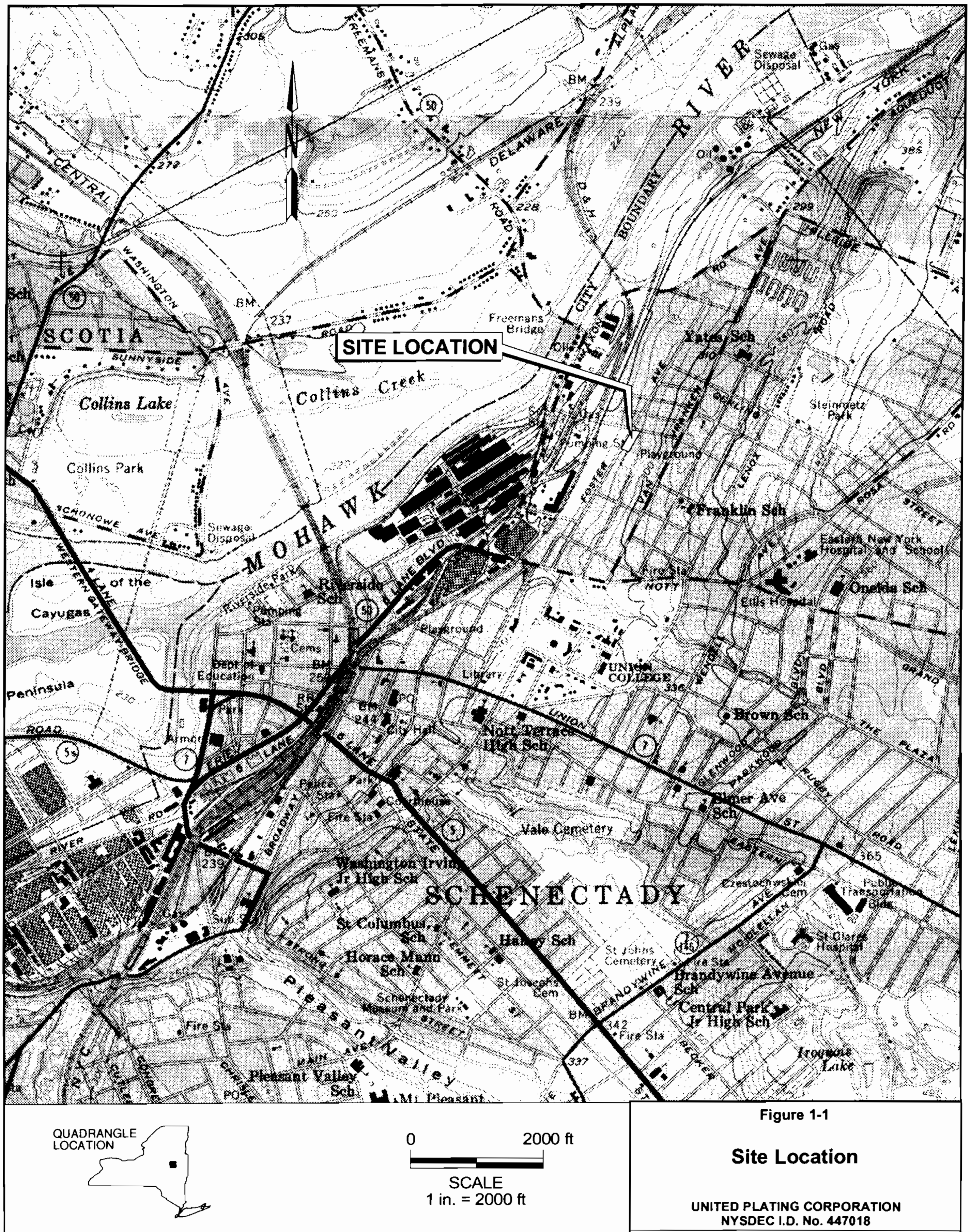
1.1 SITE DESCRIPTION AND BACKGROUND

This document presents the results of the focus feasibility study (FFS) conducted by Lawler, Matusky, & Skelly Engineers LLP (LMS) for remediation of the building interior at the United Plating (UP) site. The UP site is located at 1776 Foster Avenue in the City of Schenectady, New York (Figure 1-1). The property is 1.8 acres in size, approximately one-third of which is covered by a six-story masonry block building with an attached, two-story metal frame structure. In this FFS report, the main six-story building and the adjacent two-story structure is referred to as "the building." Figure 1-2 shows the layout of the building on the UP property.

The specific portion of the UP property addressed by this FFS is the interior of the building and the debris and other wastes that remain inside. In this report, the building interior is also referred to as "the site"; the site does not include the subsurface soils or groundwater present on the UP property. Remediation alternatives for impacted subsurface soils and groundwater on the UP property will be evaluated in the feasibility study (FS) for the entire UP property. The site boundary is outlined in Figure 1-2 in relation to the rest of the property. The layout of the rooms inside the building is presented in Figure 1-3; the rooms are labeled according to their reported former uses.

The UP property is bounded by Seneca Street to the northeast, Foster Avenue to the northwest, a vacant field to the southeast, and residential housing to the southwest. A children's playground lies to the southeast of the site. The northwest side of the property consists of a graveled parking area, concrete pads, and a sparsely vegetated area. A chain link fence fitted with three-strain barbed wire extends along most of the rest of the perimeter of the property. Access to the facility is through a gate located off of Seneca Street. The Mohawk River lies approximately 0.25 mile to the northwest of the site. The natural topography drains to the northwest toward the Mohawk River.

The UP Corporation operated a metal plating facility at the property from 1945 until 1990. The Schenectady County Grand Jury indicted UP in May 1990, and in July 1990, the State of New York obtained a court order closing the plant until the operation complied with all Environmental Conservation Laws (ECLs). On 7 November 1990 the New York State Department of Environmental Conservation (NYSDEC) conducted an inspection of the site and



Map source: USGS 7.5 minute quadrangle map, Schnectady, NY, 1954.

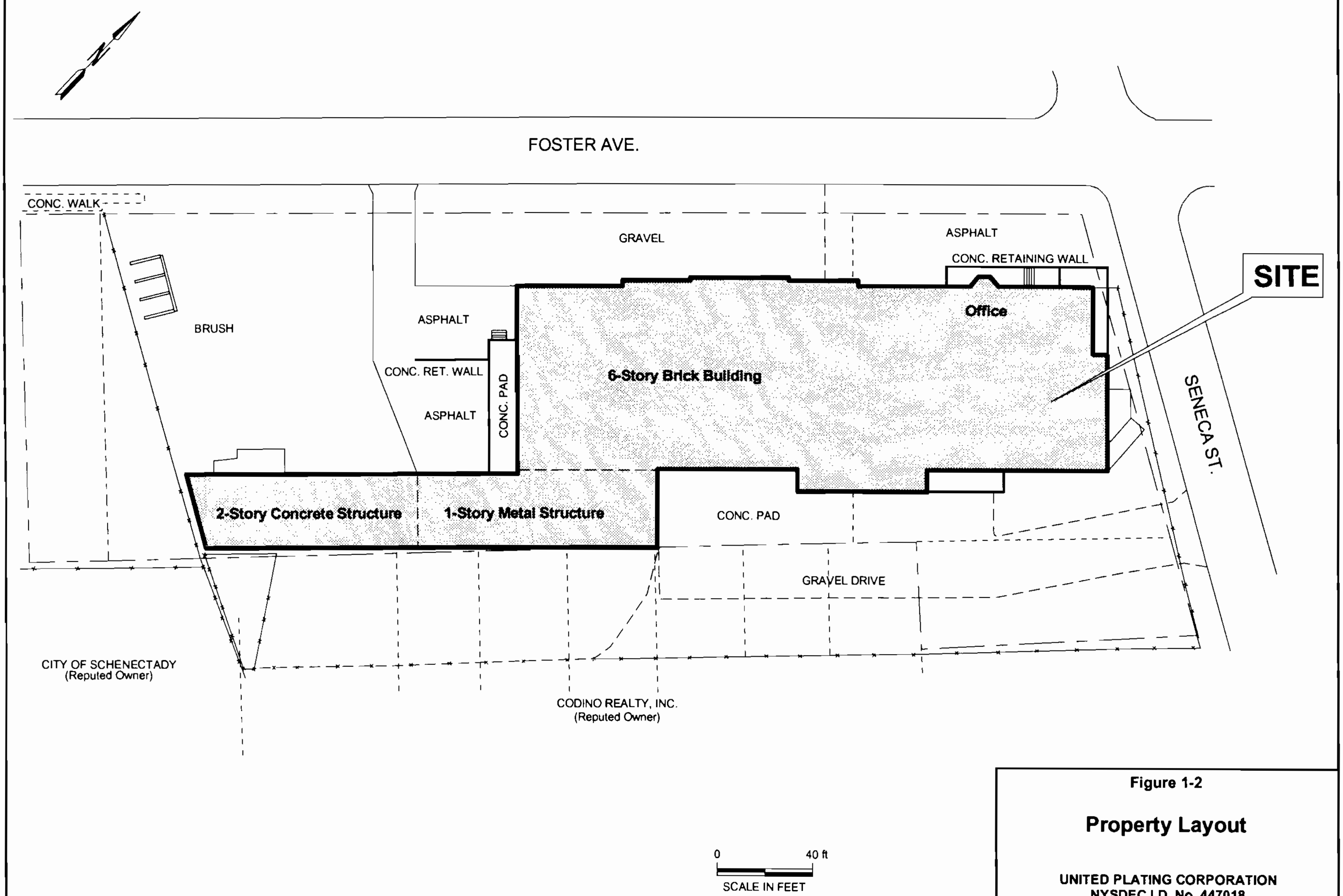
\091\USGS-LOC.ds4

Figure 1-1

Site Location

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York



Base map source: M.J. Engineering and Land Surveying 1995.

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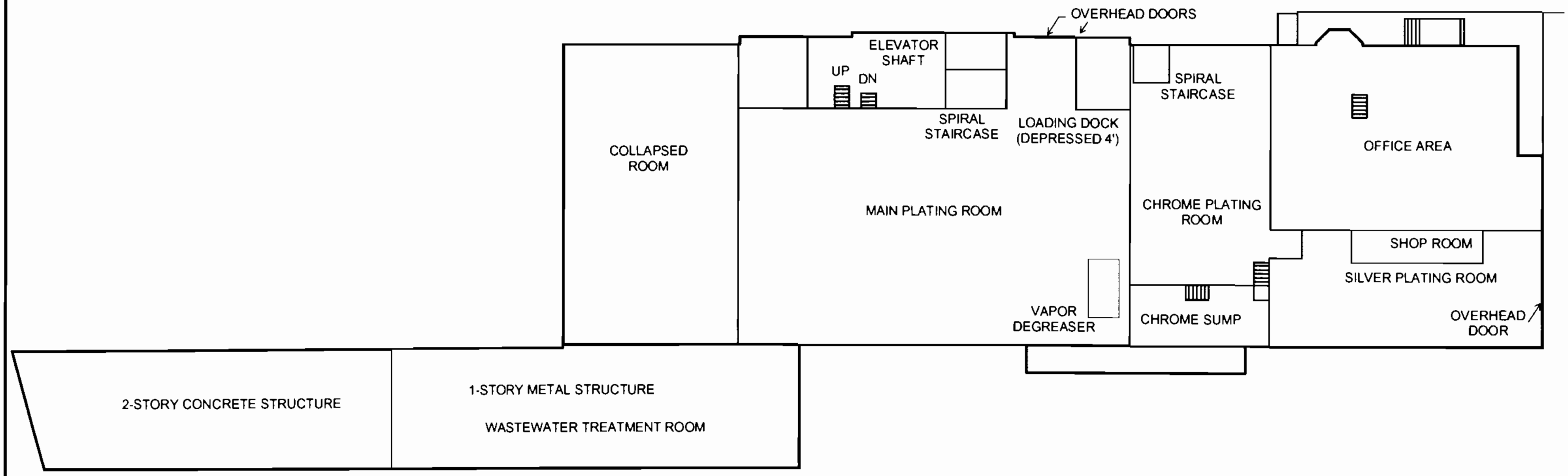
Figure 1-2

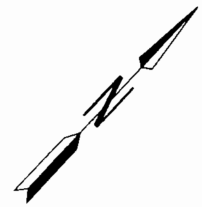
Property Layout

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

First Story Floor Plan





0 20 40 ft

APPROXIMATE SCALE
1 in. = 20 ft

Base map source: M.J. Engineering and Land Surveying 1995.

\600\650\097FLOOR.ds4

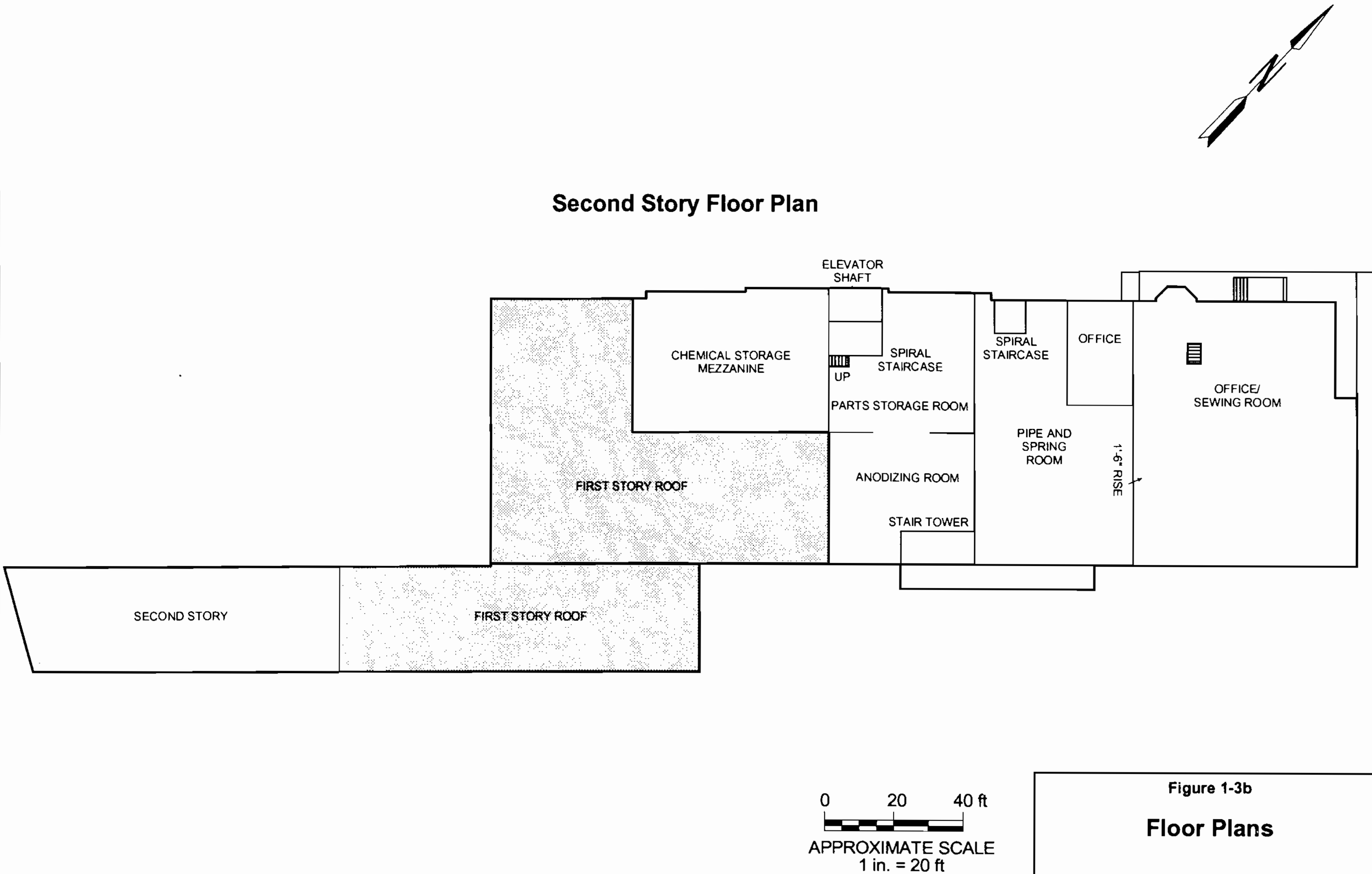
Figure 1-3a

Floor Plans

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Second Story Floor Plan



Base map source: M.J. Engineering and Land Surveying 1995.

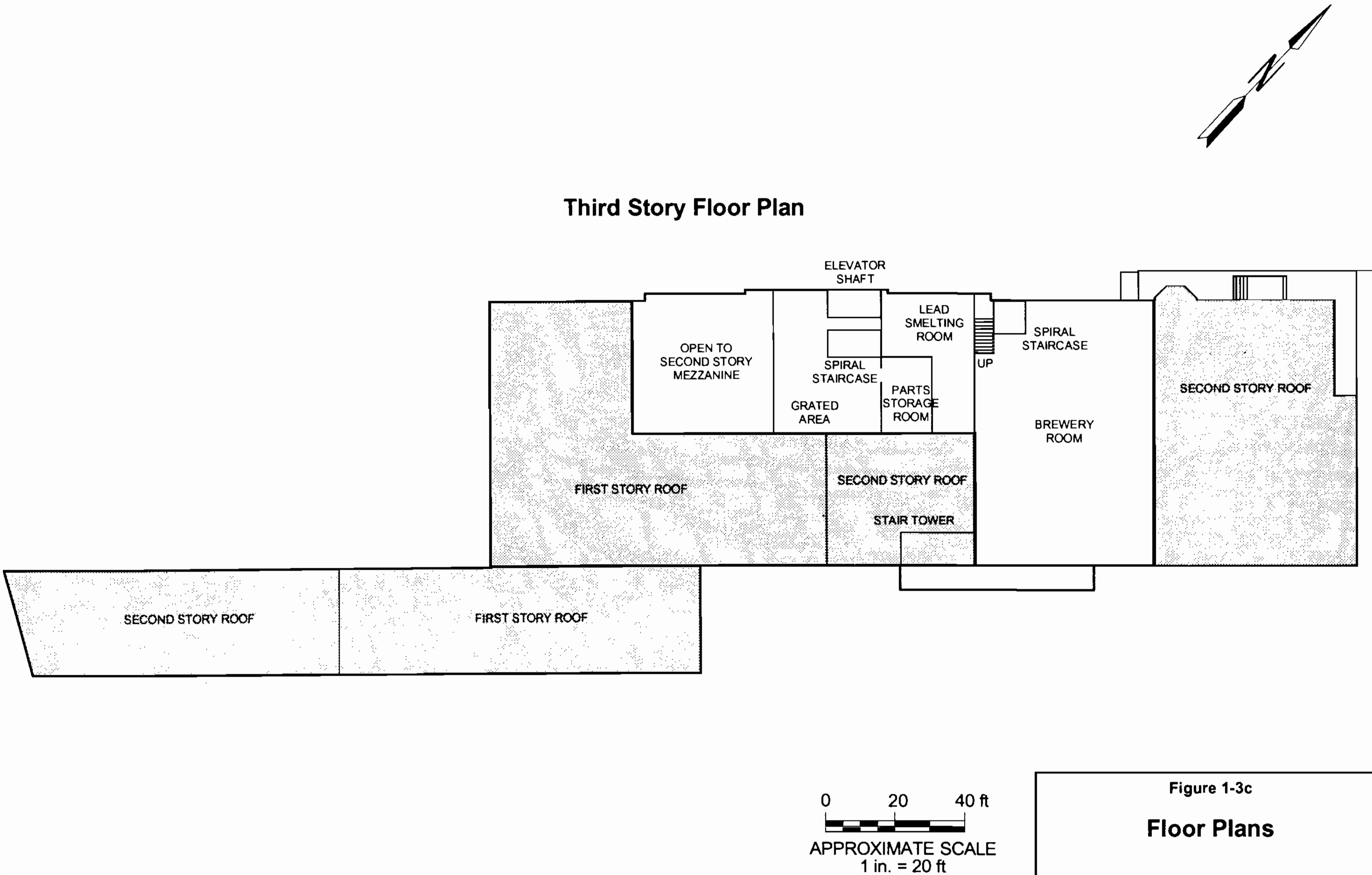
\600\650\097FLOOR.ds4

Figure 1-3b

Floor Plans

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York



Base map source: M.J. Engineering and Land Surveying 1995.

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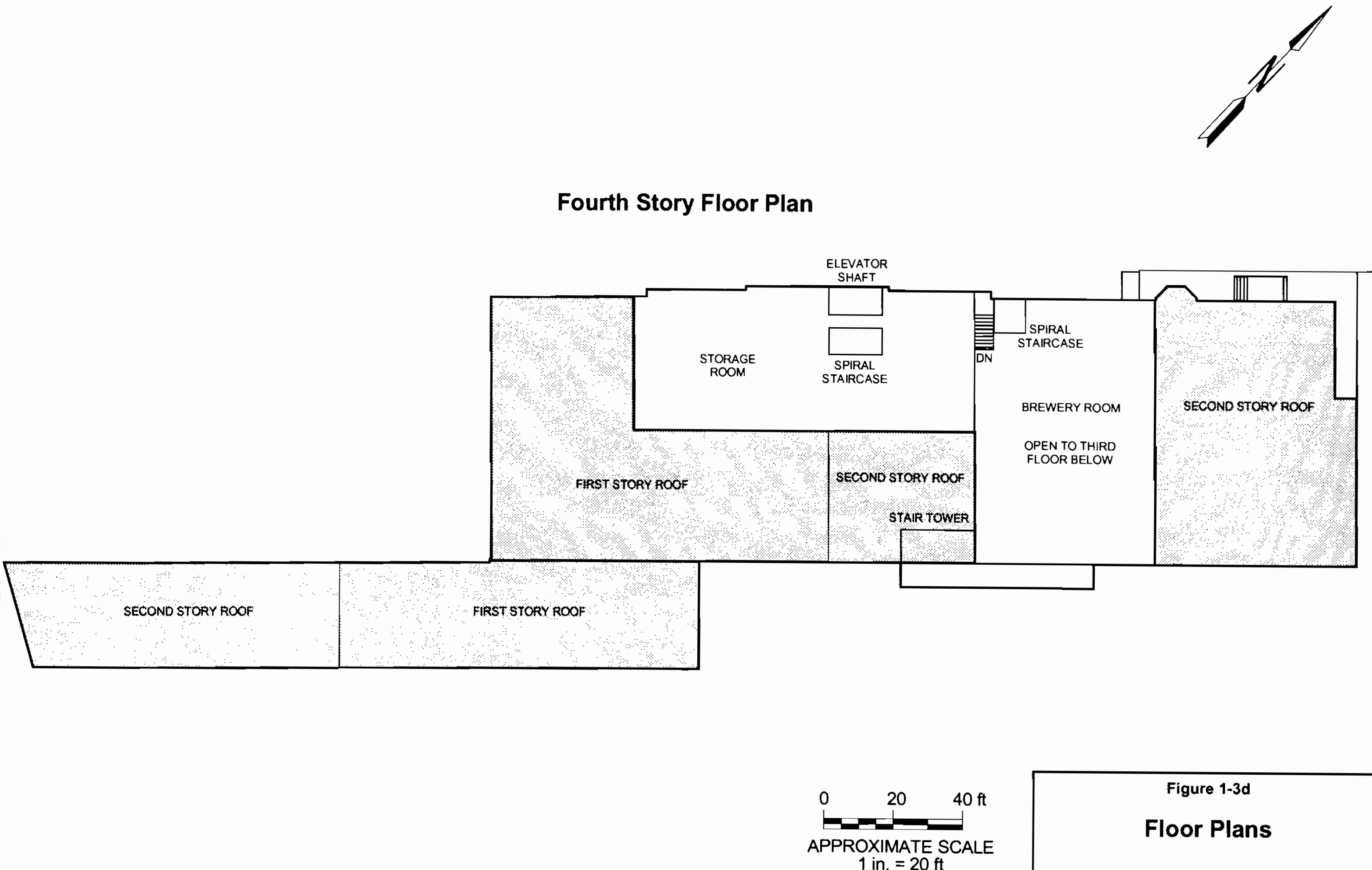
Figure 1-3c

Floor Plans

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Fourth Story Floor Plan



Base map source: M.J. Engineering and Land Surveying 1995.

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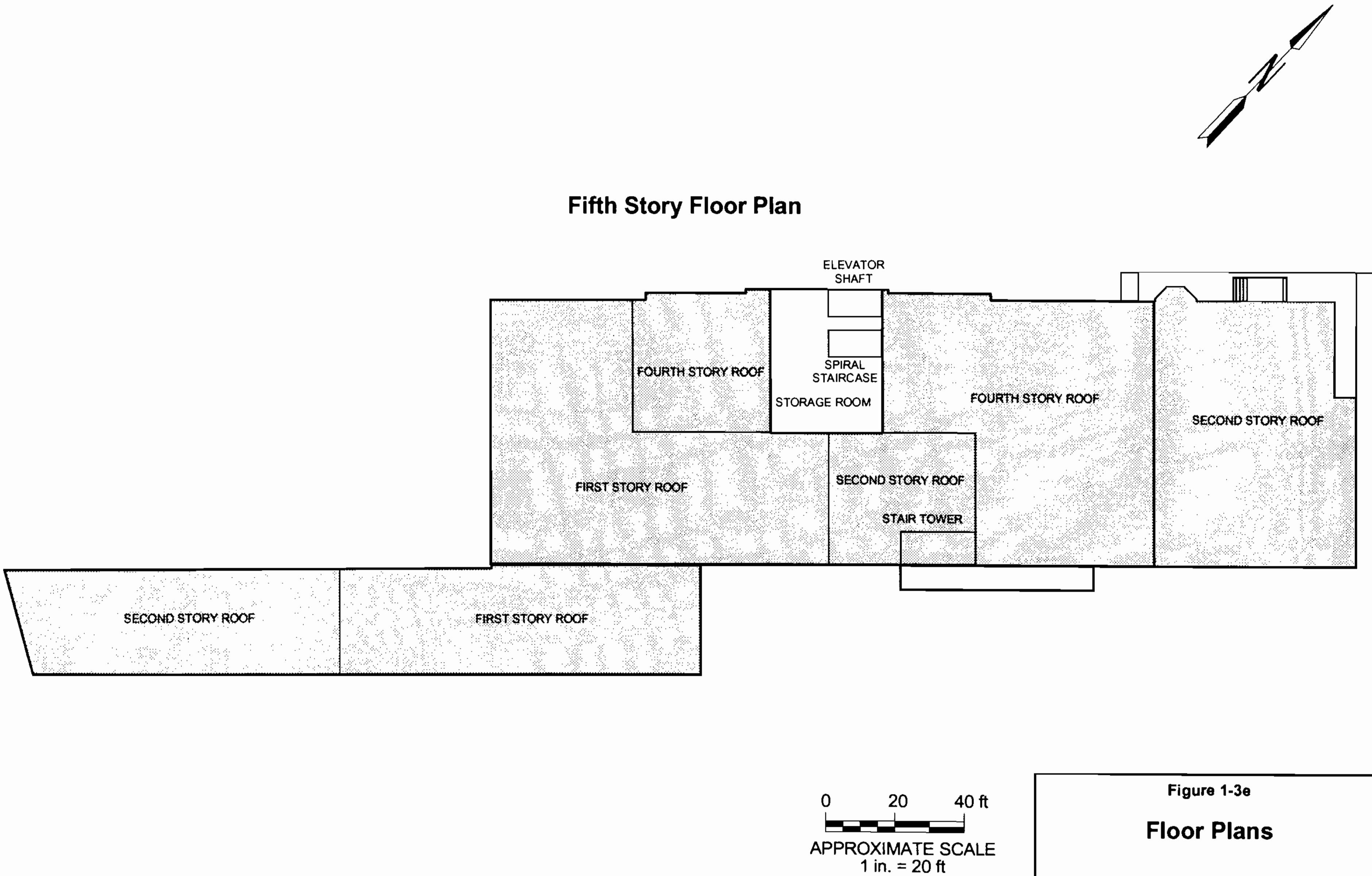
Figure 1-3d

Floor Plans

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Fifth Story Floor Plan



Base map source: M.J. Engineering and Land Surveying 1995.

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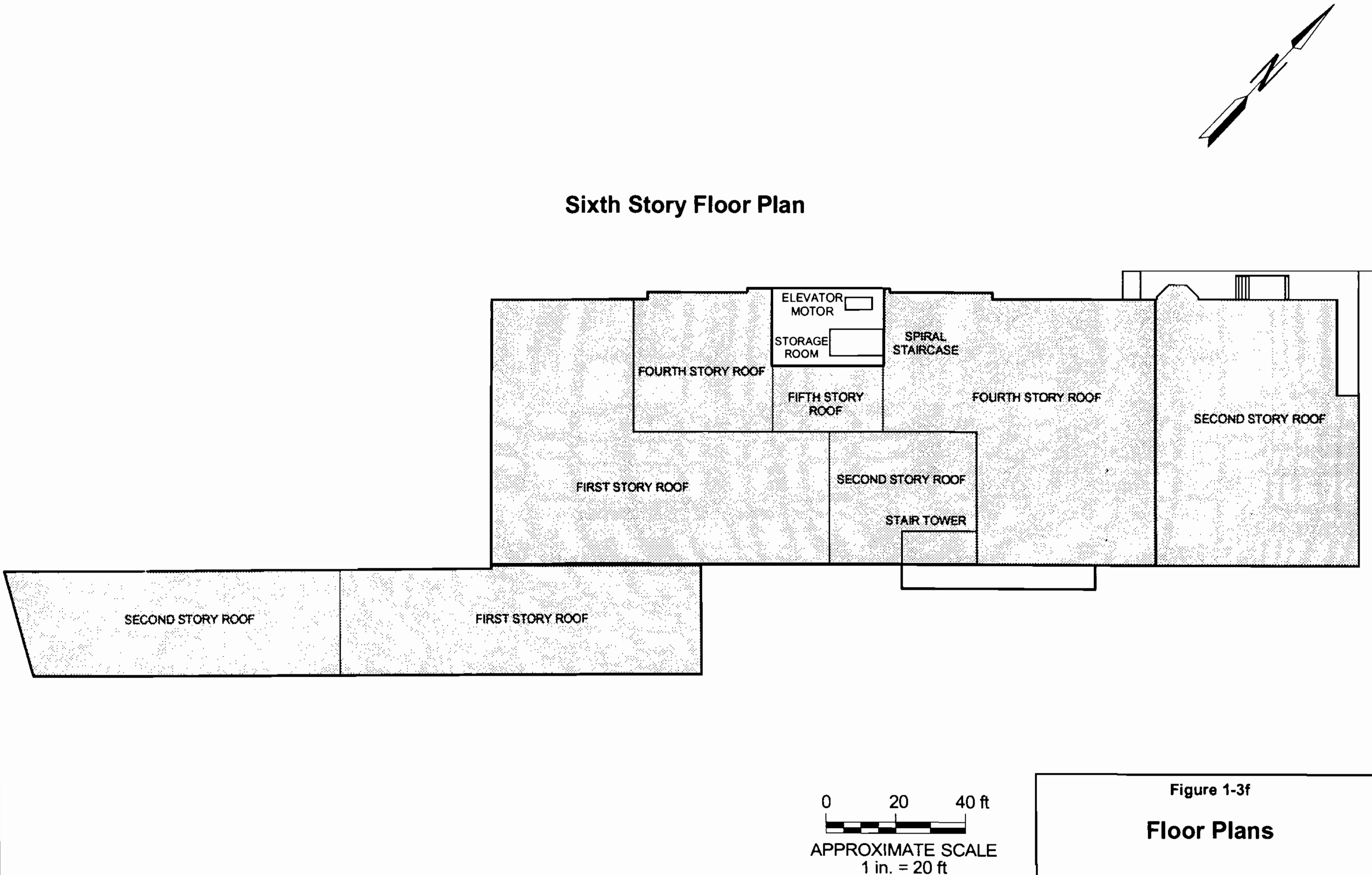
Figure 1-3e

Floor Plans

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

Sixth Story Floor Plan



Base map source: M.J. Engineering and Land Surveying 1995.

\600\650\097FLOOR.ds4

Figure 1-3f

Floor Plans

UNITED PLATING CORPORATION
NYSDEC I.D. No. 447018

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

found several hundred drums of acids, bases, cyanides, alcohols, solvents, and plating solutions stored at the site (NYSDEC 1990). In November 1990 NYSDEC requested that the U.S. Environmental Protection Agency (EPA) undertake a removal action (RA). A preliminary assessment (PA) conducted by EPA on 17 November 1990 revealed approximately 30,000 gal of bulked liquids contained in various tanks and open plating baths. From September to October 1991 hazardous wastes were collected, shipped, and disposed of through fuel burning off-site (NYSDEC 1990). Most of the solid waste that formerly contained hazardous substances and hazardous waste was left inside the building.

LMS was retained by NYSDEC to conduct an FFS to evaluate the remedial alternatives available for the debris and interior surfaces (terms defined in Section 2.1) remaining at the site. The objectives of the FFS were to establish a method for identifying hazardous conditions at the site, obtain an estimate of the quantity and types of the building's contents, evaluate the most appropriate technologies for remediation of the debris and interior surfaces inside the building, select the most appropriate plan for the interim remedial measures (IRM), and prepare conceptual plans and cost estimates for the selected alternatives. The results of this FFS report will be used to decide whether the building will be secured and remain standing, whether it will be demolished, or whether nothing will be done. This FFS report presents the work involved and approximate cost estimates for these options.

1.2 STRUCTURAL ASSESSMENT

A structural investigation of the UP building was performed in January 1996 by MJ Engineering of Clifton Park, New York. Findings from the investigation are presented in a Draft Structural Investigation Report (also referred to in this FFS as the "structural assessment") (MJ Engineering 1996). The building's structural features were identified and included steel and timber framing, concrete slab, timber roof, concrete and brick masonry walls, and other units. The general condition of each structural unit within the building was observed to evaluate the structural framework as a whole. According to the report, several of the structural members were in fair to very poor condition and would need to be repaired or replaced to serve their intended functions.

The assessment concluded that "a very considerable amount of repair is necessary to restore the building to a state fit for occupancy for any use," and "the extent and nature of structural repair and rehabilitation work required to bring this building to a point where it is usable is too great to be econmically feasible" (MJ Engineering 1996). The two suggested fates for the site were to secure and abandon the building or demolish it; these two options are evaluated in this FFS report.

1.3 CONDITION OF BUILDING INTERIOR

The site is currently unoccupied and contains the remnants of the former plating and wastewater treatment operations, including abandoned dip tanks, equipment, supplies, and other debris. The roof on the south end of the masonry block section of the building has deteriorated and collapsed.

In September 1995 LMS submitted an Interim Remedial Investigation (Interim RI) Data Report (LMS 1995) to NYSDEC containing analytical data from sampling activities conducted throughout the UP property, including inside the building. More than 200 samples were collected inside the UP building to assess existing conditions and identify potentially contaminated areas. Sample collection techniques used during the Interim RI investigation included wipe, sweep, concrete chip, wood chip, and paint chip sampling. Samples were collected from the surfaces of debris, floors, walls, ceilings, and structural supports suspected of being contaminated. Sampling results revealed that a layer of metals-contaminated dust covered most exposed surfaces inside the building and many surfaces were coated with lead-based paint. Hazardous levels of cadmium, chromium, and lead were detected in some of the dust and paint chip samples (LMS 1995).

Several subgrade floor drains, pipes, and sumps observed on the first floor were suspected of having been used in the plating process. Many of these subgrade structures contained sediment (e.g., grit and soil-like material); it is unknown whether the belowgrade pipes contain sediment because the inside of these pipes could not be observed. Samples of the sediment were collected in subgrade structures because the structures were suspected of containing hazardous materials. The sampling was limited to accessible areas. In two areas, the results indicated that the sediment was characteristically hazardous, or exceeded the Toxicity Characteristic (TC) limitation for disposal as hazardous waste.

Relevant portions of the Interim RI data are referenced throughout this FFS report and are discussed in further detail.

1.4 REPORT ORGANIZATION

The goal of this FFS is to determine a cost-effective plan for remediating the debris and interior surfaces at the UP site. Treatment goals are driven by the requirements of the disposal facilities and other debris management facilities. To achieve this goal, potentially applicable remedial alternatives were developed and evaluated based on their effectiveness, implementability, and cost in order to select the most appropriate alternative. Chapter 2 presents the remedial action objectives established for remediation of the site and discusses the use of these objectives in determining the quantities of contaminated and hazardous materials present at the site. Chapter 3 includes a preliminary screening of remedial technologies to identify those that may be applicable for this site. Technologies successfully passing the screening stage are then combined into remedial alternatives, discussed in detail in Chapter 4. Chapter 5 presents the evaluation of these alternatives; the recommended remedial plan based on this evaluation is included in Chapter 6.

CHAPTER 2

REMEDIAL ACTION OBJECTIVES AND QUANTITIES OF CONTAMINATED MATERIALS

2.1 INTRODUCTION

The FFS process involves identifying and screening potentially applicable remedial technologies, combining appropriate technologies into remedial alternatives for the site, and evaluating the alternatives based on their effectiveness, implementability, and cost. The process of alternative development and evaluation is done in conjunction with the development of remedial action objectives for the site and the quantification of contaminated materials present.

The contaminated materials discussed in this report are divided into two categories: debris and interior surfaces. The debris category includes the potentially contaminated articles that are not structural components of the building itself; debris includes tanks, piping, equipment, furniture, grating, raw materials, pallets, etc., and consists of metal, concrete, brick, plastic, wood, and other materials (e.g., glass, rubber). The contaminated interior surfaces category includes the exposed surfaces of the ceilings, walls, floors, and structural supports inside the UP building. The exterior (i.e., outdoor) surfaces of the building were not sampled during the Interim RI as these surfaces were not suspected of being contaminated because they were not directly exposed to manufacturing operations. Except in some small areas, most of the exterior walls were not painted. Similarly, only the debris within the confines of the building was suspected of being contaminated; only minimal quantities of discarded materials are currently present in outdoor areas of the property.

This chapter presents the remedial action objectives developed for the UP site and the estimated volumes of debris and interior surfaces requiring remediation. Applicable or relevant and appropriate requirements (ARARs) for the site are also identified in this chapter.

2.2 REMEDIAL ACTION OBJECTIVES

Remedial action objectives were developed for the UP site based on the results of information and data provided by the Interim RI Data Report. The investigation concluded that various materials and surfaces sampled inside the building were covered with grime, dirt, and dust that exhibited high levels of metals, with hazardous levels in a few instances. The materials and surfaces sampled included abandoned equipment, walls, floors, etc. Some interior walls appeared to be covered with lead-based paint. Most of the dirt present on the floors contained hazardous levels of metals. The data collected in the Interim RI is referenced throughout this report and is used to assess the potentially hazardous conditions that exist at the site.

2.2.1 Potential Contaminants of Concern

In order to focus the remedial alternatives appropriately, a subset of the contaminants detected at the site, referred to as contaminants of concern (COCs), was selected. COCs are those compounds posing the greatest potential health risk at a particular site based on the contaminants detected and the relative toxicity of the compounds. In the absence of a baseline risk assessment for the site, contaminants are referred to as "potential" COCs and include those contaminants that would likely be listed as COCs in a baseline risk assessment.

Potential COCs were selected based on the past use of the building interior, the former processes that were conducted at the site, and the results of the Interim RI sampling investigation. Data taken into consideration from the Interim RI included wipe, sweep, concrete chip, wood chip, and paint chip data collected in May 1995 (LMS 1995). Also considered were UP's wastewater discharge data maintained by the City of Schenectady reported between 1984 and 1989 (LMS 1995). The list of potential COCs includes the following:

- Cadmium
- Chromium
- Copper
- Lead
- Nickel
- Silver
- Zinc
- Cyanide

The data presented in the Interim RI report suggest that many of the surfaces within the site are covered with a layer of dust containing some of these potential COCs. Other surfaces are coated with lead-based paint (i.e., paint with greater than 0.5% lead content as defined by EPA). The use of chromium-, copper-, silver-, and cyanide-containing compounds at the UP site was documented by NYSDEC in their inspections of the facility when it was operating. Past use of cadmium, chromium, copper, lead, nickel, silver, zinc, and cyanide is inferred as these contaminants were detected in the wastewater effluent discharge at concentrations exceeding permit limitations (LMS 1995). During EPA's PA of the UP site on 17 November 1990, several hazardous substances that were haphazardly stored indoors were identified, including copper cyanide, nickel cyanide, and zinc cyanide.

Exposure to the potential COCs listed above should be considered when working inside the UP building. However, for the purpose of establishing remedial action alternatives, only the contaminants that are present or have the potential of being present at hazardous levels (i.e., exceeding TC limitations) will be considered. The cleanup objectives within the remedial alternatives will be driven by the requirements of the disposal or recycling facilities, which, in turn, are governed by Federal and state solid waste disposal regulations. Of the potential COCs listed above, TC regulatory limitations for waste disposal as hazardous exist for only cadmium, chromium, lead, and silver. Silver was not found in concentrations significant enough to warrant concern as a hazardous constituent of the site's wastestream (see discussion in Section 2.4). Cadmium, chromium, and lead were retained for further discussion and will be considered when selecting remedial technologies. It is expected that the remedial technologies that are selected for removal of cadmium, chromium, and lead contaminants will also remove the small quantities of copper, nickel, silver, zinc, and cyanide contaminants present.

2.3 QUANTITIES OF MATERIALS SUSPECTED OF BEING CONTAMINATED

As discussed in Chapter 1, this FFS addresses the possible response actions for the contents of the UP building and the fate of the building itself. The materials suspected of being contaminated at the UP site were divided into two general categories (defined in Section 2.1): debris and interior surfaces. Each of these categories is discussed in detail below.

2.3.1 Debris

A room-by-room inventory of debris materials was conducted in February 1996 by Precision Industrial Maintenance, Inc., of Schenectady, New York. The contents of each room were visually observed and noted to approximate the quantities and types of debris present inside the UP building. Debris was classified by the material's predominant composition. For example, a motor constructed chiefly of steel was assumed to be in the metal category, although it may contain some rubber and plastic parts. Precision Industrial Maintenance's inventory report is provided in Appendix A. Based on the types and dimensions reported, volume and weight estimates for each piece of debris were developed and then totaled. Table 2-1 summarizes the estimated quantities of debris, by room, inside the UP building based on these observations and assumptions. The total volume and mass of debris present is estimated to be 1502 yd^3 and 3575 tons, respectively. In considering volume estimates, a 1:1 ratio of volume of material to volume of voids was assumed. Volume estimates are important in calculating off-site disposal costs (Chapter 5).

TABLE 2-1

ESTIMATED QUANTITY OF DEBRIS BY TYPE BASED ON FIELD OBSERVATIONS (FEBRUARY 1996)

United Plating Site

ROOM	METAL (tons)	CONCRETE & BRICK (tons)	WOOD (tons)	PLASTIC (tons)	OTHER (tons)	TOTAL DEBRIS (tons)
First Floor						
Wastewater Treatment Room	920.3	3	7.4	11.5	3	945
Main Plating Room	547	2.1	7.3	4.4	2.3	563
Chrome Plating Room	124.4	0	1.7	0	2.4	129
Silver Plating Room	212.4	0.7	9.8	5.9	1.2	230
Office	52.9	0	2	0.4	6.4	62
Subtotal - 1st Floor	**1857**	**5.8**	**28.2**	**22.2**	**15.3**	**1929**
Second Floor						
Chemical Storage Mezzanine	15	7.5	4.2	0.2	0.4	27
Parts Storage Room	240.7	1	1.1	1.9	4	249
Anodizing Room	97.7	0.4	5	0.4	1	105
Pipe and Spring Room	235.2	0	1.8	0.2	25.8	263
Office/Sewing Room	176.6	0	8.6	1	11.8	198
Subtotal - 2nd Floor	**765.2**	**8.9**	**20.7**	**3.7**	**43**	**842**
Third Floor						
Grated Area	6.1	0	0.4	0	0	7
Lead Smelting Room	61.1	1.5	0.8	0	0.4	64
Parts Storage Room	21.8	0	0.5	0	0.2	23
Brewery Room	145.4	2	0.9	1.6	9.9	160
Subtotal - 3rd Floor	**234.4**	**3.5**	**2.6**	**1.6**	**10.5**	**253**
Fourth Floor						
Storage Room	419.3	0.4	5.3	0.3	0.7	426
Subtotal - 4th Floor	**419.3**	**0.4**	**5.3**	**0.3**	**0.7**	**426**
Fifth Floor						
Storage Room	102.7	4.1	2.6	0	0.5	110
Subtotal - 5th Floor	**102.7**	**4.1**	**2.6**	**0**	**0.5**	**110**
Sixth Floor						
Storage Room	14	0	2.6	0	0	17
Subtotal - 6th Floor	**14**	**0**	**2.6**	**0**	**0**	**17**
BUILDING TOTAL (tons)	**3393**	**23**	**62**	**28**	**70**	**3577**
Assumed Density (tons/cy)	6.615	1.958	0.540	1.161	0.801	
BUILDING TOTAL (cy)[A]	**1026**	**23**	**230**	**48**	**175**	**1502**

A - Assume 1:1 volume of void space to volume of material for disposal purposes.

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2.3.2 **Interior Surfaces**

An estimate of the interior surfaces (e.g., exposed surfaces of ceilings, walls, floors, and structural supports) present at the site was calculated based on available floor plans. The methodology used in attaining this estimate is explained in Appendix B and summarized in Table 2-2. Approximately 221,414 ft^2 of surface area exists inside the UP building. This estimate will be used to develop the total area of contaminated interior surfaces that will require treatment.

Also included as part of the interior surface discussion is the sediment that remains in below-grade piping and sumps on the first floor, particularly in the main and chrome plating rooms. The belowgrade piping and sumps were investigated during the Interim RI. The quantity of sediment present is unknown, but for cost estimating purposes a rough estimate was calculated. Based on visual observations and smoke testing results from the Interim RI, several belowgrade pipes were found between the northwestern southeastern sides of the main and chrome plating rooms. The exact number of belowgrade pipes and many discharge points could not be determined from the investigation. It is assumed that approximately 10 pipes of 50-ft length and 6-in. diameter exist belowgrade in the main and chrome plating rooms and that the pipes are completely fIlled with sediment. In addition, it is assumed that the sumps present in the main, chrome, and silver plating rooms contain approximately 1 ft of sediment. In all, it is estimated that approximately 25 yd^3 of sediment exist in belowgrade piping and sumps on the first floor.

2.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) AND TO-BE-CONSIDERED (TBC) ITEMS

This section identifies the ARARs for the UP site. Applicable requirements are defined as those promulgated Federal or state requirements (e.g., cleanup standards, standards of control) that specifically address a hazardous substance, pollutant, or contaminant found at a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site. Relevant and appropriate requirements are those promulgated Federal or state requirements that, while not applicable, address problems sufficiently similar to those encountered at CERCLA sites that their application is appropriate. In addition to ARARs, other Federal, state, and local criteria, advisories, or guidance documents may also apply to the conditions found at the site and are referred to as to-be-considered (TBC) items. TBCs are not legally binding but may be useful within the context of assessing site risks and determining site cleanup goals.

TABLE 2-2

ESTIMATED QUANTITIES OF EXPOSED INTERIOR SURFACES

United Plating Site

ROOM	FLOOR (sq. ft.)	WALLS (sq. ft.)	CEILING (sq. ft.)	STRUCTURAL SUPPORTS (sq. ft.)	TOTAL INTERIOR SURFACE (sq.ft.)
First Floor					
Wastewater Treatment	8,580	8,820	8,580	849	26,829
Collapsed Room	3,268	5,950	3,268	255	12,741
Main Plating Room	7,678	15,755	7,678	2,123	33,234
Chrome Plating Room	2,711	4,947	2,711	425	10,794
Silver Plating Room	1,887	2,880	1,887	240	6,894
Office	3,685	3,420	3,685	240	11,030
Subtotal - 1st Floor	**27,809**	**41,772**	**27,809**	**4,132**	**101,522**
Second Floor					
Collapsed Room	3,268	5,950	3,268	340	12,826
Chemical Storage	2,280	4,850	2,280	1,019	10,429
Parts Storage Room	1,680	4,910	1,680	453	8,723
Anodizing Room	1,596	1,686	1,596	453	5,331
Pipe and Spring Room	3,535	3,840	3,535	1,415	12,325
Office/Sewing Room	5,239	5,655	5,239	720	16,853
Subtotal - 2nd Floor	**17,598**	**26,891**	**17,598**	**4,400**	**66,487**
Third Floor					
Grated Area	1,271	1,800	1,271	0	4,342
Lead Smelting Room	750	1,340	750	0	2,840
Parts Storage Room	330	740	330	170	1,570
Brewery Room	3,800	8,970	3,800	1,500	18,070
Subtotal - 3rd Floor	**6,151**	**12,850**	**6,151**	**1,670**	**26,822**
Fourth Floor					
Storage Room	3,940	8,140	3,940	849	16,869
Subtotal - 4th Floor	**3,940**	**8,140**	**3,940**	**849**	**16,869**
Fifth Floor					
Storage Room	1,312	3,570	1,312	340	6,534
Subtotal - 5th Floor	**1,312**	**3,570**	**1,312**	**340**	**6,534**
Sixth Floor					
Storage Room	640	1,560	640	340	3,180
Subtotal - 6th Floor	**640**	**1,560**	**640**	**340**	**3,180**
BUILDING TOTAL (sq. ft.)	**57,450**	**94,783**	**57,450**	**11,731**	**221,414**

ARARs are generally divided into three categories: chemical-specific, location-specific, and action-specific ARARs. Chemical-specific ARARs provide guidance on acceptable or permissible contaminant concentrations in soil, air, and water. Location-specific ARARs govern activities in critical environments such as floodplains, wetlands, endangered species habitats, or historically significant areas, while action-specific ARARs are technology- or activity-based requirements.

2.4.1 **Chemical-Specific ARARs and TBCs**

2.4.1.1 ***ARARs***. Chemical-specific ARARs for the potential COCs at the UP site are summarized in Table 2-3; the origin and definition of each are presented below.

The Clean Air Act (CAA) passed in 1977 governs air emissions and ambient air quality. National Ambient Air Quality Standards (40 CFR Part 50) have been promulgated under the CAA for six criteria pollutants, including airborne particulates and lead.

New York Ambient Air Quality Standards (6 NYCRR Part 257) have been promulgated by the State of New York, including airborne particulates. However, no specific air quality standards for the COCs at this site have been promulgated. New York State has developed an air quality classification system that is used in conjunction with the air quality standards. The classification system associates ambient air quality levels with specific geographic regions of the state. The UP site is situated in a Level III geographical area, which is a medium-sized metropolitan complex.

2.4.1.2 ***TBCs***. Chemical-specific TBCs for the potential COCs at the UP site are also listed in Table 2-3 and discussed below.

The National Institute for Occupational Safety and Health (NIOSH) has developed concentrations of contaminants in air that are immediately dangerous to life or health (IDLH) for individuals in occupational settings. The IDLH is the maximum concentration, which, in the event of respirator failure, could be tolerated for 30 min without experiencing any escape-impairing or irreversible health effects. The IDLHs are appropriate only for subchronic exposures to noncarcinogenic compounds or effects of compounds in air. These values are not directly applicable to CERCLA sites; however, they may provide guidance concerning the upper bound of safe inhalation exposures to contaminants for on-site workers.

The Occupational Safety and Health Administration (OSHA) has promulgated permissible exposure limits (PELs) for a variety of contaminants in air (29 CFR 1910, Subpart Z). PELs

TABLE 2-3

CHEMICAL-SPECIFIC ARARs AND TBCs FOR POTENTIAL COCs

United Plating Site

CONSTITUENT	ARARs: NATIONAL AMBIENT AIR QUALITY STANDARDS (mg/m^3)	ARARs: NYS AMBIENT AIR QUALITY STANDARDS (mg/m^3)	TBCs: NIOSH IDLH (mg/m^3)	TBCs: OSHA PEL-TWA (mg/m^3)
Cadmium	NS	NS	9	0.005
Chromium	NS	NS	250	1
Copper	NS	NS	100	1
Lead	0.0015	NS	100	0.05
Nickel	NS	NS	10	1
Silver	NS	NS	10	0.01
Zinc	NS	NS	NL	NL
Cyanide	NS	NS	NL	NL

NS - No standard established.
NL - No exposure limit established.

are based on time-weighted average (TWA) concentrations to which workers may be exposed over an 8-hr exposure period without adverse health effects. PEL-TWAs are intended for adult workers exposed in an occupational setting and are not directly applicable to CERCLA sites. PEL-TWAs may be used as guidance values to determine whether long-term exposures to contaminants in air pose a human health risk.

2.4.2 **Location-Specific ARARs**

The UP site is not located in a critical or significant habitat for any threatened or endangered species, and no threatened or endangered species were observed by LMS or are expected to be present.

According to the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP), the building is not listed as a historic site on any New York State or national registers (correspondence with OPRHP 1996).

2.4.3 **Action-Specific ARARs and TBCs**

2.4.3.1 ***ARARs***. Action-specific ARARs for the site include compliance with Section 121, Subsections 104 and 106, of CERCLA of 1980 and amended by the Superfund Amendment and Reauthorization Act (SARA) of 1986, which state that the selected remedial alternative must attain a cleanup level that is protective of human health and the environment. The extent to which each of the remedial alternatives for the site complies with this requirement will be assessed during the detailed evaluation of alternatives.

Treatment and disposal of all hazardous wastes from the site must be in accordance with the Federal hazardous waste regulations (40 CFR Parts 260-268) promulgated under the Resource Conservation and Recovery Act (RCRA), as well as New York State hazardous waste regulations (6 NYCRR Parts 364 and 370-376). The presence of and appropriate waste code for any hazardous wastes at the site will be determined in accordance with 6 NYCRR Part 371 (Identification and Listing of Hazardous Wastes). No identified listed wastes remain at the site, and none will be generated during the remediation of the building. Some wastes may be characteristically hazardous based on their toxicity; if a representative sample of the waste exceeds a TC limitation it is known as a characteristically hazardous waste. Untreated hazardous wastes or hazardous waste residues at the UP site will likely be classified as "D" code wastes, which is a solid waste that exhibits the characteristic of toxicity if the analyte concentration in the Toxicity Characteristic Leaching Procedure (TCLP) aqueous extract exceeds the respective regulatory action level. DOO6, DOO7, and DOO8 code wastes correspond to cadmium-, chromium-, and lead-contaminated hazardous wastes, respectively, which are the type of hazardous wastes most likely to be present in small quantities based on the Interim RI data. The regulatory action level (i.e., TC limitation for waste disposal) for cadmium is 1.0 mg/l; the regulatory action level for both chromium and lead is 5.0 mg/l. The hazardous waste category includes any debris, rinse water, dust, paint, or other material resulting from cleanup activities which exhibits the TC.

Federal land disposal restrictions (LDRs) promulgated under RCRA in 40 CFR Part 268 prohibit the direct land disposal of untreated wastes when a better treatment or immobilization alternative exists. These restrictions apply to hazardous wastes as well as hazardous debris. Hazardous debris is defined in the LDR regulations as debris that contains a hazardous waste listed in Subpart D of Part 261, or that exhibits a characteristic of hazardous waste identified in Subpart C of Part 261. Debris is defined as a solid material exceeding a 60 millimeter (mm) particle size that is intended for disposal. Prior to land disposal, hazardous debris must be treated using an EPA-approved treatment technology or a technology that will achieve an established waste-specific treatment standard for the waste contaminating the debris in accordance with 40 CFR Part 268. If an EPA-approved treatment technology is employed and performance standards are achieved, the treated debris is no longer considered hazardous and can be disposed of as nonhazardous solid waste. EPA-approved technologies for treating hazardous debris are listed in Chapter 3. The second option for managing hazardous debris is to treat the debris in order to meet the existing treatment standards for the waste contaminating the debris. Treatment standards for cadmium-, chromium-, and lead-contaminated hazardous debris are listed in Table 2-4. Any residue (e.g., contaminated rinse water, dust, or paint) generated from the treatment process is subject to waste-specific treatment standards and must be separated and handled as a hazardous waste.

New York State also administers LDRs in 6 NYCRR Part 376, which also contain treatment standards for hazardous debris contaminated with cadmium, chromium, or lead (listed in Table 2-4). The Federal and state treatment standards are the same for the debris at the UP site.

Transportation of hazardous wastes must be conducted in accordance with applicable Federal and state regulations. Hazardous wastes can be stored on-site temporarily for a maximum of 90 days from the date of generation, in a manner that will prevent the release of contaminants to the surrounding environment.

2.4.3.2 ***TBCs***. In addition to treatment standards for hazardous wastes, the LDRs also specify treatment standards for underlying hazardous constituents. Underlying hazardous constituents are defined in 40 CFR Part 268 as any constituents listed in the Universal Treatment Standards

TABLE 2-4

FEDERAL AND STATE TREATMENT STANDARDS FOR HAZARDOUS DEBRIS

United Plating Site

WASTE CODE	CONSTITUENT	FEDERAL TREATMENT STANDARD (mg/l)	NEW YORK TREATMENT STANDARD (mg/l)
D006	Cadmium	1.0	1.0
D007	Chromium	5.0	5.0
D008	Lead	5.0	5.0

(UTS), except zinc and vanadium, which can be reasonably expected to be present at the point of generation of the hazardous waste, at a concentration above the constituent-specific UTS. Generally, the UTS standards are more stringent than the hazardous waste treatment standards cited in the previous section. The UTS standards, however, do not apply to the TC metal waste codes D006, D007, and D008 (characteristically hazardous wastes) but only apply to listed wastes containing cadmium, chromium, and lead at concentrations above the UTS. In the context of this FFS report, the UTS levels will be utilized in differentiating uncontaminated and contaminated debris and will establish the "clean" threshold as explained in Section 2.5. The UTS standards for cadmium, chromium, and lead are listed in Table 2-5.

2.5 QUANTITIES OF CONTAMINATED MATERIALS

Based on the estimates of suspected of being contaminated materials and chemical-specific ARARs and TBCs, estimates were derived of contaminated materials that will require treatment and/or special handling prior to disposal or demolition. The debris and interior surfaces categories previously defined were divided into three subcategories: uncontaminated; contaminated, but nonhazardous (referred to hereafter as "contaminated"); and hazardous. These subcategories are discussed below for the on-site debris and interior surfaces.

2.5.1 Uncontaminated, Contaminated, and Hazardous Debris

A method of categorizing the on-site debris based on its characteristic level of contamination was developed to separate the wastes that will require specialized treatment and/or transportation to a specific disposal facility. Some off-site disposal facilities will accept only wastes contaminated with a certain degree of contamination; for instance, municipal landfills can accept uncontaminated debris but cannot accept contaminated or hazardous debris unless it is treated. Off-site disposal facilities and their treatment requirements are discussed in Chapter 3.

TC limitations and UTSs for cadmium, chromium, and lead were used to segregate the debris based on its toxicity characteristic. If the debris exhibited a characteristic of hazardous waste above the TC limit based on the Interim RI sampling for cadmium, chromium, or lead, it is termed "hazardous debris." If the debris exhibited a characteristic level of contamination above the UTS but below the TC limitation for cadmium, chromium, or lead, it is termed "contaminated debris." If the debris exhibited a characteristic level below the UTS for cadmium, chromium, or lead, it is termed "uncontaminated debris." The assumptions made in defining these categories apply only to this FFS report and were developed to guide remediation efforts at the UP site. The development of the three debris categories and their respective numerical ranges are summarized in Table 2-6.

TABLE 2-5

UNIVERSAL TREATMENT STANDARDS

United Plating Site

CONSTITUENT	UNIVERSAL TREATMENT STANDARD NON - WASTEWATER (mg/l)
Cadmium	0.19
Chromium	0.86
Lead	0.37

TABLE 2-6

PROPOSED METHOD OF CHARACTERIZING DEBRIS BASED ON HYPOTHETICAL TCLP ANALYSIS OF DEBRIS

United Plating Site

CONTAMINANT	UNCONTAMINATED DEBRIS (mg/l)	CONTAMINATED DEBRIS[A] (mg/l)	HAZARDOUS DEBRIS[B] (mg/l)
Cadmium	Less than 0.19	0.19 - 1	Greater than 1
Chromium	Less than 0.86	0.86 - 5	Greater than 5
Lead	Less than 0.37	0.37 - 5	Greater than 5

A - Based on UTS standard for underlying hazardous constituents.
B - Based on hazardous debris treatment standard.

Obtaining a representative sample of debris for applying the hazard classification is very difficult at the UP site because of the heterogeneous nature of the debris present. EPA has developed two recommended methods for sampling and classifying building demolition debris using TCLP analysis. These methods are described in a report titled "Technical Assistance Document for Complying with the TC Rule and Implementing the TCLP" (EPA 1994). The two methods, the Sampling/Statistical Analysis Method and the Mass Balance TCLP Method, are discussed below.

The Sampling/Statistical Analysis Method consists of using drill bits to obtain core samples from the debris to be classified and analyzing the resultant sample (consisting of both actual debris material and any contaminated surface coatings or layers) using TCLP. In most cases, this method would likely result in nonhazardous TCLP levels in the UP samples as only the surficial dust or paint layer is expected to be contaminated. This method would be difficult to implement at the UP site due to the difficulty in obtaining core samples of the debris materials for disposal, particularly of large metallic equipment.

The Mass Balance TCLP Method is based on the assumption that only the surface layer is contaminated. Therefore TCLP samples are collected of the surface contaminated layer (e.g., paint or dust) only. Following analysis of these samples, the results are adjusted based on the mass of the surface layer as compared to the mass of the debris item as a whole. Generally, this method is also expected to result in a determination that the majority of debris materials are nonhazardous as the mass of the contaminated surface layer is small compared to the mass of the item as a whole. This method requires estimating or measuring the thickness and surface area of the contaminated surface layer and the mass of the debris items.

The equation defined by the Mass Balance TCLP Method is as follows:

$$TCLP_{waste} = TCLP_{dust} \times \frac{m_d}{m_w}$$

where $TCLP_{dust}$ is the TCLP concentration of the dust covering the representative sample, m_d is the mass of dust on the debris material, and m_w is the mass of the debris.

For the purposes of this report, EPA's Mass Balance TCLP Method was used to determine TCLP concentrations of on-site debris. Estimated quantities of uncontaminated, contaminated, and hazardous debris were developed based on the wipe, sweep, and paint chip sampling data results obtained during the Interim RI. Where TCLP data were not available, conservative assumptions were made to estimate the TCLP concentration. Actual TCLP analyses will likely be required for disposal definition.

To apply the Mass Balance TCLP Method, all data results obtained were converted to TCLP equivalent concentration. Wipe sample data, reported in $\mu g/100\ cm^2$, were converted to TCLP concentration by assuming that the debris surface was covered with a 1/100-in. dust layer, the density of the dust is 1.5 g per cm^3, and the dust would all be leachable in a TCLP extraction test. The TCLP laboratory procedure requires the soil sample to be diluted by a ratio of 20:1 when preparing the sample for the acidic extraction, and subsequent leachate analysis. Assuming that the entire mass of contaminant present in the sample will leach out during the extraction process, the dilution factor of 20 can be applied to the actual contaminant concentration in the sample to give a maximum possible contaminant concentration obtainable in the leachate. This calculation is shown in Appendix B; the relationship was found to be:

$$TCLP_{dust}\ (mg/l) = 0.0131\ WS$$

where WS is the wipe sample result in $\mu g/100\ cm^2$. Sweep and paint chip data results were not adjusted as these were reported in TCLP concentrations.

The TCLP concentrations of the residue layer (e.g., dust or paint) were then used to estimate the TCLP concentration of a representative sample taken of the debris (i.e., $TCLP_{waste}$). In order to perform this calculation using the Mass Balance TCLP Method, the following assumptions were made:

- For each debris type category (i.e., metal, concrete and brick, wood, plastic, and other), a representative article of debris was selected that had the highest frequency of occurrence at the site. The representative article of debris selected for each debris category and its estimated dimensions and weight are explained in Appendix B.
- The representative article of debris is covered with a 1/100-in. thick dust layer on its exposed surfaces.
- Contaminants are uniformly distributed over the surface at the $TCLP_{dust}$ concentration.
- The material of construction of the debris is not inherently hazardous.
- Contamination exists only on the surface and has not penetrated into the debris.

In the metal debris category, a steel tank was selected as the representative sample as tanks had the most visually contaminated surface at the UP site. Similarly, a concrete masonry unit was selected to represent the concrete and brick debris category, a pallet was selected for the wooden debris category, a small dip tank was selected for the plastic category, and a Styrofoam board was selected for the "other" debris category.

Data results obtained from debris surfaces of the same debris type were used when available. For example, wipe sampling results collected from metallic debris surfaces in the wastewater treatment room were used in evaluating the toxicity characteristic of metallic debris in that room. In situations where debris was present in a room but no samples were collected from debris surfaces, the $TCLP_{dust}$ concentration was taken as the average of floor sweep sample data obtained from the same room. The $TCLP_{dust}$ and $TCLP_{waste}$ calculations are provided in Appendix B and are separated by debris type in each room. The results of this data review, summarized in Tables 2-7 and 2-8, suggest that 28% of the total debris in the UP building is uncontaminated, 54% is contaminated, and 18% is hazardous. The majority of hazardous debris consists of metal (e.g., metallic dip tanks).

2.5.2 Uncontaminated, Contaminated, and Hazardous Interior Surfaces

The interior surfaces were also divided into three separate categories to quantify the areas that may need to be remediated prior to demolishing the building. Conversations with general demolition contractors indicate that before they will mobilize to demolish the UP building, all environmentally related "hazardous" conditions must be removed from the site. Some off-site disposal facilities will not accept contaminated or hazardous demolition debris; therefore, rooms that contain contaminated or hazardous interior surfaces must be identified and remediated in order to satisfy landfill requirements. Numerical ranges were established to separate the interior surfaces into categories based on the level of contamination covering the surface (summarized in Table 2-9). The data results of the Interim RI were used as a measure of contamination covering the debris surface by converting all values to $TCLP_{dust}$ equivalents (using the methods previously described). All supporting calculations used to develop the interior surface categories are provided in Appendix C. Off-site disposal facilities and their treatment requirements are discussed in Chapter 3.

EPA has developed a method for determining whether building demolition debris could be construed as a hazardous wastestream (EPA 1994). The Mass Balance TCLP Method described in the previous subsection is applied to the entire building. Rearranging the Mass Balance TCLP equation yields:

$$TCLP_{dust} < (TCLP_{waste})\ (m_w/m_d)$$

where $TCLP_{dust}$ is the average TCLP concentration of contaminant in the dust, m_d is the mass of dust covering the building, m_w is the mass of the entire building, and $TCLP_{waste}$ is the TC limitation for hazardous waste disposal. The right side of this equation is the maximum TCLP contaminant concentration in the dust (on the average) that, if exceeded, causes the entire

TABLE 2-7

ESTIMATED DEBRIS QUANTITIES BY TOXICITY CHARACTERISTIC AND DEBRIS TYPE[1]
United Plating Site

ROOM	METAL (tons) U	METAL (tons) C	METAL (tons) H	CONCRETE & BRICK (tons) U	CONCRETE & BRICK (tons) C	CONCRETE & BRICK (tons) H	WOOD (tons) U	WOOD (tons) C	WOOD (tons) H	PLASTIC (tons) U	PLASTIC (tons) C	PLASTIC (tons) H	OTHER (tons) U	OTHER (tons) C	OTHER (tons) H	TOTAL DEBRIS (tons)
First Floor																
Wastewater Treatment	-	690.2	230.1	3.0	-	-	7.4	-	-	-	-	11.5	3.0	-	-	945
Main Plating Room	-	410.3	136.8	2.1	-	-	-	7.3	-	-	4.4	-	-	2.3	-	563
Chrome Plating Room	-	108.9	15.6	-	-	-	-	1.7	-	-	-	-	-	2.4	-	129
Silver Plating Room	-	212.4	-	-	0.7	-	-	-	9.8	-	5.9	-	-	-	1.2	230
Office	52.9	-	-	-	-	-	-	2.0	-	-	0.4	-	-	6.4	-	62
Subtotal - 1st Floor	**52.9**	**1421.8**	**382.5**	**5.1**	**0.7**	**0.0**	**7.4**	**11.0**	**9.8**	**0.0**	**10.7**	**11.5**	**3.0**	**11.1**	**1.2**	**1,929**
Second Floor																
Chemical Storage	-	15.0	-	7.5	-	-	4.2	-	-	-	0.2	-	-	0.4	-	27
Parts Storage Room	240.7	-	-	1.0	-	-	1.1	-	-	1.9	-	-	4.0	-	-	249
Anodizing Room	97.7	-	-	0.4	-	-	5.0	-	-	-	0.4	-	1.0	-	-	105
Pipe and Spring Room	-	-	235.2	-	-	-	1.6	-	0.2	0.2	-	-	23.2	-	2.6	263
Office/Sewing Room	176.6	-	-	-	-	-	8.6	-	-	1.0	-	-	-	11.8	-	198
Subtotal - 2nd Floor	**515.0**	**15.0**	**235.2**	**8.9**	**0.0**	**0.0**	**20.5**	**0.0**	**0.2**	**3.1**	**0.6**	**0.0**	**28.2**	**12.2**	**2.6**	**842**
Third Floor																
Grated Area	6.1	-	-	-	-	-	0.4	-	-	-	-	-	-	-	-	7
Lead Smelting Room	61.1	-	-	1.5	-	-	-	0.8	-	-	-	-	-	0.4	-	64
Parts Storage Room	21.8	-	-	-	-	-	0.5	-	-	-	-	-	0.2	-	-	23
Brewery Room	145.4	-	-	-	2.0	-	-	0.9	-	-	1.6	-	-	9.9	-	160
Subtotal - 3rd Floor	**234.4**	**0.0**	**0.0**	**1.5**	**2.0**	**0.0**	**0.9**	**1.7**	**0.0**	**0.0**	**1.6**	**0.0**	**0.2**	**10.3**	**0.0**	**253**
Fourth Floor																
Storage Room	-	419.3	-	0.4	-	-	-	5.3	-	-	0.3	-	-	0.7	-	426
Subtotal - 4th Floor	**0.0**	**419.3**	**0.0**	**0.4**	**0.0**	**0.0**	**0.0**	**5.3**	**0.0**	**0.0**	**0.3**	**0.0**	**0.0**	**0.7**	**0.0**	**426**
Fifth Floor																
Storage Room	102.7	-	-	4.1	-	-	2.6	-	-	-	-	-	0.5	-	-	110
Subtotal - 5th Floor	**102.7**	**0.0**	**0.0**	**4.1**	**0.0**	**0.0**	**2.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.5**	**0.0**	**0.0**	**110**
Sixth Floor																
Storage Room	14.0	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	17
Subtotal - 6th Floor	**14.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**17**
BUILDING TOTAL (tons)	**919**	**1856**	**618**	**20**	**3**	**0**	**34**	**18**	**10**	**3**	**13**	**12**	**32**	**34**	**4**	**3,577**
Assumed Density (tons/cy)		6.615			1.958			0.540			1.161			0.801		
BUILDING TOTAL (cy)	**278**	**561**	**187**	**20**	**3**	**0**	**126**	**67**	**37**	**5**	**22**	**21**	**80**	**85**	**10**	**1,502**

1 - From Appendix B.
U - Uncontaminated debris.
C - Contaminated debris
H - Hazardous debris.

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TABLE 2-8

ESTIMATED QUANTITIES OF DEBRIS (BY TOXICITY CHARACTERISTIC)[1]

United Plating Site

DEBRIS TYPE	UNCONTAMINATED DEBRIS (tons)	CONTAMINATED DEBRIS (tons)	HAZARDOUS DEBRIS (tons)	TOTAL DEBRIS (tons)
Metal	919	1,856	618	3,393
Concrete & Brick	20	3	0	23
Wood	34	18	10	62
Plastic	3	13	12	28
Other	32	34	4	70
TOTAL (tons)	1,008	1,924	644	3,576[A]
TOTAL (yd^3)	509	738	255	1,502

1 - From Appendix B.
A - Value does not match Table 2-7 due to round off error.

TABLE 2-9

PROPOSED METHOD OF CHARACTERIZING INTERIOR SURFACES BASED ON HYPOTHETICAL TCLP (DUST) ON SURFACE

United Plating Site

CONTAMINANT	UNCONTAMINATED INTERIOR SURFACE[A] (mg/l)	CONTAMINATED INTERIOR SURFACE (mg/l)	HAZARDOUS INTERIOR SURFACE[B] (mg/l)
Cadmium	Less than 1	1 - 938	Greater than 938
Chromium	Less than 5	5 - 4,690	Greater than 4,690
Lead	Less than 5	5 - 4,690	Greater than 4,690

A - Based on TC limit for hazardous waste disposal.
B - Based on Mass Balance TCLP calculation of Appendix C.

building's demolition debris to be considered as a hazardous wastestream. In other words, if the average of all the $TCLP_{dust}$ data at the UP site exceeds this maximum $TCLP_{dust}$ concentration (i.e., right hand side of the equation), the demolition debris will need to disposed of as hazardous waste. This maximum $TCLP_{dust}$ concentration is equal to 938 mg/l for cadmium and 4690 mg/l for chromium and lead.

All sample data obtained from interior surfaces were analyzed to compute the average TCLP concentration for the dust ($TCLP_{dust}$) in the entire building (see Appendix C, Table C-1). Data analyzed included the results of wipe, sweep, concrete chip, wood chip, and paint chip sampling of the Interim RI. The wipe sample data results were converted to TCLP concentrations in the same manner as was done for debris in the previous subsection. Results reported as total concentration (typically reported in mg/kg) were converted to TCLP concentrations (in mg/l) using the 1/20 dilution factor rule. The average $TCLP_{dust}$ concentrations for the entire building were calculated to be 1 mg/l for TCLP cadmium, 162 mg/l for TCLP chromium, and 281 mg/l for TCLP lead. In all cases, the average $TCLP_{dust}$ concentration for the building was below the maximum $TCLP_{dust}$ concentration considered to be hazardous; therefore, the building demolition debris would not be considered to be a hazardous wastestream if the building were to be demolished.

Although the data support the assumption that the demolition debris is nonhazardous, they also suggest that surfaces are covered with contaminated dust or lead-based paint in several areas of the building. These existing conditions may pose a potential risk to on-site workers during the remediation and subsequent demolition of the building and will likely need to be treated or removed. A data review conducted to identify the rooms that contain contaminated surfaces is presented in Appendix C. The data were first grouped by the type of surface from which they were obtained (e.g., floors, walls and ceilings, and structural supports) and then arranged by room. The average value of each room's interior surface data was taken to represent the mean concentration of dust covering that surface. For some lead data, the average value was taken to represent the mean concentration of paint, rather than dust, covering a surface.

Three risk categories were developed to describe the interior surfaces of each room based on their characteristic level of contamination: hazardous, contaminated, and uncontaminated interior surfaces. For the purposes of this report, hazardous interior surfaces are defined as the surfaces of a building of which demolition debris is considered a hazardous wastestream. As the UP building demolition debris would not be considered a hazardous wastestream if the building were demolished, none of interior surfaces are considered to be hazardous. The interior surfaces are either contaminated or uncontaminated and the threshold is assumed to be the TC limitation. That is, if an interior surface is covered with dust or paint that, on the average, exhibits a toxicity characteristic above the TC limit for cadmium, chromium, or lead; that surface is considered to be contaminated. Otherwise, if an interior surface is covered with dust or paint that, on the average, exhibits a toxicity characteristic at or below the TC limit for cadmium, chromium, or lead, that surface is considered to be uncontaminated. The results of this data analysis are provided in Appendix C and summarized in Tables 2-10 and 2-11. Based on the analysis, approximately 60% of interior surfaces are contaminated and 40% are uncontaminated. The majority of the contaminated surfaces are located on the first four floors of the building; these contaminated surfaces will likely require some level of treatment prior to demolition.

2.5.3 Sediment in Belowgrade Piping and Sumps

During the Interim RI, several samples were collected of the sediment that remains in below-grade piping and sumps on the first floor, particularly in the chrome plating and main plating rooms. The quantity of sediment present is unknown, but based on field observations it is estimated to be approximately 25 yd^3. The results of sediment sampling indicate that the sediment present in nearly all areas is characteristically hazardous; therefore, later discussions concerning this sediment will assume that it is hazardous for disposal.

TABLE 2-10

ESTIMATED INTERIOR SURFACE AREAS BY LEVEL OF CONTAMINATION[1]
United Plating Site

ROOM	FLOORS (ft²) U	FLOORS (ft²) C	FLOORS (ft²) H	WALLS (ft²) U	WALLS (ft²) C	WALLS (ft²) H	CEILINGS (ft²) U	CEILINGS (ft²) C	CEILINGS (ft²) H	STRUCTURAL SUPPORTS (ft²) U	STRUCTURAL SUPPORTS (ft²) C	STRUCTURAL SUPPORTS (ft²) H	TOTAL INTERIOR SURFACES (ft²)
First Floor													
Wastewater Treatment Room	-	8,580	-	-	8,820	-	-	8,580	-	-	849	-	26,829
Collapsed Room	3,268	-	-	5,950	-	-	3,268	-	-	255	-	-	12,741
Main Plating Room	-	7,678	-	-	15,755	-	7,678	-	-	-	2,123	-	33,234
Chrome Plating Room	-	2,711	-	-	4,947	-	-	2,711	-	425	-	-	10,794
Silver Plating Room	-	1,887	-	-	2,880	-	-	1,887	-	-	240	-	6,894
Office	-	3,685	-	3,420	-	-	3,685	-	-	240	-	-	11,030
Subtotal - 1st Floor	3,268	24,541	0	9,370	32,402	0	14,631	13,178	0	920	3,212	0	101,522
Second Floor													
Collapsed Room	3,268	-	-	5,950	-	-	3,268	-	-	340	-	-	12,826
Chemical Storage Mezzanine	-	2,280	-	-	4,850	-	2,280	-	-	-	1,019	-	10,429
Parts Storage Room	-	1,680	-	4,910	-	-	1,680	-	-	453	-	-	8,723
Anodizing Room	-	1,596	-	1,686	-	-	1,596	-	-	453	-	-	5,331
Pipe and Spring Room	-	3,535	-	-	3,840	-	-	3535	-	-	1,415	-	12,325
Office/Sewing Room	-	5,239	-	-	5,655	-	5,239	-	-	-	720	-	16,853
Subtotal - 2nd Floor	3,268	14,330	0	12,546	14,345	0	14,063	3535	0	1,246	3,154	0	66,487
Third Floor													
Grated Area	1,271	-	-	1800	-	-	1271	-	-	0	-	-	4,342
Lead Smelting Room	-	750	-	-	1340	-	-	750	-	-	0	-	2,840
Parts Storage Room	-	330	-	740	-	-	330	-	-	170	-	-	1,570
Brewery Room	-	3,800	-	8,970	-	-	3,800	-	-	-	1500	-	18,070
Subtotal - 3rd Floor	1,271	4,880	0	11,510	1,340	0	5,401	750	0	170	1,500	0	26,822
Fourth Floor													
Storage Room	-	3,940	-	-	8,140	-	3,940	-	-	-	849	-	16,869
Subtotal - 4th Floor	0	3,940	0	0	8,140	0	3,940	0	0	0	849	0	16,869
Fifth Floor													
Storage Room	-	1312	-	3570	-	-	1312	-	-	340	-	-	6,534
Subtotal - 5th Floor	0	1,312	0	3,570	0	0	1,312	0	0	340	0	0	6,534
Sixth Floor													
Storage Room	-	640	-	1560	-	-	640	-	-	340	-	-	3,180
Subtotal - 6th Floor	0	640	0	1,560	0	0	640	0	0	340	0	0	3,180
BUILDING TOTAL (tons)	7,807	49,643	0	38,556	56,227	0	39,987	17,463	0	3,016	8,715	0	221,414

1 - From Appendix C.
U - Uncontaminated debris.
C - Contaminated debris
H - Hazardous debris.

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TABLE 2-11

ESTIMATED INTERIOR SURFACE AREAS BY SURFACE TYPE[1]

United Plating Site

SURFACE TYPE	UNCONTAMINATED SURFACE (ft^2)	CONTAMINATED SURFACE (ft^2)	HAZARDOUS SURFACE (ft^2)	TOTAL SURFACE (ft^2)
Floor	7,807	49,643	0	57,450
Wall	38,556	56,227	0	94,783
Ceiling	39,987	17,463	0	57,450
Structural Support	3,016	8,715	0	11,731
TOTAL	89,366	132,048	0	221,414

1 - From Appendix C.

CHAPTER 3

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES

3.1 INTRODUCTION

The first step in developing a range of alternatives intended to achieve the remedial action objectives established for the site is to identify all potentially applicable remedial technologies. An initial screening is performed in which the applicability of the identified technologies to site conditions, contaminants, and contaminated media characteristics is evaluated. The potentially applicable technologies are then evaluated based on their expected effectiveness, implementability, and cost. The most promising technologies are combined into facilitywide remedial alternatives, which are subsequently included in the detailed analysis of alternatives.

The identified technologies have been grouped by general response actions. General response actions are categories of technologies that represent a particular approach to achieving site remedial action objectives and include institutional measures, containment, removal, treatment, and disposal.

3.2 INITIAL IDENTIFICATION AND SCREENING OF TECHNOLOGIES

The general response actions and the identification and screening of technologies for the UP site are summarized in Table 3-1 and discussed below. Potentially applicable remedial technologies and process options within each of the general response action categories were identified. Remediation technologies available for the treatment of contaminated and hazardous debris surfaces and contaminated interior surfaces are similar, but may not apply to both. The technology identification process included an initial evaluation of the applicability of each remedial technology to the UP site. Inappropriate technologies were not given further consideration and were screened out, as indicated in Table 3-1.

3.2.1 No Action

The no action alternative is included as a basis of comparison with active remedial technologies in accordance with National Contingency Plan (NCP) requirements.

INITIAL IDENTIFICATION AND SCREENING OF TREATMENT TECHNOLOGIES FOR DEBRIS AND INTERIOR SURFACES

United Plating Site

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	APPLICABILITY TO TREATMENT OF DEBRIS	APPLICABILITY TO TREATMENT OF INTERIOR SURFACES	SCREENING COMMENTS
No Action	None	None	Yes	Yes	Required by NCP.
Institutional Measures	Access Restrictions	Deed restrictions	Yes	Yes	Potentially applicable for preventing human contact with existing contaminants; will not prevent continued migration of contaminants to air, soil, and groundwater.
		Fencing	Yes	Yes	Potentially applicable for reducing human contact with existing contaminants; will not prevent continued migration of contaminants to air, soil, and groundwater.
Containment	Boarding and Repair of Open Doorways, Windows, and Other Apertures		Yes	Yes	Potentially applicable for reducing risk of exposure; debris and interior surfaces will require treatment and disposal at a future time.
Removal/Disposal/Reuse	Collection, Disposal, and Recycling	Transport to a TSDF	Yes	Yes	Applicable to untreated hazardous debris.
		Disposal in industrial landfill	Yes	Yes	Applicable to nonhazardous debris.
		Disposal in C&D landfill	Yes	Yes	Applicable to uncontaminated debris.
		On-site landfill	Yes	Yes	Applicable to uncontaminated concrete and brick debris and building demolition debris.
		Recycling or recovery	Yes	Yes	Applicable to nonhazardous, metallic debris.
		Auction/Reoccupancy	Maybe	No	On-site debris has no salvage value. Building cannot be reoccupied because it is not structurally sound.

INITIAL IDENTIFICATION AND SCREENING OF TREATMENT TECHNOLOGIES FOR DEBRIS AND INTERIOR SURFACES

United Plating Site

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	APPLICABILITY TO TREATMENT OF DEBRIS	APPLICABILITY TO TREATMENT OF INTERIOR SURFACES	SCREENING COMMENTS
Treatment	Physical Extraction	Vacuum blasting	No	Yes	Effective for removal of dust and paint from masonry surfaces.
		Scarification	No	Maybe	Effective for removing a thin concrete layer but limited to use on concrete floor slabs.
		Spalling	No	Maybe	Effective on concrete floor slabs for removing a thick surface layer.
		HEPA sanding	Yes	Yes	Effective for removal of dust and paint, especially from equipment and uneven surfaces.
		High-pressure steam cleaning	Yes	Yes	Effective for removal of dust from all types of surfaces. May generate large quantities of wastewater.
		HEPA vacuuming and wet wiping	Yes	Yes	Effective for removal of dust from all types of surfaces. May not be as effective in removing dust as other technologies.
	Chemical Extraction	Water washing and spraying	Maybe	Maybe	More difficult to accomplish due to additional materials handling needs.
		Liquid-phase solvent extraction	No	Maybe	Process creates nuisance waste liquids that may cause unnecessary safety hazards.
		Vapor phase - solvent extraction	No	Maybe	Process creates nuisance vapors that may cause unnecessary safety hazards.
	Thermal Extraction	High - temperature metals recovery (HTMR)	Yes	No	Cost-effective only for metallic debris that is remelted.
		Thermal desorption	No	No	Generally more effective for debris contaminated with volatile organic compounds.
	Biological Destruction	Biodegradation	No	No	Not consistently effective in treating metals contaminants.

INITIAL IDENTIFICATION AND SCREENING OF TREATMENT TECHNOLOGIES FOR DEBRIS AND INTERIOR SURFACES

United Plating Site

GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS OPTION	APPLICABILITY TO TREATMENT OF DEBRIS	APPLICABILITY TO TREATMENT OF INTERIOR SURFACES	SCREENING COMMENTS
	Chemical Destruction	Chemical oxidation	No	No	Requires spraying of potentially hazardous agents onto surfaces and creating unnecessary safety hazards.
Treatment		Chemical reduction	No	No	Requires spraying of potentially hazardous agents onto surfaces and creating unnecessary safety hazards.
	Thermal Destruction (Incinerator)		Maybe	No	Expensive process for industrial wastes, and ineffective for metal contamination.
	Immobilization	Encapsulation	Yes	Yes	Encapsulated debris must be disposed of in a Subtitle C facility. Too expensive an option for building demolition debris.
		Sealing	Yes	Yes	Requires preparation of surface for good seal; too expensive an option for building demolition debris.
		Stabilization	Yes	Yes	Effective process to prevent partial contamination from leaching. However, not feasible for large debris and in situ surfaces.

3.2.2 **Institutional Measures**

Institutional measures that may be applied at the UP site include access restrictions, such as deed restrictions and fencing. The purpose of these institutional measures is to reduce the possibility of human contact with any contaminants remaining at the site in the absence of active remediation or following any remedial activities. Deed restrictions limit or prohibit certain uses or redevelopment of the site in the event of title transfer to other ownership and serve to notify prospective owners of the existence of remaining contamination at the site. Fencing may deter unauthorized access to contaminated areas of the site but does not eliminate contact with trespassers. A full-time guard may be hired to secure the property.

3.2.3 **Containment**

Contaminants may be contained inside the building by boarding the open doorways, windows, and other apertures and repairing the roof and other damaged surfaces. This may reduce the amount of off-site contaminant migration via air and stormwater pathways.

3.2.4 **Removal, Disposal, and Recycling**

Debris requiring off-site removal may be reused, recycled, or disposed of depending on the material's type and condition. Discussions with local scavengers indicate that there is no equipment remaining at the site that is likely to be reused. There is, however, an abundance of metallic debris that can be transported to a scrap metal facility for remelting. Sufficient quantities of other types of debris (i.e., nonmetallic debris) do not exist at the site to make recycling a cost-effective option. Several scrap metal facilities operating in the Schenectady and Albany areas have demonstrated their willingness to accept the scrap metal at minimal cost.

Off-site disposal options include construction and demolition (C&D) landfills, industrial landfills, and hazardous waste management facilities (e.g., RCRA-permitted Subtitle C facility). Some solid wastes can also be transported to a municipal incinerator or composting facility, however, these facilities will usually not accept wastes from industrial facilities or remediation projects. Incineration is usually ineffective for metals contaminants in that the metals are not destroyed when thermally treated but become bound in the slag. Off-site disposal to an incinerator or composting facility were not retained for further consideration.

C&D landfills are usually lined and will generally accept debris generated from C&D projects, such as concrete, brick, etc. (usually termed "C&D" debris). C&D landfills will only accept nonhazardous, uncontaminated waste. Several C&D landfills are within relatively close proximity of the site. Industrial landfills are lined and will accept C&D debris as well as nonhazardous wastes generated from commercial and industrial businesses, including waste that is slightly contaminated. Waste acceptance is performed on a case-by-case basis depending on the type and condition of the debris. The Pottstown Landfill in Pottstown, Pennsylvania, operated by Waste Management, Inc., is an example of an industrial landfill. Hazardous wastes that require special treatment prior to disposal are transported to a hazardous waste management facility, more commonly referred to as a treatment, storage, and disposal facility (TSDF). The hazardous constituent of the waste is usually stabilized, encapsulated, or destroyed before the waste is landfilled. An example of a TSDF in the northeastern United States is the Model City Landfill in Model City, New York, operated by Chemical Waste Management, Inc. (CWM). The encapsulation chamber at the CWM facility is 20 ft long by 5 ft wide by 4 ft high; the maximum size of debris that can be encapsulated is restricted to the size of the encapsulation chamber. Some debris may need to be dismantled, crushed, or cut to meet these maximum size requirements. The types of debris and solid waste that recycling and disposal facilities will accept are highly specific; most facilities require TC testing of the waste prior to approving the waste for transport to their facility. If the waste characteristics do not satisfy landfill requirements, the waste would require treatment, if possible, to reduce its toxicity. The treated waste would need to be resampled to verify that landfill requirements were satisfied.

Another possible disposal option is on-site landfilling, especially for materials composed of concrete and brick. The debris may be either pretreated to be considered uncontaminated C&D debris or stabilized with a concrete slurry and solidified before landfilling. A cap will need to be installed over the landfilled material either as cover or an impervious layer to minimize stormwater infiltration.

3.2.5 Treatment

Technologies available for treating hazardous debris, contaminated debris, and contaminated interior surfaces (as defined in Section 2.5) are divided into three general categories: extraction, destruction, and immobilization. Most of the treatment alternatives were adapted from the approved treatment technologies listed in the LDRs (40 CFR Part 268) for detoxifying hazardous debris. These treatment technologies apply to contaminated debris and interior surfaces as well as hazardous debris; however, treatment does not need to satisfy the specified performance and/or design and operating standards set for treating hazardous debris.

The LDRs require that the performance or design and operating standards be met for all debris surfaces that are contaminated with hazardous waste. For the purposes of this technology screening, only the exposed surfaces of the debris and interior surfaces that may have come into contact with hazardous dust are assumed to require treatment. The evaluated technologies specific to the treatment of debris and interior surfaces at the UP site are presented in the subsections below and are categorized by the contaminant removal method.

3.2.5.1 ***Extraction***. Extraction technologies that separate residue from debris or interior surfaces are divided into three groups: physical, chemical, and thermal.

Physical extraction technologies include abrasive blasting, scarification, spalling, sanding, high-pressure steam cleaning, wet wiping, and high-pressure vacuuming. Abrasive blasting involves the removal of surface contamination using water or air pressure to propel a solid media (i.e., steel shot, aluminum oxide, grit, plastic beads) against the surface to be cleaned. One type of abrasive blasting that controls the dust created during this process is vacuum blasting. The dust and blasting media are collected by a vacuum attachment and separated internally. The blasting media is returned to the head of the system for reuse, while the dust is passed through a high-efficiency particulate accumlator (HEPA) filter and collected. Scarification is performed using a scarifier tool equipped with pneumatically-operated piston heads that strike the surface, causing a thin layer (approximately 1 in.) of concrete to be chipped off a floor surface. Spalling is performed by drilling or chipping holes into a floor surface and advancing a tool bit that hydraulically spreads open and spalls off the contaminated surface. Spalling is typically used in situations where contamination has penetrated deeply into a concrete slab surface. HEPA sanding uses traditional electric sanders equipped with specially designed shrouds that are placed under a partial vacuum. The exhaust air is passed through a HEPA filter to reduce the amount of airborne particulates. High-pressure steam cleaning involves the application of steam spray of sufficient temperature, pressure, residence time, surfactants, and detergents to remove loosely bound dust from surfaces. Wet wiping involves using a damp abrasive cloth or sponge saturated with a detergent solution to absorb dust and grime from a contaminated surface. The purpose of wet wiping as compared to steam cleaning is to reduce the volume of waste generated during cleaning. High-pressure vacuuming, also known as HEPA vacuuming, is performed by vacuuming a contaminated surface with an industrial vacuum equipped with a HEPA filter. The dust is separated and captured in a filter bag for easy disposal.

Chemical extraction processes include water washing and spraying, liquid-phase solvent extraction, and vapor-phase solvent extraction. The water washing and spraying process involves dipping a contaminated material into a bath containing surfactants and detergents to extract contaminants from the surface. Liquid-phase solvent extraction utilizes a nonaqueous liquid solution or strippable sheet, which is applied to a debris surface to cause contaminants to enter the liquid phase. The contaminants are then flushed or peeled away from the debris. Vapor-phase solvent extraction is a similar technology except that an organic vapor is applied to the debris surface, causing contaminants to enter the vapor phase and be flushed away with the organic vapor.

Thermal extraction processes suitable for treating debris and interior surfaces include high-temperature metals recovery (HTMR) and thermal desorption. HTMR is a process in which debris is placed in a smelting, melting, or refining furnace under sufficient heat, residence time, mixing, fluxing agents, and carbon to extract the contaminants. Metallic debris transported to a scrap metal facility is usually sorted and then shipped for remelting. This remelting process is an application of the HTMR technology. Thermal desorption involves heating the waste in an enclosed chamber under either oxidizing or nonoxidizing atmospheres at sufficient temperature and residence time to vaporize contaminants from surfaces.

3.2.5.2 ***Destruction***. Destruction technologies include biological, chemical, and thermal processes. Biological destruction, more commonly referred to as biodegradation, involves the removal of contaminants using one of two methods: (1) extracting the contaminants into an aqueous solution and then biodegrading them in a reactor operated under aerobic or anaerobic conditions or (2) applying microbes (in solution) to the contaminated area and allowing them to digest the contaminant over time. Chemical destruction involves chemically oxidizing or reducing the contaminants by saturating the surface with an appropriate chemical reagent and allowing it to react with the contaminant. Hypochlorite (e.g., bleach) and chlorine are examples of oxidizing reagents and sulfur dioxide and bisulfites are examples of reducing reagents. Thermal destruction involves treating the debris in an incinerator or the interior surfaces with a high-temperature flame to destroy the contaminants thermally.

3.2.5.3 ***Immobilization***. Immobilization technologies include encapsulation and sealing; the contaminants are not removed or destroyed but are contained indefinitely. Encapsulation involves the application of surface-coating materials, such as polymeric organics and portland cement, or the use of a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. Encapsulation techniques can be performed in the field but are more frequently conducted at the disposal facility accepting the encapsulated wastes. This ensures the receiving landfill that the surface coating was applied as specified and that the encapsulated material will not leach toxic contaminants. Sealing is the application of an epoxy, silicone, or urethane coating that adheres tightly to the debris surface so as to avoid exposure of the surface to potential leaching media. Sealing, however, requires pretreatment of the debris surface to remove foreign matter and to clean and roughen the surface. Stabilization (and subsequent solidification) is the in-place mixing of chemical reagents with small debris (such as concrete and brick debris) and soils to prevent leaching of contaminants from the treated soils. Stabilization is an effective remediation technology for inorganic contaminants, such as those present in dust and paint at the UP site.

3.3 PRELIMINARY SCREENING OF TECHNOLOGIES

The first step in developing a range of alternatives intended to achieve the remedial action objectives for the site was to identify potentially applicable remedial technologies. Technologies for contaminated debris and interior surfaces were evaluated and screened separately. The goal of this preliminary screening was to reduce the number of technologies that may apply to the site by identifying those that were most promising and cost-effective. Appropriate technologies were consolidated and combined into preliminary remedial alternatives (Chapter 4) and then evaluated in detail based on their effectiveness, implementability, and cost (Chapter 5).

3.3.1 Contaminated and Hazardous Debris

The retained treatment technologies for contaminated and hazardous debris are discussed in this section. Deed restrictions and fencing were retained in the institutional measures category and are intended to prohibit access and use of the site in the event that no remediation or removal activities are conducted. At the UP site, unless the fencing and access restrictions are exceptional, it is unlikely that access can be completely restrictive. The containment option was retained and should be used in conjunction with the institutional measures to prevent the migration of contaminants to the environment. Although the no action, institutional measures, and containment options are ineffective and not final remedial solutions, they were retained for further evaluation to allow for a cost-benefit analysis and a comparison to active remediation.

The purpose of treating contaminated and hazardous debris is to allow acceptance by the selected disposal facility. The type of materials an off-site disposal or recycling facility will accept varies widely and approval depends on the material's TC level. The definitions for uncontaminated, contaminated, and hazardous debris are given in Section 2.5. In addition to these definitions, treated debris that is "fully clean" is defined in this FFS as exhibiting a TCLP concentration below the UTS value in a confirmatory sample. Treated debris that is "partially clean" is defined as exhibiting a TCLP concentration below the TC limitation but above the UTS value in a confirmatory sample. It is assumed that contaminated debris coated with lead-based paint does not require remediation to remove the paint to satisfy the partially clean objective. Lead-based paint is defined as paint containing in excess of 5000 mg/kg, or 0.5%, lead (LMS 1995). Most disposal facilities (except C&D landfills) will generally accept debris coated with lead-based paint as long as the debris is not considered a hazardous waste and is not categorized as hazardous debris. On the other hand, any visible dust present on the debris surface will need to be removed to satisfy the partially clean objective.

Generally, a TSDF will accept any waste present at the UP site, whether it is considered uncontaminated, contaminated, or hazardous debris. However, disposal at a TSDF is a relatively expensive option. Industrial landfills will accept uncontaminated debris as is and hazardous and contaminated debris that have been treated at a minimum to the partially clean objective. C&D landfills will accept only debris that is uncontaminated or has been cleaned to the fully clean objective. A scrap metal recycling facility will accept metallic debris that is uncontaminated or contaminated or that has been treated at a minimum to the partially clean objective.

Another possible disposal option is on-site landfilling, especially for concrete and brick materials. Concrete and brick debris can be combined with the concrete and brick waste generated from the building demolition and landfilled on-site. In this FFS, it is assumed that on-site landfilling is an option for concrete and brick debris that is either uncontaminated or treated to at least the partially clean objective. This debris stream may need to be stabilized with a chemical reagent prior to landfilling. An impervious cap may need to be installed over the landfilled material to minimize stormwater infiltration or other clean cover may be needed. Alternatives that include the on-site landfilling option may be combined with the facilitywide cleanup alternatives involving the entire UP property. Treatment alternatives for soil and groundwater will be presented in the forthcoming feasibility study (FS). An example of combining an FFS alternative with an FS alternative is to solidify the concrete and brick debris from the building with contaminated soils and landfill the waste on-site. On-site landfilling options are discussed in more detail in Chapters 4 and 5. Metal, wood, plastic, and other debris will not be considered for placement into an on-site landfill because these materials would likely cause significant subsidence of the land over time. By using only concrete and brick debris, routine maintenance of the landfill would be minimized.

The five categories of debris at the UP site include metal, concrete and brick, plastic, wood, and "other" debris (e.g., Styrofoam). During site remediation, debris will be divided into uncontaminated, contaminated, and hazardous debris categories using the room-by-room analysis presented in Chapter 2 as a guide. Figure 3-1 depicts the available disposal options for site debris and the treatment steps required by disposal facilities prior to landfilling or recycling.

Most contaminated debris and all hazardous debris at the UP site must be treated (on- or off-site) prior to disposal or recycling. Treatment technologies capable of removing contaminated and hazardous levels of dust and paint must be selected to clean the debris effectively. If the

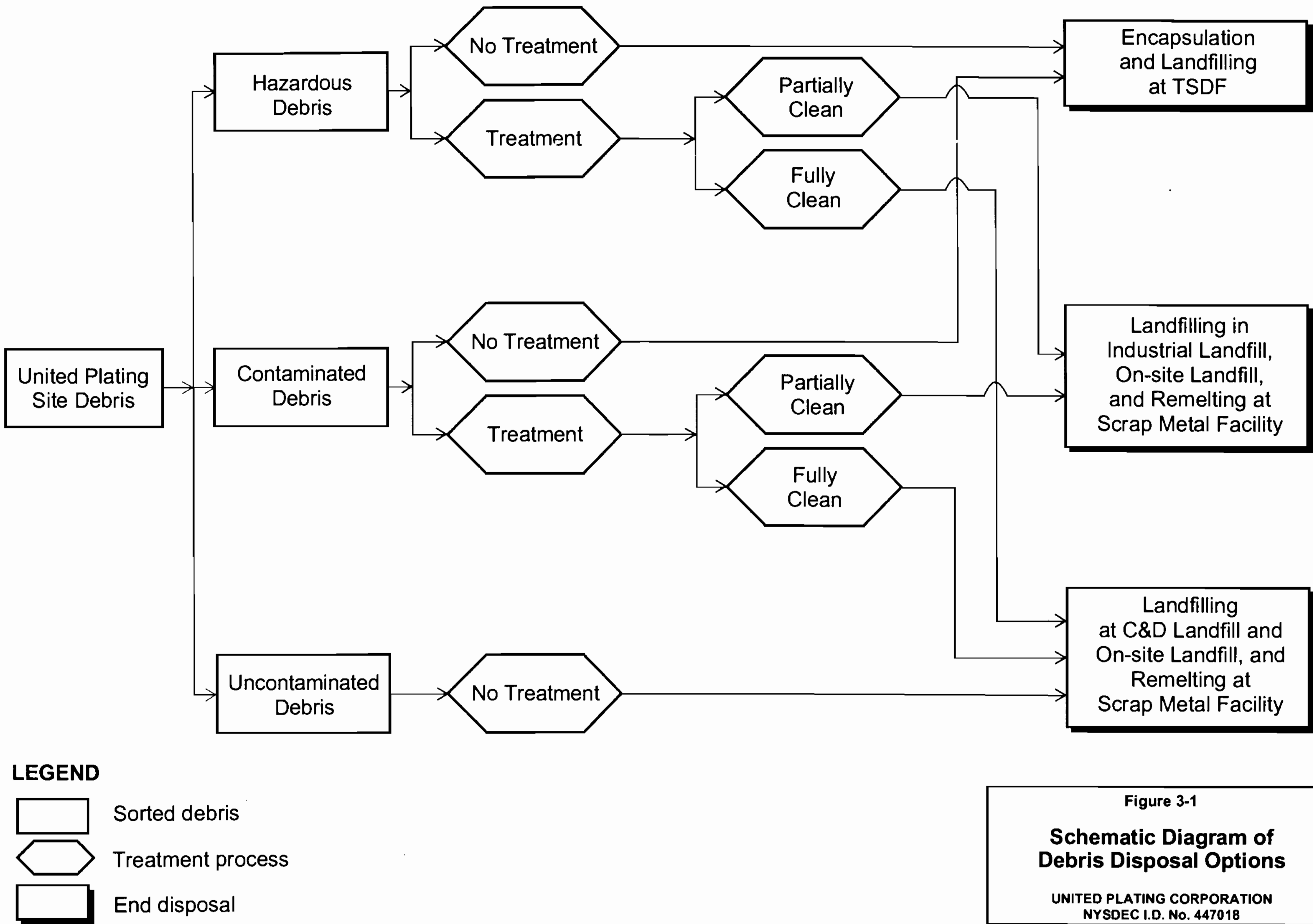

Figure 3-1

Schematic Diagram of Debris Disposal Options

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Pearl River, New York

debris is to be treated on-site, treatment can proceed in one of two ways: (1) contaminated and hazardous debris can be aggressively treated to achieve the fully clean objective, or (2) contaminated debris and hazardous debris can be treated using a less aggressive technology to satisfy the partially clean objective.

The technologies retained in Table 3-1 for treating debris include HEPA sanding, high-pressure steam cleaning, HEPA vacuuming and wet wiping, water washing (e.g., wet dipping), remelting, encapsulation, stabilization, and sealing. Of these technologies, sealing was eliminated from further consideration due to its high relative cost and complexity in comparison with other technologies that achieve similar goals. The sealing technology requires preparation of the debris surface prior to application, which essentially cleans the surface; encapsulation and stabilization are the preferable immobilization technologies for the site's debris. The other technologies were retained and selected based on the appropriate cleanup objective sought.

For hazardous debris, only treatment technologies capable of removing paint as well as dust were considered for both the fully and partially clean objectives. HEPA sanding is the only retained option capable of removing paint and dust from a debris surface and was therefore selected as the appropriate technology for treating hazardous debris. Encapsulation was also retained as an appropriate technology for treating hazardous debris off-site at a TSDF. For contaminated debris treatment, HEPA sanding would be too complex a technology to use and would not be as cost-effective. High-pressure steam cleaning would remove the metals-contaminated dust from debris surfaces more efficiently. High-pressure steam cleaning was implemented at the UP site during the Interim RI and was found to reduce surficial contamination by approximately 75%, based on wipe sampling results (LMS 1995). High-pressure steam cleaning was therefore retained as an appropriate technology for treating contaminated debris on-site. The HEPA vacuuming and wet wiping option was retained as a technology that would generate less rinse water as waste than high-pressure steam cleaning. The water washing technology was also retained as a technology that would generate less rinse water. Both the HEPA vacuuming and wet wiping option and the water washing option will not clean a debris surface as thoroughly as high-pressure steam cleaning but will remove the majority of metals-contaminated dust from the debris surface and satisfy the partially clean objective. The water washing technology (e.g., dipping contaminated debris into a detergent solution) may be more difficult to implement at the site due to the heterogeneity and large size of some of the debris present, but it was still retained.

The remelting technology is cost-effective only for metallic debris that is recyclable and has a salvage value. Metallic debris will be treated, if necessary, and then transported to a scrap metal facility for sorting and volume reduction. From there, the metal will be shipped for remelting and reclaimed.

3.3.2 Contaminated Interior Surfaces

Treatment technologies retained for contaminated interior surfaces are discussed in this section. Institutional measures for contaminated interior surfaces consist of deed restrictions and fencing similar to those presented for contaminated debris. The extent to which interior surfaces will be treated is driven by two cleanup objectives: (1) cleanup to allow the building demolition debris to be disposed of on-site or in a C&D landfill and ensure community safety by achieving a "clean" building interior (fully clean objective), and (2) cleanup to allow the building demolition debris to be disposed of on-site or in an industrial landfill and ensure the safety of a general demolition contractor by removing environmentally related hazardous conditions (partially clean objective). These objectives are presented in Figure 3-2.

As with debris, numerical ranges were established for defining the interior surface cleanup objectives. An interior surface that is treated to the fully clean objective exhibits a TCLP concentration below the TC limitation in a confirmatory sample. A treated interior surface that is partially clean exhibits a TCLP concentration above the TC limitation in a confirmatory sample. It is assumed that contaminated interior surfaces coated with lead-based paint do not require remediation to remove the paint in order to satisfy the partially clean objective. On the other hand, any visible dust present on the interior surface will need to be removed to meet the partially clean objective.

Generally, an industrial landfill will accept contaminated building demolition debris but will not accept demolition debris that contains hazardous dust (i.e., dust that is characteristically hazardous for disposal) unless it is removed. A C&D landfill will only accept building demolition debris if it is uncontaminated or treated to the fully clean objective. If the on-site landfilling of building demolition debris option is pursued, interior surfaces must be treated, at a minimum, to the partially clean objective.

Conversations with local demolition contractors have indicated that they will generally not start an industrial building demolition project unless all hazardous environmental conditions (e.g., hazardous waste and hazardous waste residues) associated with the site are remediated. If the building is demolished without being treated, the demolition must be performed by a specialty demolition contractor whose crew is trained in handling hazardous wastes. Furthermore, the demolition debris may not be accepted at an industrial landfill and may need to be transported to a TSDF. The cost and project duration for demolishing the building will be substantially

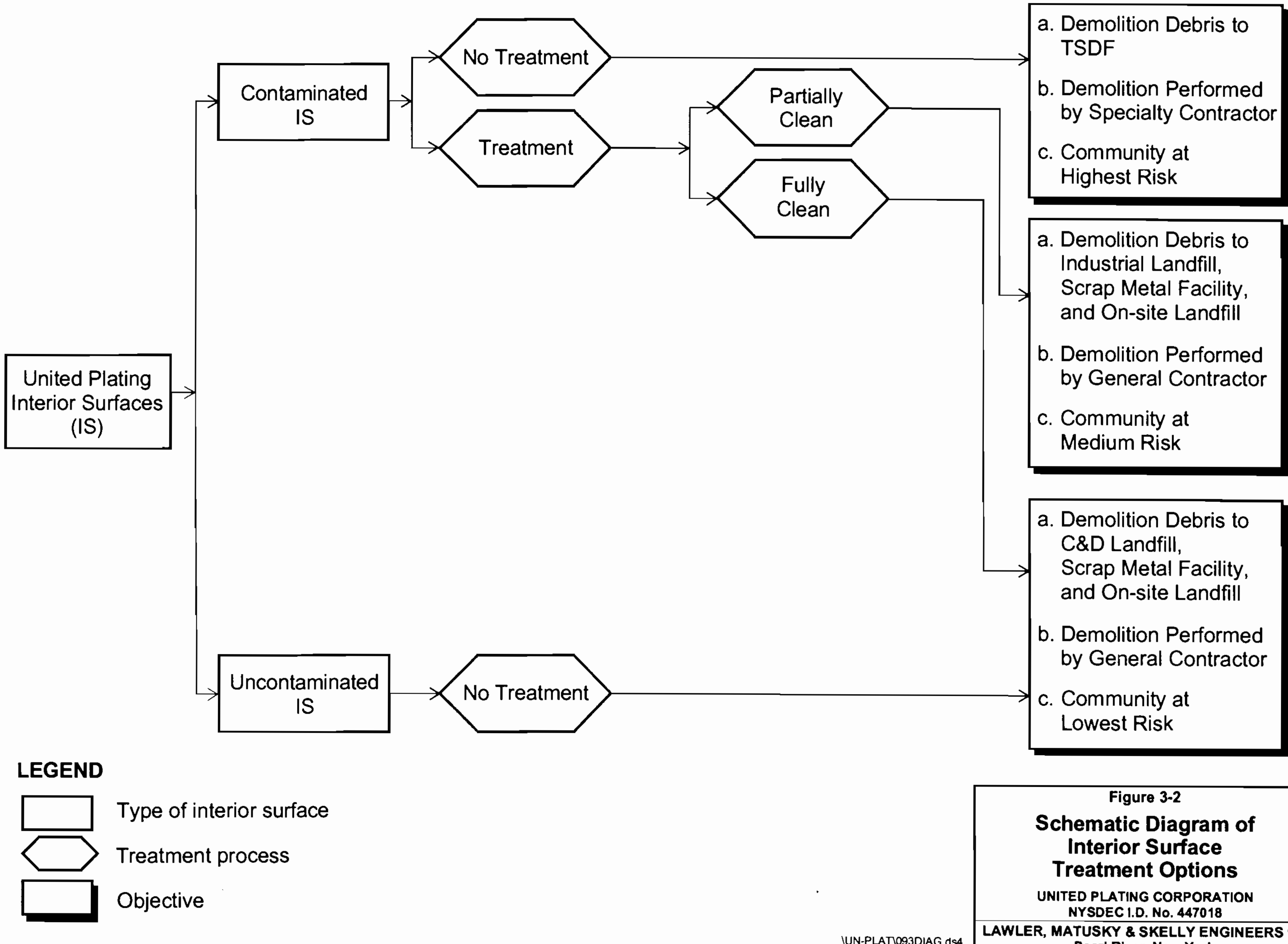

Figure 3-2

Schematic Diagram of Interior Surface Treatment Options

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higher if the interior surfaces are not treated, at a minimum, to the partially clean definition. In this FFS report, it is assumed that the building interior surfaces must be treated, at a minimum, to the partially clean objective in order for a general contractor to perform the demolition project. In addition, a substantial cost savings will be realized if interior surfaces are treated in place prior to demolition as compared to treating the waste after demolition.

The four types of interior surfaces at the UP site (floors, walls, ceilings, and interior surfaces) are categorized in Chapter 2 by their exhibited level of contamination (e.g., uncontaminated, contaminated, and hazardous). Based on the analysis, none of the interior surfaces were considered to be hazardous but several areas were considered to be contaminated. Treatment of contaminated interior surfaces can proceed in one of two ways: (1) surfaces can be aggressively treated to achieve the fully clean objective, or (2) surfaces can be treated using a less aggressive technology to satisfy the partially clean objective. An example of the second case is a technology that removes hazardous dust but not lead-based paint from a surface.

The retained technologies in Table 3-1 for treating interior surfaces at the UP site include the following: vacuum blasting, scarification, spalling, HEPA sanding, high-pressure steam cleaning, HEPA vacuuming and wet wiping, water washing and spraying, liquid-phase solvent extraction, vapor-phase solvent extraction, encapsulation, sealing, and stabilization. Some treatment options are capable of treating only a specific type of surface. In selecting a treatment option for the UP interior surfaces, a treatment option capable of treating several types of interior surfaces was favored over one that is only intended to treat one specific type of surface. For example, the scarification and spalling technologies are limited to removing contaminants only from concrete cast floors, and thus were not given further consideration for use at the UP site. Other treatment options that were not retained included chemical extraction technologies, such as water washing and spraying, liquid-phase solvent extraction, and vapor-phase solvent extraction; as these technologies usually generate hazardous wastes and may create unsafe working conditions that are unnecessary. Encapsulation is generally not an appropriate technology for building demolition wastestreams because of its low-capacity throughput; however, it was retained for demolition debris that is transported to a TSDF. Sealing of the interior surfaces would not be an effective technology if the building is to be torn down as the encapsulating material would likely chip or strip off and be ineffective.

The remaining technologies were retained for further consideration and selected based on the appropriate cleanup objective. For contaminated interior surfaces, only treatment technologies capable of removing paint as well as dust were considered in achieving the fully clean objective. Vacuum blasting and HEPA sanding were the only two retained options capable of achieving this and were therefore selected as the appropriate technologies for treating contaminated interior surfaces to the fully clean objective. For contaminated interior surfaces that will be treated to the partially clean objective, two simpler, more cost-effective technologies will also be considered: high-pressure steam cleaning and HEPA vacuuming and wet wiping. In addition, stabilization was retained as an appropriate technology for use if the UP building is demolished. The concrete and brick rubble from the building demolition can be stabilized with a chemical reagent (e.g., concrete slurry), possibly mixed with site soils, and landfilled on-site.

CHAPTER 4

DEVELOPMENT OF PRELIMINARY ALTERNATIVES

4.1 INTRODUCTION

Remedial alternatives were developed to achieve the remedial action objectives for the site. The NCP includes requirements for development of remedial alternatives to ensure that the alternatives selected provide decision makers with an appropriate range of options as well as sufficient information to compare the alternatives. The range of options is dependent on site-specific conditions; however, to the extent possible, one or more alternatives in each of the following categories should be developed:

1. A range of source-control alternatives that includes treatment to reduce the toxicity, mobility, or volume of contaminants present, including:

    a. An alternative that removes or destroys contaminants to the maximum extent possible and minimizes the need for long-term management of remaining wastes or waste treatment residuals.

    b. One or more alternatives that vary in the degree of treatment and long-term management required.

    c. An alternative that involves little or no treatment but protects human health and the environment through containment or institutional controls to prevent exposure to hazardous materials.

2. One or more innovative treatment technologies, if any such technologies appear promising (i.e., comparable or superior performance for lower cost).

3. The no or minimal action alternative.

The development and selection of a final range of remedial alternatives that address these NCP requirements are presented in this chapter.

Five alternatives were developed that describe possible scenarios at the site: no action, institutional measures and containment, full on-site cleanup, partial on-site cleanup, and minimal on-site cleanup. Each alternative is divided into four parts, which describe the principal phases of remediation and include site work, remediation of hazardous debris, remediation of contaminated debris, and remediation of interior surfaces. The alternatives that were developed do not include all potential combinations of the retained treatment and disposal options, but are intended to allow for evaluation of each of the potential remedial elements. These elements may be combined in the final remediation alternative selected for the site.

4.2 ALTERNATIVE 1: NO ACTION

The no action alternative does not include any institutional or containment controls or active remedial measures to clean on-site debris and interior surfaces. This alternative assumes that the status quo is maintained for the building interior; no costs are incurred as a result of implementation. Alternative 1 provides a baseline for comparison with the other selected alternatives.

4.2.1 Site Work

No site work will be performed under this alternative. The building will remain standing and will not be demolished. There will be no materials requiring disposal. No regular maintenance or repairs will be made to any part of the site.

4.2.2 Remediation of Hazardous Debris

Hazardous debris that is present will be left untreated and remain on-site.

4.2.3 Remediation of Contaminated Debris

Contaminated debris that is present will be left untreated and remain on-site.

4.2.4 Remediation of Interior Surfaces

Interior surfaces will be left in their present condition and will not be treated.

4.3 ALTERNATIVE 2: INSTITUTIONAL MEASURES AND CONTAINMENT

Alternative 2 does not include any removal or treatment of debris or interior surfaces, but does include institutional measures and containment controls to minimize human contact with the contaminated surfaces at the site. Institutional measures and containment controls include deed restrictions, fencing, boarding, roof repair, and full-time security. Deed restrictions can limit the future uses of the building and property in the event the property is transferred to other ownership. Deed restrictions are intended to notify prospective owners of the existence of remaining contamination and the limitation such contamination has on site uses prior to property transfer. Fencing, boarding, and a full-time security guard will limit unauthorized access and potential contact of trespassers with remaining contamination, and roof repair will reduce the amount of stormwater penetrating into the building.

4.3.1 Site Work

Site work will focus on isolating the site from trespassers and reducing the amount of stormwater and wind that penetrates into the building and carries contaminants into the surrounding environment. By repairing the openings in the walls and roof of the building, contaminants will not migrate into the environment as readily (via stormwater and air pathways). Plywood, corrugated steel, and polyethylene sheeting can be used to construct temporary barriers and reduce the amount of stormwater and wind that currently penetrate the building. These barriers will require periodic inspection and maintenance.

A barbed-wire fence already exists along the perimeter of the property, but tighter security, such as a full-time security guard, will be needed to deter trespassers. The existing fence will also require periodic inspection and maintenance.

4.3.2 Remediation of Hazardous Debris

The hazardous debris that is present will be left untreated and remain on-site.

4.3.3 Remediation of Contaminated Debris

The contaminated debris that is present will be left untreated and remain on-site.

4.3.4 Remediation of Interior Surfaces

Interior surfaces will be left in their present condition and will not be treated.

4.4 ALTERNATIVE 3: FULL ON-SITE CLEANUP

Alternative 3 presents the use of remedial technologies that would achieve a full on-site cleanup accomplishing the following goals:

1. Clean all debris to the fully clean objective and dispose of the treated waste using the most economically feasible disposal option. It is assumed under this alternative that all debris present inside the building will be removed. Only treatment options capable of removing paint as well as dust were considered in

this alternative. Hazardous and contaminated debris will be cleaned to the fully clean objective to satisfy the requirements of landfills and scrap metal facilities accepting the debris.

2. Thoroughly clean the building interior to remove all hazardous waste residues, including dust or paint containing hazardous levels of cadmium, chromium, or lead. This will enable the building demolition, if conducted, to be performed by a general demolition contractor rather than a specialty contractor. If the building is demolished, the demolition debris can either be disposed of in a C&D landfill or an on-site landfill. Treatment of interior surfaces shall satisfy the fully clean objective.

3. Provide the highest level of protection for human health and the environment by removing all debris and thoroughly cleaning the building interior surfaces.

Perhaps one of the most difficult tasks at the UP site will be carrying the heavy pieces of debris from the upper floors of the building to ground level. While the building was occupied, heavy equipment and materials were probably carried to the upper floors via elevator and then moved from room to room with a manual forklift or dolly. Currently, the facility is not provided with electrical power and it is unclear whether the existing elevator is operable. Even if the elevator were functioning properly, a safety inspection would need to be conducted to determine whether the elevator's supports could withstand heavy loads. The structural assessment conducted by MJ Engineering did not address the elevator or its supports specifically, but did suggest that several areas of the building are in danger of collapsing (MJ Engineering 1996). In addition, the floors in some rooms may not be capable of supporting heavy materials-handling equipment, such as a backhoe. The use of lighter, more compact equipment, such as a forklift or skid steer loader (e.g., Bobcat), may be more appropriate for moving debris from room to room. Debris from the upper floors can be carried to ground level through the use of enclosed chutes, a crane, or other equipment. Heavier, more cumbersome debris may be dismantled into lighter components to facilitate transport and handling. The most efficient and economical method of removing and treating the on-site debris should be evaluated and defined in the final remediation plan.

Debris will be brought to a common area of the property for treatment, if necessary, and staging. A staging area will be established where debris will be loaded into suitable containers, such as a lined roll-off container. Containers should be loaded in a manner such that the void space volume in the container is minimized. Volume reduction equipment, such as a shredder or compactor, should be considered for use at the site in the final remediation plan. The loaded containers will then be prepared for shipment if the wastes are to be disposed of off-site.

If sampling of the debris wastestreams is required by a disposal facility or other party, for cost estimating purposes it is assumed that one confirmatory sample will be collected for every 20 yd^3 of debris. If sampling of the building interior is required prior to demolition, it is assumed that one confirmatory sample will be collected for every 10,000 ft^2 of interior surface treated. The samples will be collected and analyzed for TCLP cadmium, chromium, and lead. Similarly, if dust, rinse waters, spent cleaning materials, or other wastes are generated as a result of treatment, it is assumed that the wastestreams will be characterized for disposal by sampling for TCLP cadmium, chromium, and lead. For solid wastestreams, it is assumed that one sample will be collected for every 20 yd^3 of waste shipped for disposal; for liquid wastes it is assumed that one sample will be collected for every 5000 gal of rinse water shipped for disposal.

Remediation at the UP site will need to be carried out in steps as the start time of several tasks is dependent on the completion of other tasks. The following sections describe the type of technologies that will be used to achieve the cleanup objective of this alternative. The phases of remediation are divided into five parts for discussion purposes: site work, remediation of hazardous debris, remediation of contaminated debris, remediation of uncontaminated debris, and remediation of interior surfaces.

4.4.1 Site Work

The fate of the UP building is still uncertain and the decision as to whether to abandon or demolish it remains to be determined. End disposal facilities for each debris type were selected and are independent of the building demolition in all cases except for concrete and brick debris. If the building is not demolished, the concrete and brick debris will be transported and disposed of off-site. If the building is demolished, concrete and brick debris may still be disposed of off-site but may also be mixed with concrete and brick debris from the building demolition (if demolition is pursued) and disposed of on-site. Disposal options for all debris types are discussed in detail below.

4.4.1.1 ***No Demolition***. Under this option, remediation of the building interior will focus around keeping the UP building standing. The debris will be treated as necessary to satisfy the fully clean objective. All debris will be disposed of off-site. Interior surfaces will be treated to satisfy the full on-site cleanup alternative by cleaning the surfaces to the fully clean objective.

4.4.1.2 ***Demolition With Off-site Disposal***. The UP building will be demolished under this option and all debris present inside the building and generated during demolition will be transported and disposed of off-site. The debris will be treated to the fully clean objective in order to satisfy the requirements of this alternative.

Interior surfaces will be treated to the fully clean objective. The building will then be demolished and the demolition debris will be sorted by type and disposed of off-site.

4.4.1.3 ***Demolition With On-site Disposal.*** Again, the UP building will be demolished under this option but a portion of the debris stream, namely the concrete and brick stream, will be disposed of on-site following demolition. The concrete and brick debris and interior surfaces will be treated to the fully clean objective so that the material that is landfilled does not contain high levels of contaminants. Under this option, material that is landfilled on-site is assumed to be clean and will not require further treatment (i.e., stabilization) before landfilling. The remaining debris will be treated as necessary to satisfy the requirements of off-site disposal facilities.

4.4.2 Remediation of Hazardous Debris

Approximately 644 tons of debris categorized as hazardous exist at the UP site, of which 618 tons are metal, 10 tons are wood, 12 tons are plastic, and 4 tons are other types of debris (e.g., Styrofoam). There is no hazardous concrete and brick debris. To achieve the goals of the full on-site cleanup alternative, hazardous debris must be cleaned to the fully clean objective. Prior to land disposal, hazardous debris must be treated using an EPA-approved treatment technology or a technology that will achieve the established waste-specific treatment standards for cadmium, chromium, and lead listed in Chapter 2. At the UP site, debris treated to these treatment standards is considered to be only partially clean. To be considered fully clean, debris must be treated to the UTS values for cadmium, chromium, and lead, which are also listed in Chapter 2. This is achieved by treating to the fully clean objective.

Off-site disposal facilities that will accept the treated debris include TSDFs, industrial landfills, C&D landfills, and scrap metal facilities. Disposal of treated debris at a TSDF is not economical and unnecessary. Additionally, disposal of the treated debris at a local C&D landfill may be more economical than disposal at a distant industrial landfill. One option for metallic debris is to transport it to a scrap metal facility (but only if the metal presents some salvage value to a scrap metal dealer). Metal taken to a scrap metal facility is sorted, brought to a metal reclamation facility, and remelted in an industrial furnace. An alternative option for concrete and brick debris treated to the standards established by this alternative is on-site disposal. Concrete and brick debris may be used as backfill when leveling the property following demolition. Other options that apply to all types of debris include disposal in an industrial landfill or C&D landfill.

4.4.2.1 ***No Treatment***. Hazardous debris can be removed from the UP site as is and transported to a TSDF. However, disposal without treatment would not be consistent with the goals of the full on-site cleanup defined by this alternative. Disposal at a TSDF is not given further consideration under Alternative 3.

4.4.2.2 ***Partial Treatment***. Treatment to the partially clean objective would not satisfy the objectives of Alternative 3. Hazardous debris must be treated to the fully clean objective by using technologies capable of removing paint as well as dust. Partial treatment will not achieve this level of removal and therefore is not given further consideration.

4.4.2.3 ***Full Treatment***. Full treatment of hazardous debris is the only option that will satisfy the objectives of Alternative 3 so that the debris can be disposed of in an on-site or off-site landfill or transported to a scrap metal facility. HEPA sanding was retained as the appropriate treatment technology for cleaning hazardous debris to the fully clean objective because of its ability to remove hazardous paint as well as hazardous dust. Wastes that will be generated as a result of HEPA sanding will include dust, paint, and used vacuum filter bags. Treated debris may be disposed of in a C&D landfill, a scrap metal facility, or an on-site landfill, depending on the type of material. Treated metallic debris may be taken to a scrap metal facility. Clean concrete and brick debris may be landfilled on-site as well as off-site. Off-site landfilling in a C&D landfill is an option for all types of debris treated to meet the objectives of Alternative 3.

4.4.3 Remediation of Contaminated Debris

Approximately 1924 tons of debris categorized as contaminated debris exist at the UP site, of which 1856 tons are metal, 3 tons are concrete and brick, 18 tons are wood, 13 tons are plastic, and 34 tons are other types of debris. To achieve the goals of the full on-site cleanup alternative, contaminated debris must be treated to the fully clean objective and removed from the building. Disposal options for the treated debris are similar to those presented for treated hazardous debris in the previous section.

4.4.3.1 ***No Treatment***. Contaminated debris can be removed from the UP site as is and transported to a TSDF; however, this would not be consistent with the goals of the full on-site cleanup defined by this alternative. Disposal of contaminated debris at a TSDF is not given further consideration under Alternative 3.

4.4.3.2 ***Partial Treatment***. Treatment to the partially clean objective would not satisfy the objectives of Alternative 3. Contaminated debris must be treated to the fully clean objective by using technologies capable of removing paint as well as dust. Partial treatment will not achieve this level of removal and therefore is not given further consideration.

4.4.3.3 ***Full Treatment***. Full treatment of contaminated debris is the only option that will satisfy the objectives of Alternative 3 so that the treated debris can be disposed of in an on-site or off-site landfill or transported to a scrap metal facility. Retained technologies that are assumed to be capable of treating contaminated debris to the fully clean objective are HEPA sanding, high-pressure steam cleaning, and water washing. The cost-effectiveness of these three options will be evaluated in Chapter 5. Wastes that will be generated using these technologies may include dust, paint, rinse water, or used vacuum filter bags. Debris treated by any of these technologies may be disposed of in a C&D landfill, a scrap metal facility, or an on-site landfill, depending on the debris type. Clean metallic debris may be taken to a scrap metal facility. Clean concrete and brick debris may be landfilled on-site as well as off-site. Off-site landfilling in a C&D landfill is an option for all types of debris treated to meet the objectives of Alternative 3.

4.4.4 Remediation of Uncontaminated Debris

Approximately 1008 tons of debris categorized as uncontaminated debris exist at the UP site, of which 919 tons are metal, 20 tons are concrete and brick, 34 tons are wood, 3 tons are plastic, and 32 tons are other debris. In this FFS, uncontaminated debris is assumed not to require any treatment to be approved for disposal in a C&D landfill. Uncontaminated concrete and brick debris may also be disposed of on-site without treatment.

4.4.5 Remediation of Contaminated Interior Surfaces

Based on calculations summarized in Chapter 3, it was estimated that 221,414 ft^2 of interior surfaces exist inside the UP building, of which 132,048 ft^2 is contaminated and the rest is uncontaminated. Contaminated interior surfaces include 49,643 ft^2 of floors, 56,227 ft^2 of walls, 17,463 ft^2 of ceilings, and 8715 ft^2 of structural supports. In order to achieve the goals of the full on-site cleanup alternative, contaminated interior surfaces must be treated to the fully clean objective and not to any lesser degree. The building interior must be thoroughly cleaned to remove all hazardous dust and paint. Treating the interior surfaces to the fully clean objective is assumed to provide the highest level of protection for human health and the environment in the surrounding community.

The hazardous sediment present inside the belowgrade pipes and sumps of the first floor will be excavated and removed. Approximately 25 yd^3 of sediment is estimated to require excavation and disposal.

4.4.5.1 ***No Treatment***. Contaminated interior surfaces must be treated under this alternative; therefore, no treatment is not an acceptable option.

4.4.5.2 ***Partial Treatment***. Partial treatment of interior surfaces will not achieve the cleanup objective of this alternative. Hazardous paint as well as hazardous dust must be treated to the fully clean treatment objective and partial treatment will not accomplish this.

4.4.5.3 ***Full Treatment***. Full treatment is the only acceptable option that will achieve the objectives of this alternative. Retained technologies that are assumed to be capable of treating interior surfaces to the fully clean objective include vacuum blasting and HEPA sanding. These two technologies were the only two retained options that could remove hazardous paint as well as hazardous dust. Two other technologies, high-pressure steam cleaning and the HEPA vacuuming and wet wiping process, are available that will remove hazardous dust from an interior surface (to the fully clean objective) but not hazardous paint.

For the purposes of developing cost estimates for treating interior surfaces, two treatment procedures were proposed: a simple procedure that involves using one treatment technology for treating all of the interior surfaces and a more complex procedure that involves using multiple technologies. The latter procedure will utilize specific technologies that are intended to treat a particular type of interior surface.

Single Technology. Use of one technology to treat all of the interior surfaces may be less complicated and simpler to implement at the site. HEPA sanding was selected as the most appropriate technology for this option because of its versatility and ability to treat irregularly shaped surfaces. Vacuum blasting is not appropriate for use on structural supports and was therefore not selected. Interior surfaces must be HEPA sanded until the fully clean objective is satisfied. Wastes that will be generated as a result of HEPA sanding include dust, paint, and used vacuum filter bags.

Multiple Technologies. Remediation of interior surfaces may proceed more efficiently by implementing technologies that were designed to treat a specific type of surface. For instance, vacuum blasting is a practical technology for removing paint and dust from concrete and brick surfaces, such as wall and ceiling surfaces. Vacuum blasting removes paint from a concrete or brick surface more efficiently than HEPA sanding and is therefore selected for use on wall and ceiling surfaces. HEPA sanding was selected for treatment of structural supports as this technology is the most practical technology for removing paint and dust from irregularly shaped surfaces (e.g., surface of an I-beam). For floor surfaces, the HEPA vacuuming and wet wiping process was selected as the appropriate technology as floors are covered with only dust, which is easily removed from a floor surface. The HEPA vacuuming and wet wiping process also generates less waste than other technologies, especially high-pressure steam cleaning. If the multiple technologies option is selected, interior surfaces must be treated to the fully clean objective. Wastes that will be generated as a result of this treatment option include dust, paint, spent blasting media, used vacuum filter bags, and rinse water.

4.4.6 Remediation of Uncontaminated Interior Surfaces

Estimates show that 89,366 ft^2 of interior surfaces at the UP site are categorized as uncontaminated. Uncontaminated interior surfaces are assumed not to require any treatment to satisfy the full on-site cleanup alternative.

4.5 ALTERNATIVE 4: PARTIAL ON-SITE CLEANUP

Alternative 4 presents the use of remedial technologies that would achieve a partial on-site cleanup accomplishing the following goals:

1. Use more efficient technologies to clean all debris to the partially clean objective. In this alternative, debris cannot be disposed of in a C&D landfill because treatment will not satisfy the requirements for land disposal. It is assumed under this alternative that all debris present inside the building will be removed. Hazardous and contaminated debris will be cleaned to the partially clean objective to satisfy the requirements of landfills and scrap metal facilities accepting the debris.

2. Clean the building interior to a lesser degree than Alternative 3 in order to achieve the partially clean objective. This will enable the building demolition to be performed by a general demolition contractor rather than a specialty contractor (if the building is demolished). The building demolition debris can either be disposed of in an industrial landfill or stabilized and disposed of on-site.

3. Provide a moderate level of protection for human health and the environment in the surrounding community by removing all debris and partially cleaning the building interior surfaces.

The options available for debris handling and testing in Alternative 4 are similar to those of Alternative 3. Remediation will need to be carried out in steps as the start time of several tasks is dependent on the completion of other tasks. In this section, the four remediation phases are further divided by the type of technology that will be used to achieve the cleanup objective. These categories are similar to those presented for Alternative 3.

4.5.1 Site Work

As in Alternative 3, concrete and brick debris will be disposed of either on-site or off-site, depending on whether the UP building is demolished. If the building is not demolished, the concrete and brick debris will be transported and disposed of off-site. If the building is demolished, concrete and brick debris may still be disposed of off-site but may also be mixed with concrete and brick debris from the building demolition and disposed of on-site. Available disposal options for all debris types are discussed in detail below.

4.5.1.1 ***No Demolition***. Under this option, remediation of the building interior will focus around keeping the UP building standing. The debris will be treated as necessary to satisfy the requirements of off-site disposal facilities. All debris will be disposed of off-site. Interior surfaces will be treated to satisfy the objectives of this alternative by cleaning the surfaces to the partially clean objective.

4.5.1.2 ***Demolition With Off-Site Disposal***. The UP building will be demolished under this option and all debris present inside the building and debris generated during the building demolition will be transported and disposed of off-site. The debris will be treated to the partially clean objective to satisfy the requirements of off-site disposal facilities. Interior surfaces will also be treated to the partially clean objective. The building will then be demolished and the demolition debris will be sorted by type and disposed of off-site to the same facilities designated for debris of the same material (i.e., debris present inside the building).

4.5.1.3 ***Demolition With On-Site Disposal***. Again, the UP building will be demolished under this option but a portion of the debris stream, namely the concrete and brick, will be disposed of on-site following demolition. The concrete and brick debris and interior surfaces will be treated to the partially clean objective so that the material that is landfilled does not contain high levels of contaminants. Debris that is landfilled on-site will require stabilization with a chemical reagent to immobilize any remaining contaminants and reduce the potential for subsurface contamination. The remaining debris will be treated as necessary to satisfy the requirements of off-site disposal facilities.

4.5.2 Remediation of Hazardous Debris

To achieve the goals of the partial on-site cleanup alternative, hazardous debris will be treated to the partially clean objective in order to be removed from the site or disposed of on-site. Prior to land disposal, hazardous debris must be treated using an EPA-approved treatment technology or a technology that will achieve the established waste-specific treatment standards for cadmium, chromium, and lead. This is achieved by treating the debris to the partially clean objective.

4.5.2.1 ***No Treatment.*** Hazardous debris can be removed from the UP site as is and transported to a TSDF. However, removal without treatment would not be consistent with the goals of the partial on-site cleanup defined by this alternative. Disposal at a TSDF is not given further consideration under Alternative 4.

4.5.2.2 ***Partial Treatment.*** Hazardous debris needs to be treated at a minimum to the partially clean objective if the treated debris is to be disposed of in an industrial landfill, a scrap metal facility, or an on-site landfill. HEPA sanding was retained as the appropriate treatment technology for cleaning hazardous debris to the partially clean objective because of its ability to remove hazardous paint as well as hazardous dust. HEPA sanding to achieve the partially clean objective will require less effort than HEPA sanding to satisfy the fully clean objective. Wastes that will be generated as a result of HEPA sanding include dust, paint, and used vacuum filter bags. Treated debris may be disposed of at an industrial landfill, a scrap metal facility, or an on-site landfill, depending on the debris type. Partially clean concrete and brick debris that is landfilled on-site will require stabilization treatment.

4.5.2.3 ***Full Treatment.*** Treatment of hazardous debris to the fully clean objective is unnecessary as it will surpass the expectations of the partially clean objective and will be too costly. Full treatment is not given further consideration in satisfying the requirements of Alternative 4.

4.5.3 Remediation of Contaminated Debris

To achieve the goals of the partial on-site cleanup alternative, contaminated debris either needs to be removed from the site or disposed of on-site by treating to the partially clean objective. Disposal options for the treated debris are similar to those presented for treated hazardous debris in the previous section.

4.5.3.1 ***No Treatment***. As with hazardous debris, contaminated debris can be removed from the UP site as is and transported to a TSDF. However, removal without treatment would not be consistent with the goals of the partial on-site cleanup defined by this alternative. Disposal to a TSDF is not given further consideration under Alternative 4.

4.5.3.2 ***Partial Treatment***. Contaminated debris treated to the partially clean objective may be disposed of in an industrial landfill, a scrap metal facility, or an on-site landfill. Of the retained technologies, HEPA sanding, high-pressure steam cleaning, HEPA vacuuming and wet wiping, and water washing are appropriate technologies for achieving the partial treatment objective. The HEPA vacuuming and wet wiping process is the most economical option because it is more efficient than both HEPA sanding and water washing and will generate considerably less waste than high-pressure steam cleaning.

In performing the HEPA vacuuming and wet wiping process, a debris surface will be aggressively cleaned using an industrial vacuum equipped with brush accessories that loosen dirt. The surface will then be wiped with a reusable damp cloth or scouring pad to remove any lodged residue. Wastes that will be generated during these treatment steps include spent cloths, scouring pads, wastewater, dust, and used vacuum filter bags. The HEPA vacuuming and wet wiping technology was selected as the appropriate technology for contaminated debris treated to the partially clean objective.

4.5.3.3 ***Full Treatment***. As with hazardous debris, treatment to the fully clean objective is unnecessary to fulfill the goals of Alternative 4. Full treatment was not given further consideration for contaminated debris.

4.5.4 Remediation of Uncontaminated Debris

Uncontaminated debris is assumed not to require any treatment to be approved for disposal by a C&D landfill or to be disposed of on-site.

4.5.5 Remediation of Contaminated Interior Surfaces

In order to achieve the goals of the partial on-site cleanup alternative, contaminated interior surfaces must be treated at a minimum to the partially clean objective. The building interior must be remediated to remove all visible dust from interior surfaces. In addition, the hazardous sediment inside belowgrade pipes and sumps of the first floor will be excavated and removed. Approximately 25 yd^3 of sediment is estimated to require excavation and disposal (see Chapter 2).

4.5.5.1 ***No Treatment***. Contaminated interior surfaces must be treated under this alternative; therefore, no treatment is not an acceptable option to satisfy the partial on-site cleanup alternative.

4.5.5.2 ***Partial Treatment***. The partial on-site cleanup alternative can be achieved with partial treatment of interior surfaces by removing the hazardous dust from interior surfaces. Retained technologies that are assumed to be capable of removing dust to satisfy the partially clean objective include vacuum blasting, HEPA sanding, high-pressure steam cleaning, and HEPA vacuuming and wet wiping. For the purposes of developing cost estimates for treating interior surfaces, two treatment procedures were proposed: a simple procedure that involves using one treatment technology for treating all of the interior surfaces and a more complex procedure that involves using multiple technologies. The latter procedure utilizes multiple technologies that will treat interior surfaces more efficiently.

Single Technology. Use of one technology to treat all interior surfaces may be less complicated and simpler to implement at the site. The HEPA vacuuming and wet wiping option was selected as the most appropriate technology for this option as it can be performed more efficiently and economically relative to the other technologies. HEPA vacuuming and wet wiping will generate considerably less waste than vacuum blasting and high-pressure steam cleaning. Vacuum blasting is not an appropriate technology for use on structural supports.

If the single technology option is selected, interior surfaces must be HEPA vacuumed and wet wiped until the partially clean objective is satisfied. Wastes that will be generated by implementing this option include dust, rinse water, and used vacuum filter bags, cloths, and scouring pads.

Multiple Technologies. Remediation of interior surfaces may be performed in less time if multiple technologies are utilized. In this option, heavily soiled interior surfaces will be pretreated using HEPA vacuuming and wet wiping. All surfaces will then be treated using high-pressure steam cleaning to remove the dust that remains. High-pressure steam cleaning is a more efficient treatment technology than the HEPA vacuuming and wet wiping process, but it generates a considerable amount of waste. If the multiple technologies option is selected, wastes that will be generated include dust, rinse water, and used vacuum filter bags, cloths, and scouring pads.

4.5.5.3 ***Full Treatment***. Full treatment of interior surfaces will achieve the cleanup objective of this alternative but is beyond what is necessary to satisfy this objective. Therefore, this option is not given further consideration.

4.5.6 Remediation of Uncontaminated Interior Surfaces

As in Alternative 3, uncontaminated interior surfaces are assumed not to require any treatment to satisfy the partial on-site cleanup alternative.

4.6 ALTERNATIVE 5: MINIMAL ON-SITE CLEANUP

Alternative 5 is similar to Alternative 4, with the exception that hazardous and contaminated debris will not be treated on-site but will be transported directly to a TSDF for encapsulation treatment and disposal. The building will be partially treated but will not be demolished under Alternative 5. Minimal on-site cleanup will accomplish the following goals:

1. Collect all hazardous and contaminated debris for direct disposal to a TSDF. Uncontaminated debris will be disposed of in a C&D landfill. This alternative will limit the amount of handling and treatment required to dispose of the on-site debris as quickly and effortlessly as possible.

2. Clean the building interior to same degree as Alternative 4 in order to achieve the partially clean objective.

3. Provide a moderate level of protection for human health and the environment in the surrounding community by removing all debris and partially cleaning the building interior surfaces.

The options available for debris handling and testing under Alternative 5 are similar to those presented in Alternatives 3 and 4. Remediation will need to be carried out in steps as the start time of several tasks is dependent on the completion of other tasks. In this section, the four remediation phases are further divided by the type of technology that will be used to achieve the cleanup objective.

4.6.1 Site Work

The UP building will not be demolished under Alternative 5. All debris present inside the building will be transported off-site for disposal and recycling. Interior surfaces will be cleaned to satisfy the partially clean objective.

4.6.2 Remediation of Hazardous Debris

Hazardous debris will not be remediated on-site under this alternative. It will be collected and transported off-site to a TSDF for encapsulation treatment. The treated debris will then be disposed of in a landfill located within the same facility.

4.6.3 **Remediation of Contaminated Debris**

As with hazardous debris, contaminated debris will not be treated on-site. Contaminated debris will be collected and transported off-site to a TSDF for encapsulation treatment and land disposal.

4.6.4 **Remediation of Uncontaminated Debris**

Uncontaminated debris is assumed not to require any treatment prior to off-site land disposal and will be disposed of in a C&D landfill.

4.6.5 **Remediation of Contaminated Interior Surfaces**

In Alterative 5, contaminated surfaces will be treated in the same manner as for Alternative 4 by treating to the partially clean objective. The building interior must be remediated to remove all visible dust from interior surfaces. In addition, the hazardous sediment inside belowgrade pipes and sumps of the first floor will be excavated and removed. Approximately 25 yd^3 of sediment is estimated to require excavation and disposal.

4.6.5.1 ***No Treatment***. Contaminated interior surfaces must be treated under this alternative; no treatment is not an acceptable option to satisfy the minimal on-site cleanup alternative.

4.6.5.2 ***Partial Treatment***. The goals of Alternative 5 can be achieved with partial treatment of interior surfaces by removing the hazardous dust from interior surfaces. Retained technologies that are assumed to be capable of removing dust to satisfy the partially clean objective include vacuum blasting, HEPA sanding, high-pressure steam cleaning, and HEPA vacuuming and wet wiping. As in Alternative 4, two treatment procedures were proposed for treating contaminated interior surfaces: a simple procedure that involves using one treatment technology for treating all of the interior surfaces and a more complex procedure that involves using multiple technologies. The latter procedure utilizes multiple technologies that will treat interior surfaces more efficiently.

Single Technology. As with Alternative 4, the HEPA vacuuming and wet wiping option was selected as the most appropriate technology for this option as it can be performed more efficiently and economically relative to the other technologies. HEPA vacuuming and wet wiping will generate considerably less waste than vacuum blasting and high-pressure steam cleaning. Vacuum blasting is not an appropriate technology for use on structural supports.

If the single technology option is selected, interior surfaces must be HEPA vacuumed and wet wiped until the partially clean objective is satisfied. Wastes that will be generated by implementing this option include dust, rinse water, and used vacuum filter bags, cloths, and scouring pads.

Multiple Technologies. Remediation of interior surfaces may be performed in less time if multiple technologies are utilized. In this option, heavily soiled interior surfaces will be pretreated using HEPA vacuuming and wet wiping. All surfaces will then be treated using high-pressure steam cleaning to remove the dust that remains. High-pressure steam cleaning is a more efficient treatment technology than the HEPA vacuuming and wet wiping process, but it generates a considerable amount of waste. If this option is selected, wastes that will be generated include dust, rinse water, and used vacuum filter bags, cloths, and scouring pads.

4.5.5.3 ***Full Treatment.*** Full treatment of interior surfaces will achieve the cleanup goal of this alternative but is beyond what is necessary to satisfy this objective. Therefore, this option is not given further consideration in Alternative 5.

4.5.6 Remediation of Uncontaminated Interior Surfaces

Uncontaminated interior surfaces are assumed not to require any treatment to satisfy the minimal on-site cleanup alternative.

4.7 SUMMARY OF REMEDIAL ALTERNATIVES

The five main remedial alternatives developed for the site are summarized in Table 4-1. These remedial alternatives are intended to evaluate the effects of building demolition, disposal facility selection, and treatment process selection. The alternatives selected do not include all potential combinations of the options at hand, but are intended to allow for evaluation of each of the potential remedial elements. These elements may be recombined in the final remedial alternative selected for the site.

Alternative 1 is the no action alternative. This alternative assumes that the status quo is maintained at the site. Alternative 1 provides a baseline for comparison with the other selected alternatives.

Alternative 2 is the implementation of institutional measures and containment controls. This alternative strives to minimize human contact with the contaminated material at the site by

Table 4-1

SUMMARY OF REMEDIAL ALTERNATIVES

United Plating Site

ALTERNATIVE	ELEMENT: Site Work			Hazardous Debris			Contaminated Debris					Uncontaminated Debris	Contaminated Interior Surfaces					Uncontaminated Interior Surfaces
	No Demolition	Demolition Off-site Disposal	Demolition On-site Disposal	No Treatment (Encapsulation or No Action)	Partial Treatment (HEPA Sanding)	Full Treatment (HEPA Sanding)	No Treatment (Encapsulation or No Action)	Partial Treatment (HEPA Vac and Wipe)	Full Treatment (HEPA Sanding)	Full Treatment (Steam Cleaning)	Full Treatment (Water Washing)	No Treatment	No Treatment	Partial Treatment (Single Technology)	Partial Treatment (Multiple Technologies)	Full Treatment (Single Technology)	Full Treatment (Multiple Technologies)	No Treatment
1. No Action	X			X			X					X	X					X
2. Institutional Measures Containment	X			X			X					X	X					X
3. Full On-Site Clean up																		
3A. No Demolition /Off-site Disposal	X					X			X	X	X	X				X	X	X
3B. Demolition /Off-site Disposal		X				X			X	X	X	X				X	X	X
3C. Demolition /On-site and Off-site Disposal			X			X			X	X	X	X				X	X	X
4. Partial On-Site Cleanup																		
4A No Demolition /Off-site Disposal	X				X			X				X		X	X			X
4B. Demolition /Off-site Disposal		X			X			X										
4C. Demolition /On-site and Off-site Disposal			X		X			X				X		X	X			X
5. Minimal On-site Cleanup	X			X			X							X	X			X

establishing deed restrictions, fencing the perimeter of the property, sealing the openings of the building, and providing a full-time security guard.

The full on-site cleanup alternative, Alternative 3, and the partial on-site cleanup alternative, Alternative 4, were subdivided to evaluate the feasibility of three possible scenarios. Alternative 3A assumes the UP building will remain standing and all debris will be disposed of off-site. Alternative [redacted] is similar to Alternative 3A except it assumes that the building will be demolished and all debris will be disposed of off-site. I[redacted] UP building will be demolished, but some debris will be disposed of on-site and the rest will be disposed of off-site. In [redacted]

3B = 4B

3C = 4C

For Alternative 4, three subalternatives were developed based on the status of the building, the selected treatment objective, and the selected disposal facilities. Alternative 4A assumes that the UP building will remain standing and all debris will be disposed of off-site. Alternative [redacted] assumes the UP building will be demolished and all debris will be disposed of off-site. Alternative 4C also assumes the UP building will be demolished, but some debris will be disposed of on-site and the rest will be disposed of off-site. Hazardous and contaminated debris in Alternatives 4A, 4B, and 4C will be treated to the partially clean objective instead of the fully clean objective.

Alternative 5 is similar to Alternative 4 but assumes the hazardous and contaminated debris will be transported directly to a TSDF and not treated on-site. At the TSDF facility this debris will be encapsulated and subsequently landfilled. Interior surfaces will be treated to the partially clean objective.

CHAPTER 5

DETAILED EVALUATION OF REMEDIAL ALTERNATIVES

5.1 INTRODUCTION

This chapter presents an evaluation of the nine remedial alternatives discussed in Chapter 4. The purpose of the evaluation is to identify the advantages and disadvantages of each alternative as well as key trade-offs among them. The recommended option for remediation of the building interior is presented in Chapter 6.

The criteria used to evaluate the alternatives include effectiveness, implementability, and cost. The effectiveness criterion includes the overall protectiveness of human health and the environment and the reduction in toxicity, mobility, or volume of contamination achieved by each alternative. The implementability criterion considers the feasibility of the proposed technologies. Capital costs were estimated for each alternative and are included in this FFS for comparative purposes; detailed cost est/mates will be prepared in the site remediation plan. A summary of this evaluation is presented in Table 5-1 and discussed in detail in the sections below. It should be noted that community and state acceptance are also criteria to be considered in evaluating the remedial alternatives; these criteria will be established at a public hearing, if one is held.

5.2 EFFECTIVENESS

5.2.1 Alternative 1: No Action

The no action alternative assumes that all existing debris, interior surfaces, and associated contamination will remain in place. No improvements or repairs will be made to the site nor will any institutional controls be implemented. Alternative 1 is not protective of human health or the environment as the existing contamination will remain inside the building and will not be contained to prevent migration into the surrounding environment.

The continued presence of contamination inside the UP building may preclude or complicate the facilitywide remediation of the entire property. The soil and groundwater data obtained during the Interim RI suggest that soils and groundwater adjacent to and beneath the building are contaminated with metals as well as some volatile organic compounds (VOCs) (LMS 1995). The next planning stage of site remediation will involve remediating the on-site contaminated soils and groundwater. If treatment is selected, the soils beneath the building will need to be accessed in order to be remediated to remove source areas of contamination. Accessing the

SUMMARY OF EVALUATION OF REMEDIAL ALTERNATIVES

United Plating Site

CRITERIA	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: INSTITUTIONAL MEASURES AND CONTAINMENT	ALTERNATIVE 3A: FULL CLEANUP/NO DEMOLITION/OFF-SITE DISPOSAL	ALTERNATIVE 3B: FULL CLEANUP/DEMOLITION/OFF-SITE DISPOSAL	ALTERNATIVE 3C: FULL CLEANUP/DEMOLITION/ON-SITE AND OFF-SITE DISPOSAL
Effectiveness	No long-term effectiveness or permanence provided as contaminants remain on-site. Building may interfere with facilitywide remediation.	Prevents human contact through institutional controls; contaminants will remain in the environment. Building may interfere with facilitywide remediation.	Protects human health and the environment by removing contamination from building. Slightly increased risk of exposure to cadmium, chromium, and lead during on-site treatment. Building may interfere with facilitywide remediation.	Protects human health and the enviroment by removing contamination from building.	Protects human health and the environment by removing contamination from building.
Implementability	No constraints to implementation.	Implementability of deed restrictions is currently unknown but possible. May be difficult to seal openings in building. May not be able to use heavy equipment inside building.	Common technologies used in treatment. May not be able to use heavy equipment on upper floors of building due to structural concerns. Safe means of bringing debris to ground level must be provided.	Common technologies in treatment and demolition.	Common technologies used in treatment and demolition. On-site landfilling option may require approval by lead agency.
COST:					
Capital:	$0	$61,000	$2,307,000	$3,358,000	$3,008,000
O&M (per year):	$0	$130,000	$0	$0	$0
Present Worth:	$0	$2,059,000	$2,307,000	$3,358,000	$3,008,000

SUMMARY OF EVALUATION OF REMEDIAL ALTERNATIVES
United Plating Site

	ALTERNATIVE 4A: PARTIAL CLEANUP/PARTIAL TREATMENT/NO DEMOLITION/OFF-SITE DISPOSAL	ALTERNATIVE 4B: PARTIAL CLEANUP/PARTIAL TREATMENT/DEMOLITION/OFF-SITE DISPOSAL	ALTERNATIVE 4C: PARTIAL CLEANUP/PARTIAL TREATMENT/DEMOLITION/ ON-SITE AND OFF-SITE DISPOSAL	ALTERNATIVE 5: MINIMAL CLEANUP/NO TREATMENT OF DEBRIS/PARTIAL TREATMENT OF INTERIOR SURFACES/NO DEMOLITION/OFF-SITE DISPOSAL
Effectiveness	Protects human health and the environment to a lesser extent than full cleanup. Slight risk of exposure to cadmium, chromium, and lead during on-site treatment. Building may interfere with facilitywide remediation.	Protects human health and the environment by removing contamination from building.	Protects human health by removing contamination from building. Slightly greater risk in landfilling stabilized debris on-site.	Protects human health and the environment by removing contamination from building. Building may interfere with facility-wide remediation.
Implementability	Common technologies used in treatment. May not be able to use heavy equipment on upper floors of building due to structural concerns. Safe means of bringing debris to ground level must be provided.	Common technologies used in treatment and demolition.	Common technologies used in treatment and demolition. On-site landfilling option will require approval by lead agency.	Common technologies used in treatment. May have some difficulty encapsulating large or heavy debris objects.
COST:				
Capital:	$1,640,000	$2,689,000	$2,566,000	$1,367,000
O&M (per year):	$0	$0	$0	$0
Present Worth:	$1,640,000	$2,689,000	$2,566,000	$1,367,000

soils beneath the building will be a considerable, if not impossible, task if the building is still standing. Soil remediation will be further impeded if debris is scattered throughout the building, especially the first floor. The use of shoring around the site may be limited due to the uncertain structural integrity of the building. The future implications of selecting Alternative 1 as they relate to the facilitywide remediation should be considered when forming a decision on the building remediation.

5.2.2 **Alternative 2 Institutional Measures and Containment**

In Alternative 2, the institutional controls and containment alternative, the debris inside the building will not be removed nor will the interior surfaces be treated. This alternative provides some protection of human health through the use of deed restrictions, improved fencing, boarding, roof repair, and full time security to reduce the potential for human contact with on-site contamination. The purpose of the containment measures is two-fold: (1) to deter trespassers from entering the building illegally and coming into contact with contaminated surfaces, and (2) to reduce the amount of contamination that is spreading to the environment via air (i.e., contaminants transported by wind as particulate dust) and stormwater (i.e., contaminants dissolved in water and transported through subsurface) pathways.

The long-term effectiveness of this alternative in preventing human contact with the contamination is dependent on implementation of deed restrictions, maintenance of the fencing, boarding, and roofing barriers, and hiring full-time security. As the building continues to deteriorate, contaminants inside the building may migrate into the surrounding environment, including the subsurface soils and groundwater. The surrounding community may be put at high risk if the building were ever set on fire or unexpectedly collapse. The measures proposed under this alternative provide some protection to the community under normal conditions but would not safeguard the community under emergency or disastrous conditions.

A few short-term risks will result in the implementation of Alternative 2. These risks mainly pertain to on-site workers who will come into contact with the contaminated surfaces. Short-term risks include inhalation of particulate dust contaminated with cadmium, chromium, and lead (generated during the repair work) and skin contact with contaminated surfaces. To the extent possible, these risks will be minimized through the use of dust-suppression methods (e.g., wetting or negative air pressure containment systems), personal protective equipment (PPE) by workers, and impervious liners and covers, as appropriate.

The same concerns regarding soil remediation are raised in Alternative 2 as were discussed in Alternative 1. The continued presence of contamination inside the UP building will likely complicate the facilitywide remediation of the entire property. If the decision is made to treat the soils beneath the building, the soils will need to be accessed. The use of shoring around the site may be limited due to the uncertain structural integrity of the building. As with Alternative 1, the future implications of selecting Alternative 2 as they relate to the facilitywide remediation should be considered when forming a decision on the building remediation.

5.2.3 Alternative 3: Full On-site Cleanup

The three subalternatives of Alternative 3 assume that on-site debris and interior surfaces will be treated to the fully clean objective to facilitate disposal and provide the highest level of protection for human health and the environment. Treatment to the fully clean objective will permanently remove the sources of metals contamination at the site and provide the greatest long-term effectiveness.

There is some short-term risk of cadmium, chromium, and lead exposure to on-site workers during the treatment processes because large quantities of dust will be generated during treatment. However, these risks will be minimized by implementing appropriate engineering controls, such as isolating work areas during treatment, continuously HEPA vacuuming to reduce fugitive dust, and enforcing the use of appropriate PPE by workers.

Mobility of the metals-contaminated dust and paint, both on debris and interior surfaces, will be considerably reduced through extraction treatment. All waste residues that are generated during treatment, including dust, paint, rinse water, used wipes, etc., will be disposed of off-site. Wastes that are characteristically hazardous will be taken to a TSDF, where they will be stabilized and subsequently landfilled. Stabilization treatment is a commonly used technology that greatly reduces the leachability of metals contaminants, including cadmium, chromium, and lead. Landfilling is protective of human health and the environment as long as the landfill is appropriately designed and constructed and is adequately maintained so that contaminants are not released to the environment.

Some aspects concerning short- and long-term effectiveness of remediation will vary, depending on the subalternative selected. These aspects are discussed below.

5.2.3.1 ***Alternative 3A: No Demolition/Off-site Disposal.*** Off-site disposal of all wastes will ensure that contaminants are not released to the environment. The facilitywide remediation may be impeded if the building remains standing and is not demolished. The same concerns regarding soil remediation are raised in Alternative 3A as were discussed in Alternatives 1 and 2. If the decision is made to treat the soils beneath the building, the soils will need to be accessed; this will be a considerable task if the building is still standing. If the building's presence obstructs the soil remediation project, this alternative would not be protective of human health and the environment because the soil contamination would not be removed.

5.2.3.2 ***Alternative 3B: Demolition/Off-site Disposal.*** In Alternative 3B, off-site disposal of all wastes will ensure that contaminants are not released to the environment. Demolition of the building will facilitate soil remediation in the facilitywide remedial stage.

5.2.3.3 ***Alternative 3C: Demolition/On-site and Off-site Disposal.*** Alternative 3C is as effective in protecting human health and the environment as Alternative 3B. The concrete and brick surfaces will be treated to remove contamination before the building is demolished. The building demolition debris will be combined with the concrete and brick debris inside the building and spread as backfill on-site.

5.2.4 Alternative 4: Partial On-site Cleanup

The three subalternatives of Alternative 4 assume that on-site debris and interior surfaces will be treated to the partially clean objective to facilitate disposal and provide a moderate level of protection for human health and the environment. Treatment to the partially clean objective will remove the majority of metals contamination at the site but will not be as effective as Alternative 3.

There is a slight short-term risk of cadmium, chromium, and lead exposure to on-site workers. However, these risks will be minimized by implementing appropriate engineering controls, such as isolating work areas during treatment, continuously HEPA vacuuming to reduce fugitive dust, and enforcing the use of appropriate PPE by workers performing the remediation.

Mobility of the metals-contaminated dust and paint both on debris and interior surfaces will be considerably reduced through extraction treatment, but not as effectively as in Alternative 3. All waste residues that are generated during treatment, including dust, paint, rinse water, used wipes, etc., will be disposed of off-site. Wastes that are characteristically hazardous will be taken to a TSDF, where they will be stabilized and subsequently landfilled.

Some aspects concerning short- and long-term effectiveness of remediation will vary, depending on the subalternative selected. These aspects are discussed below.

5.2.4.1 ***Alternative 4A: Partial Treatment/No Demolition/Off-site Disposal.*** Off-site disposal of all wastes will ensure that contaminants are not released to the environment. The facilitywide remediation may be impeded if the building remains standing and is not demolished. The same concerns regarding soil remediation are raised in Alternative 4A as were discussed in Alternatives 1 and 2. If the building's presence obstructs the soil remediation project, this alternative would not be protective of human health and the environment because the soil contamination would not be removed.

5.2.4.2 ***Alternative 4B: Partial Treatment/Demolition/Off-site Disposal.*** In Alternative 4B, off-site disposal of all wastes will ensure that contaminants are not released to the environment. Demolition of the building will facilitate soil remediation in the facilitywide remedial stage.

5.2.4.3 ***Alternative 4C: Partial Treatment/Demolition/On-site and Off-site Disposal.*** The effectiveness of Alternative 4C is similar to Alternative 4B except that there is a greater risk to the environment as a result of placing concrete and that is slightly contaminated brick debris on the ground. This risk will be reduced by stabilizing the debris prior to landfilling to immobilize any remaining contaminants. Stabilization treatment is a commonly used technology that greatly reduces the leachability of metals contaminants.

5.2.5 Alternative 5: Minimal On-site Cleanup

Alternative 5 is as effective in protecting human health and the environment as Alternative 4A. Hazardous and contaminated debris will be collected and transported directly to a TSDF for encapsulation treatment. There is a lower short-term risk of cadmium, chromium, and lead exposure to on-site workers as the debris will require less handling before being shipped off-site. However, there may be a greater risk to the general public as hazardous and contaminated debris will be transported through communities en route to the TSDF compared to treated debris in Alternatives 3 and 4.

5.3 IMPLEMENTABILITY

5.3.1 Alternative 1

Alternative 1, the no action alternative, presents no constraints to implementation as no action is required.

5.3.2 Alternative 2

Window boarding and roof repair are readily available technologies that require common construction materials and techniques. Precautionary measures should be taken when working inside the building and on the roof to ensure safety. The implementability of deed restrictions at the site is currently unknown but is expected to be possible. Full-time security is also implementable and it is likely the only measure that will prevent trespassers. Improvements to the roof will be limited to the installation of preformed aluminum panels to keep water out. Structural improvements to the roof are not included in fulfilling the containment objective.

5.3.3 Alternatives 3A, 3B, and 3C

The three subalternatives of Alternative 3 are all implementable at the UP site and are discussed collectively in this section. Debris from the upper floors will be carried down to ground level using common construction equipment. The southeastern portion of the site provides adequate space for sorting, staging, and loading the debris materials. There may be some difficulty in lowering heavy or large debris from the upper floors. These difficulties can potentially be alleviated by planning the remediation project in advance and using appropriate equipment and trained personnel.

Most of the technologies that were proposed under the Alternative 3 subalternatives were developed by the lead-based paint and asbestos abatement industry and should be readily available to the site. These technologies include HEPA sanding, water washing, vacuum blasting, HEPA vacuuming, and wet wiping. It is unknown whether the water or power supply to the site is functional; however, it is expected that water and power can be temporarily supplied to the site, if necessary.

5.3.4 Alternatives 4A, 4B, and 4C

The Alternative 4 subalternatives are as implementable as those of Alternative 3. Stabilization treatment proposed under Alternative 4C is performed by mixing concrete and brick debris with a stabilizing agent (e.g., concrete slurry). This technology is commonly used in improving the bearing capacity of soil in construction. Implementation of the on-site landfilling option may require approval from a lead agency.

5.3.5 Alternative 5

The technologies described in Alternative 5 are as implementable as those of Alternatives 3 and 4. It is assumed that the encapsulation technology will be conducted at a TSDF, namely at the Chemical Waste Management facility in Model City, New York.

5.4 COST

Before estimating the costs for each alternative, some of the task elements of Alternatives 3, 4, and 5 were evaluated to select the most appropriate treatment technology for a specific task based on cost. The most cost-effective technology of these task elements was retained as the most appropriate treatment technology for the remediation project. In the Alternative 3 subalternatives, three options were identified for treating contaminated debris to the fully clean objective: HEPA sanding, steam cleaning, and water washing. The estimated costs of these options were compared and water washing was found to be the most economical. It was estimated that water washing would cost approximately $300,000 (including treatment and disposal costs), steam cleaning would cost approximately $500,000, and HEPA sanding would cost approximately $1,200,000. Water washing is less labor intensive than sanding and steam cleaning but requires more time to set up and operate the treatment system. Some of the larger abandoned tanks at the UP site may be used to serve as dip tanks in the water washing process and may be placed in the belowgrade sumps to facilitate cleanup.

Similarly, for interior surface treatment use of a single technology was compared to the use of multiple technologies to clean contaminated interior surfaces. To achieve full on-site cleanup, HEPA sanding was evaluated alone and in comparison to HEPA vacuuming and wet wiping, vacuum blasting, and HEPA sanding. The use of multiple technologies was estimated to cost about $30,000 less than using a single technology; treatment using multiple technologies was estimated at $220,000 (treatment and disposal), while treatment using only HEPA sanding was estimated at $250,000. For treatment of interior surfaces to the partially clean objective, the use of a single technology, HEPA vacuuming and wet wiping, was compared to the use of multiple technologies, HEPA vacuuming and wet wiping pretreatment and high-pressure steam cleaning. In this case, treatment using multiple technologies was estimated to cost approximately $100,000 (treatment and disposal), while treatment using only a single technology was estimated to cost approximately $60,000. Based on these evaluations, the use of multiple technologies is justified in treating interior surfaces to the fully clean objective (Alternative 3) and the use of a single technology is justified in treating interior surfaces to the partially clean objective (Alternatives 4 and 5).

Tables 5-2 through 5-10 present the estimated costs for implementing each of the nine separate remedial alternatives at the UP site. These costs include capital and long-term operations and maintenance (O&M) costs. The present worth of the alternatives was calculated based on a 30-year life and a 5% interest rate, in accordance with the RI/FS guidance under CERCLA (EPA 1988). These costs were estimated based on the assumptions discussed in Chapter 4 and have a level of accuracy of +50 to -30%. The cost estimates presented here are for comparative

TABLE 5-2

COST ESTIMATE FOR ALTERNATIVE 1: NO ACTION

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)
CAPITAL COSTS:			
A. Direct Costs:	-	-	$0
B. Indirect Costs:	-	-	$0
O&M COSTS:	-	-	$0
PRESENT WORTH:			
Based on a 30-yr life and a 5% interest rate:			$0

TABLE 5-3

COST ESTIMATE FOR ALTERNATIVE 2: INSTITUTIONAL MEASURES AND CONTAINMENT

United Plating Site

ITEM	UNIT COST ($)		QUANTITY	COST (1996 $)[a]	
CAPITAL COSTS:					
A. Direct Costs:					
Deed Restrictions:	-		-	-[b]	
Roof Repair:					
Aluminum Roofing	$1.76	/ft²	13,120 ft²	$23,000	
Boarding:	$1.08	/ft²	5,000 ft²	$5,000	
Fencing Upgrade	$12.88	/lf	1,220 /lf	$16,000	
			Subtotal:	**$44,000**	
B. Indirect Costs:					
Engineering and Design @ 5%:	-		-	$2,000	
Legal and Administrative @ 10%:	-		-	$4,000	
Contingency @ 25%:	-		-	$11,000	
			TOTAL CAPITAL COSTS:	**$61,000**	
O&M COSTS:					
Fence, Roof, and Boarding Maintenance:					
Quarterly Inspection	$400	/visit	4 visits	$2,000	/yr
Roof and Boarding Repair	$1.76	/ft²	1,300 ft²	$2,000	/yr
Fence Repair	$32	/lf	20 lf	$1,000	/yr
Security Guard	$2,400	/wk	52 wk	$125,000	/yr
			TOTAL O&M COSTS:	**$130,000**	**/yr**
PRESENT WORTH:					
Based on a 30-yr life and a 5% interest rate:				$2,059,000	

a - Costs rounded to nearest $1,000.
b - Costs cannot be determined at this time.

COST ESTIMATE FOR ALTERNATIVE 3A: FULL ON-SITE CLEANUP/NO DEMOLITION/OFF- SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)
CAPITAL COSTS:			
A. Direct Costs:			
Site Preparation:			
Contractor Mob/Demob	LS	-	$70,000
Chute Assembly	$50.08 /lf	100 /lf	$5,000
Repair Plumbing for Public Water Access	LS	-	$2,000
Removal of Debris to Ground Level:			
Gutting in Level D	$5.08 /ft²	57,450 ft²	$292,000
Materials Handling Equipment	$7,901 /wk	16 wks	$126,000
Crane	$8,369 /wk	4 wks	$33,000
Excavation, Removal of Hazardous Sediment[A]	$8.44 /ft²	1,000 ft²	$8,000
Debris Treatment:			
Hazardous Debris - HEPA Sanding in Level C	$1.74 /ft²	247,386 ft²	$430,000
Contaminated Debris - Water Washing in Level C	$0.38 /ft²	674,773 ft²	$256,000
Confirmatory Sampling	$150 /sample	50 samples	$8,000
Interior Surface Treatment:			
Contaminated Interior Surfaces			
Floors - HEPA Vac and Wiping in Level C	$0.37 /ft²	49,643 ft²	$18,000
Walls & Ceilings - Vacuum Blasting in Level C	$2.38 /ft²	73,690 ft²	$175,000
Structural Supports - HEPA Sanding in Level C	$1.74 /ft²	8,715 ft²	$15,000
Confirmatory Sampling	$150 /sample	14 samples	$2,000
Recycling and Disposal:			
Sorting and Loading	$13.23 /yd³	1,502 yd³	$20,000
Hazardous Waste (Dust and Used Wipes)			
Transportation to TSDF in Model City, NY	$64 /yd³	22 yd³	$1,000
Stablization and Landfilling	$185 /ton	14 tons	$3,000
Hazardous Liquids (Rinse water)			
Transportation to TSDF	$0.32 /gal	102,000 gal	$33,000
Stabilization (Treatment)	$1.00 /gal	102,000 gal	$102,000
Recyclable Metallic Debris[B]			
Transportation and Disposal to Local Scrap Metal Facility	$2 /ton	3,054 ton	$6,000
All Other Debris	$82 /ton	521 ton	$43,000
Transportation and Disposal to Local C & D Landfill			
		Subtotal:	$1,648,000

COST ESTIMATE FOR ALTERNATIVE 3A: FULL ON-SITE CLEANUP/NO DEMOLITION/OFF- SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)
B. Indirect Costs:			
Engineering and Design @ 5%	-	-	$82,000
Legal and Administrative @ 10%	-	-	$165,000
Contingency @ 25%	-	-	$412,000
		TOTAL CAPITAL COSTS:	$2,307,000
O&M COSTS:			
		TOTAL O&M COSTS:	$0 /yr
PRESENT WORTH:			
Based on a 30-yr life and a 5% interest rate			$2,307,000

A - Includes disposal of 25 yd^3 of sediment as hazardous waste.
B - Approximately 90% of metallic debris assumed to be recyclable.
LS - Lump sum.

TABLE 5-5

COST ESTIMATE FOR ALTERNATIVE 3B: FULL ON-SITE CLEANUP/DEMOLITION/ OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)
CAPITAL COSTS:			
A. Direct Costs:			
Site Preparation:			
Same as Alternative 3A			$77,000
Removal of Debris to Ground Level:			
Same as Alternative 3A			$459,000
Debris Treatment:			
Same as Alternative 3A			$694,000
Interior Surface Treatment:			
Same as Alternative 3A			$210,000
Building Demolition[A]	LS	-	$750,000
Recycling and Disposal:			
Same as Alternative 3A			$208,000
		Subtotal:	$2,398,000
B. Indirect Costs:			
Engineering and Design @ 5%	-	-	$120,000
Legal and Administrative @ 10%	-	-	$240,000
Contingency @ 25%	-	-	$600,000
		TOTAL CAPITAL COSTS:	$3,358,000
O&M COSTS:			
		TOTAL O&M COSTS:	$0 /yr
PRESENT WORTH:			
Based on a 30-yr life and a 5% interest rate			$3,358,000

A - Actual cost estimate received from demolition contractor; includes disposal of demolition debris as nonhazardous waste.
LS - Lump Sum.

TABLE 5-6 (Page 1 of 2)

COST ESTIMATE FOR ALTERNATIVE 3C:
FULL ON-SITE CLEANUP/DEMOLITION
ON-SITE DISPOSAL AND OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)
CAPITAL COSTS:			
A. Direct Costs:			
Site Preparation:			
Same as Alternative 3A			$77,000
Removal of Debris to Ground Level:			
Same as Alternative 3A			$459,000
Debris Treatment:			
Same as Alternative 3A			$694,000
Interior Surface Treatment:			
Same as Alternative 3A			$210,000
Building Demolition:[A]	LS	-	$500,000
Recycling and Disposal:			
Sorting and Loading	$13.23 /$yd^3$	1,502 yd^3	$20,000
Hazardous Waste (Dust)			
Transportation to TSDF in Model City, NY	$64 /$yd^3$	22 yd^3	$1,000
Stablization and Landfilling	185 /ton	14 tons	$3,000
Hazardous Liquids (Rinse water)			
Transportation to TSDF	$0.32 /gal	102,000 gal	$33,000
Stabilization	$1.00 /gal	102,000 gal	$102,000
Recyclable Metallic Debris			
Transportation and Disposal to Local Scrap Metal Facility	$2 /ton	3,054 tons	$6,000
Concrete and Brick Debris			
On-Site Backfilling/Compaction	$2.05 /$yd^3$	1,591 yd^3	$3,000
All Other Debris			
Transportation and Disposal to Local C & D Landfill	$82 /ton	498 tons	$41,000
		Subtotal:	$2,149,000

COST ESTIMATE FOR ALTERNATIVE 3C:
FULL ON-SITE CLEANUP/DEMOLITION
ON-SITE DISPOSAL AND OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)	
B. Indirect Costs:				
Engineering and Design @ 5%	-	-	$107,000	
Legal and Administrative @ 10%	-	-	$215,000	
Contingency @ 25%	-	-	$537,000	
		TOTAL CAPITAL COSTS:	$3,008,000	
O&M COSTS:				
		TOTAL O&M COSTS:	$0	/yr
PRESENT WORTH:				
Based on a 30-yr life and a 5% interest rate			$3,008,000	

A - Actual cost estimate received from general contractor; includes off-site disposal of metallic and wooden demolition debris, but not concrete and brick demolition debris.
LS - Lump Sum.

COST ESTIMATE FOR ALTERNATIVE 4A: PARTIAL ON-SITE CLEANUP/NO DEMOLITION/OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)		QUANTITY		COST (1996$)
CAPITAL COSTS:					
A. Direct Costs:					
Site Preparation:					
Same as Alternative 3A					$77,000
Removal of Debris to Ground Level:					
Same as Alternative 3A					$459,000
Debris Treatment:					
Hazardous Debris - HEPA Sanding in Level C	$1.06	/ft²	247,386	ft²	$262,000
Contaminated Debris - HEPA Vac and Wiping in Level C	$0.33	/ft²	674,773	ft²	$223,000
Confirmatory Sampling	$150	/sample	50	samples	$8,000
Interior Surfaces Treatment:					
Contaminated Interior Surfaces					
All Surfaces HEPA Vac and Wiping in Level C	$0.33	/ft²	132,048	ft²	$44,000
Confirmatory Sampling	$150	/sample	14	samples	$2,000
Recycling and Disposal:					
Sorting and Loading	$13.23	/yd³	1,502	/yd³	$20,000
Hazardous Waste (Dust and Used Wipes)					
Transportation to TSDF in Model City, NY	$64	/yd³	20	/yd³	$1,000
Stabilization and Landfilling	$185	/ton	14	tons	$3,000
Hazardous Liquids (Rinse water)					
Transportation to TSDF	$0.32	/gal	10,000	gal	$3,000
Stabilization	$1.00	/gal	10,000	tons	$10,000
Recyclable Metallic Debris					
Transportation to Local Scrap Metal Facility	$2.00	/ton	3,054	tons	$6,000
All Other Debris					
Transportation to Industrial Landfill in Pottstown, PA	$55	/yd³	579	/yd³	$32,000
Landfilling	$40	/ton	521	tons	$21,000
				Subtotal:	$1,171,000

COST ESTIMATE FOR ALTERNATIVE 4A: PARTIAL ON-SITE CLEANUP/NO DEMOLITION/OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996$)	
B. Indirect Costs:				
Engineering and Design @ 5%	-	-	$59,000	
Legal and Administrative @ 10%	-	-	$117,000	
Contingency @ 25%	-	-	$293,000	
		TOTAL CAPITAL COSTS:	$1,640,000	
O&M COSTS:				
		TOTAL O&M COSTS:	$0	/yr
PRESENT WORTH:				
Based on a 30-yr life and a 5% interest rate			$1,640,000	

TABLE 5-8

COST ESTIMATE FOR ALTERNATIVE 4B: PARTIAL ON-SITE CLEANUP/DEMOLITION/OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)
CAPITAL COSTS:			
A. Direct Costs:			
Site Preparation:			
Same as Alternative 4A			$77,000
Removal of Debris to Ground Level:			
Same as Alternative 4A			$459,000
Debris Treatment:			
Same as Alternative 4A			$493,000
Interior Surface Treatment:			
Same as Alternative 4A			$46,000
Building Demolition:[A]	LS	-	$750,000
Recycling and Disposal:			
Same as Alternative 4A			$96,000
		Subtotal:	$1,921,000
B. Indirect Costs:			
Engineering and Design @ 5%	-	-	$96,000
Legal and Administrative @ 10%	-	-	$192,000
Contingency @ 25%	-	-	$480,000
		TOTAL CAPITAL COSTS:	$2,689,000
O&M COSTS:			
		TOTAL O&M COSTS:	$0 /yr
PRESENT WORTH:			
Based on a 30-yr life and a 5% interest rate			$2,689,000

A - Actual cost estimate received from demolition contractor; includes disposal of demolition debris as nonhazardous waste.
LS - Lump Sum.

TABLE 5-9 (Page 1 of 2)

COST ESTIMATE FOR ALTERNATIVE 4C: PARTIAL ON-SITE CLEANUP/DEMOLITION/ON-SITE AND OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)		QUANTITY		COST (1996 $)
CAPITAL COSTS:					
A. Direct Costs:					
Site Preparation:					
Same as Alternative 4A					$77,000
Removal of Debris to Ground Level:					
Same as Alternative 4A					$459,000
Debris Treatment:					
Same as Alternative 4A					$493,000
Interior Surface Treatment:					
Same as Alternative 4A					$46,000
Building Demolition[A]	LS		-		$500,000
Recycling and Disposal:					
Sorting and Loading	$13.23	/yd³	1,502	yd³	$20,000
Hazardous Waste (Dust and Used Wipes)					
Transportation to TSDF	$64	/yd³	20	yd³	$1,000
Stablization and Landfilling	185	/ton	14	tons	$3,000
Hazardous Liquids (Rinse water)					
Transportation to TSDF	$0.32	/gal	10,000	gal	$3,000
Stabilization	$1.00	/gal	10,000	gal	$10,000
Recyclable Metallic Debris					
Transportation to Local Scrap Metal Facility	$2	/ton	3,054	tons	$6,000
Concrete and Brick Debris					
Stabilization	$80	yd³	1,591	yd³	$127,000
Post-Treatment Analysis[B]	$150	sample	16	samples	$2,000
Backfilling	$2.05	yd³	3,182	yd³	$7,000
Asphalt Pavement (2 in.)	$0.47	ft²	80,000	ft²	$38,000
All Other Debris					
Transportation and Disposal to Local C&D Landfill	82	/ton	498	tons	$41,000
				Subtotal:	$1,833,000

COST ESTIMATE FOR ALTERNATIVE 4C: PARTIAL ON-SITE CLEANUP/DEMOLITION/ON-SITE AND OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)	QUANTITY	COST (1996 $)
B. Indirect Costs:			
Engineering and Design @ 5%	-	-	$92,000
Legal and Administrative @ 10%	-	-	$183,000
Contingency @ 25%	-	-	$458,000
		TOTAL CAPITAL COSTS:	$2,566,000
O&M COSTS:			
		TOTAL O&M COSTS:	$0 /yr
PRESENT WORTH:			
Based on a 30-yr life and a 5% interest rate			$2,566,000

A - Actual cost estimate received from demolition contractor; does not include disposal of concrete and brick demolition debris but does include disposal of metallic and wooden demolition debris.
B - Assume 1 sample collected for every 200 yd^3 of treated material (assume 100% volume increase).
LS - Lump Sum.

TABLE 5-10

COST ESTIMATE FOR ALTERNATIVE 5: MINIMAL ON-SITE CLEANUP/NO DEMOLITION/OFF-SITE DISPOSAL

United Plating Site

ITEM	UNIT COST ($)		QUANTITY		COST (1996 $)
CAPITAL COSTS:					
A. Direct Costs:					
Site Preparation:					
Same as Alternative 4A					$77,000
Removal of Debris to Ground Level:					
Same as Alternative 4A					$459,000
Interior Surface Treatment:					
Same as Alternative 4A					$46,000
Recycling and Disposal:					
Sorting and Loading	$13.23	/yd³	1,052	yd³	$14,000
Hazardous Waste (Dust and Used Wipes)					
Transportation to TSDF in Model City, NY	$64	/yd³	6	yd³	$1,000
Stabilization and Landfilling	$185	/ton	8	tons	$1,000
Hazardous Waste (Rinse Water)					
Transportation to TSDF	$0.32	/gal	10,000	gal	$3,000
Stabilization	$1.00	/gal	10,000	gal	$10,000
Recyclable Metallic Debris (Uncontaminated)					
Transportation to Local Scrap Metal Facility	$2	/ton	827	tons	$2,000
Other Uncontaminated Debris					
Transportation and Disposal to C&D Landfill	$82	/ton	89	tons	$7,000
Contaminated and Hazardous Debris					
Transportation to TSDF	$64	/yd³	1,021	yd³	$65,000
Encapsulation and Landfilling	$285	/yd³	1,021	yd³	$291,000
				Subtotal:	$976,000
B. Indirect Costs:					
Engineering and Design @ 5%	-		-		$49,000
Legal and Administrative @ 10%	-		-		$98,000
Contingency @ 25%	-		-		$244,000
				TOTAL CAPITAL COSTS:	$1,367,000
O&M COSTS:					
					$0 /yr
				TOTAL O&M COSTS:	$0 /yr
PRESENT WORTH:					
Based on a 30-yr life and a 5% interest rate					$1,367,000

purposes only; detailed cost estimates will be prepared in the final remediation plan once a well-defined scope of work is developed.

There are no capital or O&M cost associated with the no action alternative, Alternative 1. Alternative 2 has an estimated capital cost of $44,000 and annual O&M costs of $130,000 due to quarterly inspections, maintenance, and full-time security. The present worth of Alternative 2 is $2,059,000, with an accuracy range of $1,441,000 to $4,583,000.

Alternative 3A has an estimated capital cost of $2,307,000 and no annual O&M costs. The present worth of Alternative 3A is $2,307,000, with an accuracy range of $1,615,000 to $3,605,000. The categories of tasks included in Alternative 3A are site preparation, removal of debris to ground level, debris treatment, interior surface treatment, recycling, and disposal. Estimated costs for Alternatives 3B and 3C were similar to Alternative 3A, except that building demolition costs were added. Alternative 3B has an estimated capital cost of $3,358,000 and no annual O&M costs. The present worth of Alternative 3B is $3,358,000, with an accuracy range of $2,351,000 to $5,037,000. Alternative 3C has an estimated capital cost of $3,008,000 and no annual O&M costs. The present worth of Alternative 3C is $3,008,000, with an accuracy range of $2,106,000 to $4,512,000.

Cost estimates for demolishing the UP building were provided by two separate general contractors and were $215,000 and $750,000 (MJ Engineering 1996). Their costs included disposal of the demolition debris off-site as nonhazardous waste. In this FFS, the latter estimate (i.e., $750,000) was used in developing costs for Alternative 3B, 3C, 4B, and 4C as a conservative estimate. The contractor that developed this cost estimate stated that the off-site disposal costs from the building demolition were estimated at roughly one-third the total cost, or $250,000. This figure was subtracted from the total demolition cost in determining the approximate cost of demolition without off-site disposal in Alternatives 3C and 4C; demolition costs without disposal are estimated to be approximately $500,000 using these assumptions. It should be noted that a considerable range of demolition costs was quoted by contractors (between $200,000 and $500,000 just to demolish the building). More reliable cost estimates should be obtained from demolition contractors by soliciting competitive bids for a well-defined work scope. If the demolition option is pursued, the demolition cost should be determined before forming a final remediation plan.

Based on conversations with several solid waste disposal contractors and landfill personnel, it appears that the tipping fee at C&D landfills in the Schenectady area fluctuate considerably from landfill to landfill. Typical disposal costs ranged between $60 and $100 per ton; the average of this range ($80 per ton plus $2 per ton for transportation) was used in developing costs for the FFS alternatives. It should be noted that if landfilling in a C&D landfill facility is selected in the final remediation plan, a cost comparison of available landfills within a short radius (e.g., 50 miles) of the site should be conducted.

Alternative 4A has an estimated capital cost of $1,640,000 and no annual O&M costs. The present worth of Alternative 4A is $1,640,000, with an accuracy of $1,148,000 to $2,460,000. The unit costs for some technologies are lower for Alternative 4A than Alternative 3A as the surfaces will not be treated as thoroughly, making the process more efficient. Estimated costs for Alternatives 4B and 4C were similar to Alternative 4A, except that the building demolition costs were added. Alternative 4B has an estimated capital cost of $2,689,000 and no annual O&M costs. The present worth of Alternative 4B is $2,689,000, with an accuracy of $1,882,000 to $4,034,000. Alternative 4C has an estimated capital cost of $2,566,000 and no annual O&M costs. The present worth of Alternative 4C is $2,566,000, with an accuracy of $1,796,000 to $3,849,000. The debris stabilization and on-site disposal options of Alternative 3C may be combined with the facilitywide remediation to reduce project duration and costs. These feasibility of combining these options should be evaluated in the forthcoming feasibility study (FS) for the impacted subsurface soils and groundwater.

The scope of work for Alternative 5 is similar to Alternative 4A, except that debris will not be treated on-site. Alternative 5 has an estimated capital cost of $1,367,000 and no annual O&M costs. The present worth of Alternative 5 is $1,367,000, with an accuracy of $957,000 to $2,051,000. In Alternative 5, approximately 25% of the capital costs were allocated to off-site disposal. A 1:1 volume of voids to volume of material has been assumed throughout this FFS report in estimating the volume of wastes that require disposal. The Alternative 5 cost estimate is the most sensitive to change in this ratio. For example, if the waste could only be packed or compacted to achieve a 5:1 volume of voids to volume of material ratio (i.e., less packing per volume), this would result in 2483 yd^3 of waste requiring disposal instead of the estimated 993 yd^3. The off-site disposal costs would increase by 250%, resulting in a $612,000 increase in total capital costs and a present worth of $1,979,000.

In developing the final remediation plan, actual costs should be obtained for each task described in these alternatives. Many of the unit costs used in the tables of this section were obtained from common references used in the construction and environmental restoration industries. Because the cost to conduct some of the tasks described in the alternatives are specific to the UP site, these costs should be verified by soliciting bids to contractors experienced in performing the work described by each specific task.

CHAPTER 6

SELECTION OF RECOMMENDED REMEDIAL PLAN

6.1 INTRODUCTION

Recommended remedial plans are provided for the two available options at the site: no building demolition and demolition. The alternatives are divided into groups in order to compare like alternatives that accomplish similar goals. Alternatives 2, 3A, 4A, and 5 are compared to consider letting the building stand under the no demolition option. Alternatives 3B, 3C, 4B, and 4C are compared to consider demolishing the building. The remediation of the UP building (debris and interior surfaces) does not depend on the status of the building itself; the decision to demolish the building will be based on the remedial objectives and plans for the site. However, the remedial plan for the overall site (i.e., facilitywide remediation) will be a combination of both the building and site remediation because they affect each other. One alternative is recommended for each option (no demolition and demolition) based on the criteria of reliability, implementability, and cost. However, as the site remediation may affect the building remediation, the recommendations also include other alternatives that may be applicable facilitywide remediation.

6.2 COMPARISON OF ALTERNATIVES

Alternatives that achieve similar objectives are compared separately in this section.

6.2.1 No Action

Alternative 1 (continuation of status quo), the no action alternative, was not selected for remediation of the site as it does not provide any protection to human health and the environment. Alternative 1 was developed and provided in this FFS for comparison purposes.

6.2.2 No Demolition Options

Alternative 2, the institutional controls and containment alternative, will provide some protection to human health and the environment by implementing measures to prevent contaminant migration and discourage human contact. However, the contamination will remain on-site and will need to be removed or otherwise handled at some later date; if not addressed the contamination will it become a potential health and environmental risk if the building collapses. Alternative 2 also has the highest long-term O&M costs due to the full-time security requirements. This alternative was not selected because of its ineffectiveness in removing contaminants from the UP site, its inability to protect human health and the environment in case of a fire or disastrous condition, and its relatively high cost.

Alternatives 3A and 4A both include off-site removal of debris and decontamination of interior surfaces without demolishing the UP building; both actions meet the criteria of reliability and implementability. The present worth cost of implementing Alternative 4A is significantly lower than Alternative 3A (29% less).

Alternative 5 has the lowest present worth of all the remedial alternatives except the no action alternative (Alternative 1), based on the given assumptions. It also fulfills the criteria of reliability and implementability. The major reasons for the low costs of this alternative are that the costs for encapsulating and disposing of debris are based on a per cubic yard fee rather than a per ton fee and the assumptions made in estimating the volume of waste. The $285 per yd^3 cost for encapsulating and disposing of debris at a TSDF was quoted by CWM of Model City, New York. The encapsulation process involves fitting a special encapsulant liner into a rolloff container, loading the container with debris and waste, pouring proprietary sealants and stabilizers into the container, covering the liner with a lid, and then lifting the liner out of the container and placing the filled liner into a landfill. The cost for this treatment is a set price for each load that is stabilized and landfilled. The tighter the liner can be packed, the lower the unit price per ton. For metallic debris, this translates to a cost of $86 per ton, assuming a 1:1 volume of voids to volume of material ratio and a density of 6.615 tons/yd^3. However, it is possible that this 1:1 ratio may not be achieved as the untreated debris cannot be dismantled or compacted due to its hazardous nature. Contractors will not have the opportunity to reduce the volume of containerized waste aggressively and therefore will not be able to pack the debris as densely as in the subalternatives of Alternatives 3 and 4.

The effects of volume reduction as they relate to Alternative 5 are demonstrated by example. If the volume of voids to volume of debris ratio were increased to 2:1, the total quantity of hazardous debris requiring encapsulation treatment increases from 1021 yd^3 to 1532 yd^3. The cost for transporting, encapsulating, and landfilling this debris increases the project's present worth from $1,367,000 to $1,617,000, an 18% increase.

Therefore, in selecting a remedial alternative for the site, there is greater certainty in the cost estimates for Alternative 4A than those for Alternative 5. Until it is demonstrated that the debris can be densely packed without substantially increasing sorting and loading costs, Alternative 4A is preferred over Alternative 5 under the no demolition option.

6.2.3 Demolition Options

Alternatives 3B, 3C, 4B, and 4C meet the criteria of reliability and implementability. However, the on-site disposal alternatives (Alternatives 3C and 4C) may be slightly less implementable because of environmental concerns, public perception, regulations, and requirements for on-site disposal. In Alternatives 3B and 4B, the building would be demolished and all debris would be disposed of off-site. A considerable cost savings is realized if a portion of this wastestream, namely the concrete and brick debris, is used as backfill material on-site rather than being transported off-site. These options were evaluated under Alternatives 3C and 4C; Alternative 3C was estimated to cost $350,000 less than Alternative 3B and Alternative 4C was estimated to cost $123,000 less than Alternative 4B. As the concrete and brick will be only partially treated in Alternatives 4B and 4C, the debris that is used as backfill material will be stabilized beforehand. Even with the costs associated with stabilizing the concrete and brick, the present worth cost of Alternative 4C is $442,000 less than Alternative 3C. For Alternatives 3B, 3C, 4B, and 4C, the cost of remediating the entire property will likely be lower without the building covering the contaminated soil.

The cost difference between Alternatives 3C, 4B, and 4C are slight when considering the +50% to -30% range of cost estimates in an FS. The small range in costs implies that the selection of one of these alternatives should not depend as much on the relative costs of the alternatives as on the goals to be achieved. If full treatment is sought, Alternative 3C is recommended. If partial treatment is selected but on-site treatment is not viewed as an acceptable option, then Alternative 4B is recommended; otherwise, Alternative 4C is recommended.

6.3 RECOMMENDATIONS

Recommendations for the UP site are presented for two separate scenarios: the no demolition option and the demolition option. The recommended remedial plans are presented below.

6.3.1 No Demolition Option

If it is decided that the building will not be demolished, the recommended remedial plan for the building debris and interior surfaces is Alternative 4A. Alternative 4A involves HEPA sanding hazardous debris and HEPA vacuuming and wiping all contaminated debris and contaminated interior surfaces. Metallic debris will be transported to a scrap metal facility, where it will be sorted and ultimately sent for remelting. The remaining debris will be transported to the Pottstown Landfill, an industrial landfill in Pennsylvania.

Alternative 5 has a lower estimated cost than Alternative 4A; however, the reliability of a major portion of the cost estimate is questionable. Without additional assessment of these questionable costs, Alternative 5 cannot be recommended at this time.

6.3.2 **Demolition Option**

If the decision is made to demolish the building, the recommended remedial plan is Alternative 4C. Alternative 4C involves HEPA sanding hazardous debris and HEPA vacuuming and wiping all contaminated debris and contaminated interior surfaces. Metallic debris will be transported to a scrap metal facility, where it will be sorted and ultimately sent for remelting. Concrete and brick debris will be stabilized and then spread as backfill material over the UP property following building demolition. The remaining debris will be transported to the Pottstown Landfill.

However, it should be noted that differences among Alternatives 3C, 4B, and 4C (including differences in estimated costs) are insignificant considering the accuracy of the estimates. Therefore, any one of these alternatives would be suitable for the demolition option.

6.3.3 **Other Recommendations**

6.3.3.1 ***Demolition***. The decision to demolish the building directly affects the selection of the remedial plan. Although the building remediation does not require demolition, demolition does open up a number of alternatives that are both cost-effective for the building treatment itself and may also help in the site remediation. For example, remediation of surface and subsurface soils may be combined with on-site stabilization and disposal of the concrete and brick debris from the building demolition.

The costs related to building demolition were conservatively estimated (using the higher of the two quotes that were received). As these same costs are included in all the alternatives for the demolition option, the comparison among them is not affected. As a result, however, demolition option does appear high in comparison to the no demolition option. If demolition is to be considered, a better cost estimate will be needed to resolve the range differences of $215,000 to $750,000. In particular, an item-by-item cost breakdown is needed.

6.3.3.2 ***Void Estimate***. Alternative 5 is a cost-effective alternative for the no demolition option, assuming the debris can be packed in rolloff containers in such a way as to minimize void space. Before this alternative can be selected as the remedial plan, a disposal container test should be conducted to determine the actual costs of disposal.

6.3.3.3 ***Building and Site Remediation***. The building remediation discussed in this FFS report and site remediation to be presented in the site FS report must be combined and integrated. Although interim remedial measures (IRMs) are a possible method for remediating the building, the high estimated costs ($1.5 to $2.5 million) and the effects on the facilitywide remediation plan may make IRMs unrealistic. The better option may be to conduct the full building and site remediation as one unit following RI/FS procedures. The combination of remediation plans will provide a more cost-effective remediation, as disposal options may be optimized. Also, any decision on the fate of the building and on-site disposal will require input from the general public. As many alternatives for the building have been developed in this report, the combined FS for the building, subsurface soils, and groundwater may be better conducted as an FFS, focusing on and adding to the existing alternatives.

6.3.3.4 ***Interim Remedial Measures***. Two possible IRM activities that should be considered at this time are: an investigation of the belowgrade pipes and sumps of the first floor and removal of debris from inside the building.

Sediment Removal. The sediment remaining in these existing pipes and sumps is likely hazardous and is probably acting as a source of contamination in the subsurface beneath the building. By excavating these pipes and removing the hazardous sediment in advance, remediation of the building interior will be expedited. The estimated cost of this IRM activity is approximately $10,000 to $20,000.

Debris Removal. Because all the remedial plans for the building and site include the removal of the debris and because debris removal may become more difficult and costly if the building deteriorates further, one possible IRM is to remove and dispose of the debris in the building. Other than deciding which is the best method for the debris remediation, this IRM can proceed while investigations are conducted and decisions are made concerning the building's status and interior surface and site remediation. The cost for debris removal and disposal can be easily broken out of the alternatives discussed in Chapter 5.

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APPENDIX A

INVENTORY OF DEBRIS MATERIALS INSIDE UNITED PLATING BUILDING

Conducted by Precision Industrial Maintenance, Inc.
(February 1996)

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	500 gallon poly tank on steel legs	5'x4'D	medium	solids on bottom	dispose	Cyanide
2	500 gallon poly tank on steel legs	5'x4'D	medium	solids on bottom	dispose	Cyanide
3	2,000 gallon poly tank	6.5'x8'D	~ 200 lb but very bulky	solids on bottom	dispose	Cyanide
4	Pallets -2 (30 bags on 1st, 20 on 2nd)		Heavy	dusty/dirty	dispose	Sodium Bicarb
5	Steel tubs & ice (1-small, 2-large)	3'x3'x4' & 6'x3'x4	heavy		scrap	
6	Small metal tub filled w/ wood & plastic	6'x2'x2'	medium		scrap tub	wood - C&D
7	~ 2-wood pallets, 20 shipping boxes, hand cart	8'x16'	light		C&D	
8	Row of 4 dip tanks	5'x30"x4.5'	heavy	solids on bottom	dispose	
9	Electric polisher	4'x1.5'x4'	heavy	dusty	scrap	
10	Pile of various size dip tanks (8), misc. angle iron & scrap steel	tanks 4'x4'x3'-10'x4'x3'	heavy	tanks have solids & ice in the bottom	dispose	steel pieces may have scrap value
11	14 Pallets, wood shelf	4'x2'x3'	medium	dusty	C&D	
12	Asst dip tanks	2'x4'x3'-4'x6'x3'	heavy	Solids in bottom	dispose	
13	I beam, steel rack,(over 8,9&12)	60x10x10	heavy	dusty	scrap	

PVC piping attached to walls & ceiling:
~ 150' of 1"
~ 200' of 3/4"
~50" of 2"

Waste Water Treatment

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Steel shelves	~7'hx50'	medium	dusty	scrap	
2	Metal table & 2 chairs	table 3'x8'	light	dusty	C&D	
3	Steel tub	4'x8'x3'	heavy	Solids in bottom	dispose	
4	10 Pallets & misc. debris	various ~ 5 yards	light	dirty	C&D	
5	Steel tubs / wood shelf	3'x3'x2'-4'x8'x3'	heavy	solids in bottom of tub	dispose	
6	Pile of pallets & assorted debris	~ 3' high	medium	dirty	C&D	
7	Pile of pallets & assorted debris. insulation	~5' high	medium	dirty	C&D	
8	2-Metal drums, 2-fiber (poor condition), & other asst debris	various	medium	dirty	scrap	Empty????
9	Machine, 3 bins, asst metals, shopping carts & other asst debris	various ~ 3 yards	light - medium	dirty	C&D	
10	Unable to access room due to condition of roof. Areas 6-9 viewed from a distance)					

Zinc Plating Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal Plating Tank	50'x4'x3'	Heavy	White powdery residue	Scrap	tank is split into 2 long sections
2	Plastic plating tank	3'x3'x2'	Medium	Clean, but paint chip like residue in the bottom	Dispose	
3	Steel storage cabinet	6'x3'x2'	Medium	clean	scrap	contains a contaminated rock
4	Work bench (wood/metal)	10' long	Heavy	dirty	dispose	Littered w/ small parts, hoses, piping, packing peanuts,(misc. lumber under bench)
5	Electrical boxes - 4				scrap	on walls
6	Metal plating tank	4'x4'x4'	Heavy	hard green residue	scrap	contam board in tank (VPPC-18)
7	Metal Plating tank	4'x4'x4'	Heavy	white powdery residue	scrap	#6-7- Boards on top of tanks
8	Metal Plating tank	4'x4'x4'	Heavy	very rusty, white residue	scrap	#8-11 covered w/ poly
9	Metal Plating tank	4'x4'x6'	Heavy	clean but rusty	scrap	
10	Metal Plating tank	4'x4'x4'	Heavy	heavy rust, contam?	scrap	
11	Metal Plating tank	4'x4'x6'	Heavy	clean	scrap	contains heat exchanger covered w/ white residue
12	Electrical boxes - 5				scrap	on walls
13	Fume Hood- Wood Frame W/ plastic	8'x6'x3'	Medium	PVC pieces highly contaminated	dispose	PVC ductwork leads to fume hood in Shop Room
14	Drum Cart, 6"x10' PVC pipe, 2 small wood stands, scattered on floor					
15	Metal plating tank	4'x4'x4'	Heavy	very rusty, white residue	scrap	
16	Metal plating tank	4'x4'x4'	Heavy	rusty, white residue	scrap	paper packing mat'l (?) in tank
17	Plastic plating tank	3'x3'x2'	Light	green residue	dispose	
18	Plastic plating tank	2'x3'x2'	Light	slight residue	dispose	
19	Various wood items	various	Light	dirty, no visible contam	C&D	
20	Various lumber, Small Scale, Styrofoam, plumbing	various ~ 6 yards total	Light-Medium	dirty, no visible contam	mostly C&D	On top of Shop Room
21	Metal plating tank	3'x3'x3'	Heavy	clean	scrap	
22	Metal plating tank	2'x3'x3'	Medium	pinkish white powdery residue	scrap	
23	Fluorescent lights - 4 fixtures		light		C&D	on ceiling
24	~ 300' of conduit				scrap	
25	Water lines ~ 75'	1 1/4 "			scrap	

Silver Plating Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
26	Air Line? ~ 100'	1"			scrap	
27	Pallets ~ 50			no visible contamination	C&D	
28	Sink	2.5'x2'x4'		no visible contamination	C&D	

Silver Plating Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Wood Shelving Units			Dusty	C&D	Built in
2	Fume Hood	3'x2'x7'		green residue around base	Dispose	Not able to get near due to debris, some material in hood
3	Pallet Jacks - 2		Heavy	clean	scrap	Look like they can be rolled
4	Sink				C&D	Built into counter
5	Lab Benches - 3				C&D	Built in
6	Floor littered w/ newspapers, Styrofoam, debris, cans	~ 2 yards		dirty, but no apparent contamination	dispose	
7	Metal cabinets	2'x5'x4'	Medium	dirty, but no apparent contamination	C&D	
8	Metal Desk			Dirty,	C&D	in bad shape
9	Sink Unit -wood w/ fiberglass coating	4'x12'x4'H	Heavy	Contaminated	C&D	Free standing unit, contains electrical outlets
10	Workbench	2'x12'x4'		Dirty	C&D	built in
11	Metals Shelves	3'x2'x8'	Heavy	dirty	scrap	contains various filters, all clean
12	Fluorescent lights				C&D	on ceiling
13	Fume Hood- metal	6"x4'x6"	Heavy	contaminated?	dispose	leaning against bench #9
14	Scale	3'x2'x2'	Medium	dirty, no contamination	scrap	
15	Piping PVC $^{3}/_{4}$" ~ 40"				C&D	
16	File cabinets	std	light	dirty	C&D	
17	Electrical boxes - 2				Scrap	On walls
18	Anodes - 6	3"x2'				

Shop Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Boiler	4'Dx8'L	Heavy		Scrap	
2	Metal plating tank	4'x5'x8'	Heavy	Clean	Dispose	dead bird in tank
3	Metal plating tank	4'x5'x10'	Heavy	Fairly clean, slight residue	Dispose	
4	Metal plating tank	4'x5'x8'	Heavy	Contaminated	Dispose	
5	Fume Hoods - 3	4'Wx1'deep	Heavy	contaminated	Dispose	
	Ductwork- metal ~50'	18" - 2'D	Medium	Contaminated	Dispose	Connects hoods
6	Metal plating tank	4'x4'x4'	heavy	yellow residue	Dispose	Full of ice
7	Wooden shelf	4'x3'x3'	Heavy	contaminated	dispose	
8	Metal Plating tank	2'x3'x5'	Heavy	residue in bottom	dispose	Segmented tank - 2 compartments
9	Electrical boxes - 10					on walls
10	Control panels - 5					on walls
11	Floor is littered w/ misc. garbage, steel, PVC pipe, chairs, buckets	various ~ 1 yard total	light	contaminated	dispose	
12	Shelving units -5	3'x4'x7'	heavy	dirty	C&D	wood and metal
13	Metal plating tank	4'x4'x4'	heavy	crusty white residue	scrap	
14	Metal plating tank- lined	4'x4'x4'	heavy	black residue	dispose	
15	Metal plating tank	4'x4'x8'	heavy	green powdered residue	dispose	
16	Metal plating tank	4'x6'x4'	heavy	green powdered residue	dispose	
17	Metal plating tank	1'x3'x4'	medium	white powder residue	dispose	full of ice
18	17H Drum		heavy	?	?	full, frozen to ground
19	Conduit ~ 200'	3/4" - 1"			Scrap	
20	Water lines - 1"					Covered w/ asbestos
21	Fluorescent lights - 4				C&D	on ceiling
22	Metal shelving units - 5	3'x2'x5' - 8'x6'x3'	heavy	dirty	C&D	
23	2" Styrofoam ~ 10 sheets	2'x8'			C&D	
25	Floor is littered w/ misc. poly, rug, metal parts, hoses, wood	various ~ 1 yard total	light	dirty, possibly contaminated	dispose	

Chrome Plating Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Lead pot liners	1.5'hx1'd	heavy	lead	dispose	
2	Lead acid batteries ~10		medium		recycle	
3	Metal plating tank	2'x3'x4'	heavy	white residue	scrap	
4	Metal plating tank	3'x3'x3'	heavy	rusty but clean	scrap	
5	Metal plating tank	2'x2'x3'	heavy	white powdered residue	scrap	
6	Metal plating tank	2'x2'x3'	heavy	white powdered residue	scrap	
7	Metal plating tank	2'x2'x4'	heavy	white powdered residue	scrap	
8	Metal plating tank	3'x5'x3'	heavy	$^1/_4$ full of greenish ice	scrap	
9	Metal plating tank	2'x3'x4'	heavy	3" of greenish ice	scrap	
10	17H drum		?	white powdery residue	dispose?	frozen to ground
11	17E drum		?	full	dispose?	frozen to ground
12	Metal plating tank	3'x3'x4'	heavy	2" of greenish ice	scrap	
13	Metal plating tank	3'x4'x5'	heavy	white powdery residue	scrap	
14	Plastic plating tank	2'x3'x4'	heavy	dusty	dispose	full of poly sheeting
15	Oven?	8'x8'x6'	heavy	white powdery residue	dispose	wood & steel construction
16	Wood workbenches		heavy	dusty	C&D	
17	Metal plating tank	3'x4'x5'	heavy	white powdery residue	scrap	
18	Metal plating tank	3'x4'x5'	heavy	white residue	scrap	
19	Metal plating tank	1'x3'x4'	heavy	white powdery residue	scrap	
20	Metal plating tank	2'x3'x4'	heavy	green powdery residue	scrap	
21	Metal plating tank	4'x4'x4'	heavy	white residue	scrap	
22	Metal plating tank	4'x4'x8'	heavy	Partially filled w/ greenish ice	scrap	
23	Plastic plating tank	2'x2'x3'	heavy	clean	dispose	full of garbage/poly
24	Metal plating tanks	2'x4'x12'	heavy	white residue	scrap	
25	Metal plating tanks	3'x3'x3'	heavy	clean	scrap	
26	Metal plating tanks	4'x4'x4'	heavy	green coating	scrap	
27	Plastic plating tank	4'x4'x5'	heavy	clean	dispose	
28	Angle iron stand	4'x5'x6'	heavy	clean but rusty	scrap	
29	Metal plating tank	3'x4'x4'	heavy	full of ice	scrap	under hole in roof
30	Metal plating tank	3'x4'x4'	heavy	full of ice	scrap	under hole in roof
31	Metal plating tank	3'x4'x4'	heavy	blue-green residue	scrap	

Main Plating Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
32	Metal plating tank	3'x6'x4'	heavy	clean	scrap	
33	Metal plating tank	3'x4'x4'	heavy	clean	scrap	
34	Metal plating tank	3'x4'x4'	heavy	green & white residues	scrap	
35	Metal plating tank	3'x4'x4'	heavy	green & white residues	scrap	
36	Metal plating tank	3'x4'x4'	heavy	green & white residues	scrap	
37	Metal plating tank	3'x4'x4'	heavy	yellowish crystals	scrap	
38	Metal plating tank	3'x4'x4'	heavy	white powdery residue	scrap	
39	Metal plating tank	3'x4'x4'	heavy	clean	scrap	partially full of ice
40	Metal plating tank	3'x4'x4'	heavy	green/ white & pink ice	scrap	
41	Pile of garbage	~ 4 yards	light - medium	dirty/ possible contaminated	dispose	steel pieces, racks, shelves, cardboard
42	Metal plating tank	3'x4'x4'	heavy	residue	scrap	
43	Metal plating tank	3'x4'x4'	heavy	residue	scrap	
44	Wooden platform in front of tanks	2'lengthsx50'	medium	contaminated	dispose	has base composed of steel and wood - base is ~ 1' high
45	Exhaust ducts-galvanized	3'Dx10'L	heavy	contaminated	scrap	
46	PUMEX?	~3X80#bags	light	dirty	dispose?	fine white powder
47	Water softener salt pellets	2x80#bags	light	dirty	dispose	
48	bags of sodium sulfite & sodium bicarb	~ 10 100# bags	light	dirty/ ripped	dispose	
49	Plastic plating tank	2'x3'x3'	heavy	black oily residue	dispose	
50	Plastic plating tank	2'x3'x3'	heavy	green residue	dispose	
51	wood frame	6'x10'	medium	dirty		
52	Metal plating tank	3'x4'x5'	heavy	white residue	scrap	
53	Metal plating tank	3'x4'x5'	heavy	white residue	scrap	
54	Steel table	6' long	heavy	dirty	scrap	baskets on top
55	metal plating tank	1'x3'x2'	medium	heavy contamination	scrap	
56	metal plating tank	3'x4'x5'	heavy	full of ice/very rusty	scrap	
57	metal plating tank	4'x8'x8'	heavy	clean	scrap	
58	propane cylinders - 2	~ 30 LB	light	empty	dispose	
59	Metal plating tank	3'x4'x10'	heavy	white residue	scrap	
60	Metal plating tank	3'x4'x6'	heavy	white residue	scrap	

Main Plating Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
61	Metal plating tank	4'x3'x10'	heavy	white powder residue	scrap	
62	Metal plating tank	5'x4'x6'	heavy	white powder residue	scrap	
63	Metal plating tank	5'x3'x8'	heavy	full of ice & misc. garbage	scrap	
64	Hoist		heavy	rusty	scrap	on ceiling
65	fluorescent lights - 11				C&D	on ceiling
66	electrical boxes - ~25				scrap	on walls
67	Pile of bricks, wood, PVC pipe pieces, desk fan	various ~ 1 yard	light	dirty, probably contaminated	dispose	
68	Conduit ~ 500'	3/4" - 2"			scrap	on walls
69	Boiler	4'Dx12'L	heavy	dirty	scrap	
70	Expansion tank	30"Dx5'L	heavy	dirty	scrap	
71	Wood workbench	1'x4'x3'	medium	dirty	C&D	
72	Fuel oil pump	3"Hx2'x8'	heavy	dirty/oily	scrap	oil on floor by pump
73	Metal parts cabinet	2'x3'x8'	heavy	dirty	scrap	contains misc. furnace parts
74	Expansion tank	3'Dx5"L	heavy	dirty	scrap	
75	Water softeners -2	1.5'Dx4.5'H	medium	dirty	C&D	Sears/Lindsay
76	Fluorescent Lights - 4				C&D	2 hanging, 2 on floor
77	Electrical box -6				scrap	on walls
78	Condensate return pump	1'x3'	medium	dirty	scrap	
79	Water tank	18"x2'	medium	dirty	scrap	
80	Lockers-metal	1'x3'x6'	medium	dirty	scrap	
81	Oil tanks -2	275 gal	heavy	dirty/ oily	scrap	~1/4 full
82	Work benches - 4	~5'l	heavy	dirty	C&D	
83	Ovens - 2	2.5'x3'x3'	heavy	dirty	C&D	
84	Misc. mechanical & electrical part on floor, workbenches	various ~ 1 yard	light	dirty	scrap	
85	Electrical Boxes -10				scrap	on walls

Main Plating Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal shelves	8'x2'x8'	heavy	dirty	scrap	
2	Metal cabinet	2'x2'x5'	medium	dirty	scrap	
3	Metal Workbench	8'x3'x3'	heavy	dirty	scrap	
4	Metal Workbench	4'x3'x3'	heavy	dirty	scrap	
5	30 gal metal drum & debris		medium	dirty	scrap	
6	Wood desk	3'x6'x3'	heavy	dirty	scrap	
7	Metal cabinet	4'x2'x6'	heavy	dirty	scrap	
8	Rack & Bins	8'x2'26'	heavy	dirty	scrap	full of assorted fittings
9	30 gal metal drum & asst piping		heavy	dirty	scrap	
10	Metal racks	8'x2'x6'	heavy	dirty	scrap	
11	racks & metal bins -2	12'x2'x8'	heavy	dirty	scrap	
	wooden table, metal chair,	2'x2'x3' Cart				
12	wood/metal cart	4'x2'x2'	heavy	dirty	scrap	
13	Wood wire reel, wood table	2'x3'x3'	heavy	dirty	C&D	
14	shopping cart, metal table	2'x5'x3'	heavy	dirty	scrap	
	Room full of assorted wires,					
	conduit, electrical motors &					
15	debris	~4-5 yards				

Main Plating Room - Upper

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal desk & table, cardboard box, insulation, plastic	various ~1 yard total	medium	dusty	scrap	(dispose of cardboard, poly)
2	Metal table, wood table & asst debris	3'x3'x4' & 3'x6'x3	heavy	dusty	scrap	(wood table C&D)
3	Metal desk, metal shelf & asst. debris	3'x6'x3' & 31'x5'x4'	medium	dusty	scrap	
4	wood shelves -4 & asst debris	8'x2'deep	heavy	dusty	C&D	Built in
5	Metal Table	3'x5'x5'	medium	dusty	scrap	
6	metal desk & asst debris	3'x6'x3'	medium	dusty	scrap	
7	small metal shelves -2 & asst debris	2'x2'x3'	medium	dusty	scrap	
8	metal desk, asst debris	3'x6'x3'	medium	dusty	scrap	
9	4 metal chairs, asst debris		light	dusty	scrap	
10	walk in safe & metal shelves	2'x8'	heavy	dusty	scrap	
11	wood shelf, metal desk, asst debris	3'x6'x3' & 1'x5'x3	medium	dusty	scrap	Shelf - C&D
12	Wood table	20"x3'x3'	medium	dusty	C&D	

1st Floor Office

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Debris (wood, Styrofoam, fiberboard, metal)	various ~ 2 yards total	light	dirty	dispose	(scrap metal pieces)
2	WOOD DESK	3'X6'X6'	heavy	dirty	salvage?	in good shape
3	Curbstones - 3	3'x6'x6"	heavy	dirty	C&D	
4	Wood Desk	3'X6'X6'	heavy	dirty	C&D	broken
5	Pallets ~ 25		light	dirty	C&D	one has heavy contamination & should be disposed
6	Wood Drum holder	3'x2'x2'	light	dirty	C&D	
7	Garage door panels ~ 20	2'x12'	light	dirty	scrap	
8	Large wood cabinet	8'x3'x3'	heavy	dirty	C&D	
9	metal desk	3'x6'x3'	medium	dirty	scrap	
10	wood cabinet	6'x4'x3'	heavy	dirty	C&D	
11	switch gear on wheels	2'x3'x7'	heavy	dirty	scrap	
12	Poly, cardboard, shopping cart, small metal pieces, scattered in floor	various ~ 1/2 yard	light	dirty	C&D	

2nd Floor - Chem Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal desk	3'x6'x3'	medium	dirty	scrap	
2	Secretary, wood	3'x3'x2'	medium	dirty	C&D	
3	Metal rolling racks -4	6'hx8'long	light	dirty	scrap	
4	Fluorescent lights 12		light		C&D	6 hanging, 6 on floor
5	suspended ceiling				C&D	frame hanging, ~1/2 tiles on floor
6	Floor litter w/ ceiling tiles, wood, cardboard, vinyl door strips	various ~ 2 yards	light	dirty	C&D	
7	Windows ~6	various ~ 1/2 yard	light	dirty	C&D	
8	boxes of labels on pallets		light	dirty	trash	6 small boxes
9	Wood shelf unit	~7' long	medium	dirty	C&D	single shelf, built in

2nd Floor Office

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal garage door, plywood signs			dirty, probably contaminated	scrap	Between Parts Room & Anodizing Room
2	Metal Shelves ~ 13	3'x3'x6'-3'x6'x6'	Heavy	very rusty	scrap	
3	Gas fired water heater	3'Dx5'	heavy	dirty	C&D	Exhaust piping attached
4	Cardboard tubes w/ steel rod inside	3'x6" (rods 1/8"-1"D)	light	dirty	scrap	
5	Motors ~ 20	1/3 hp-1-hp	heavy	dirty	scrap	Items 5-12 are scattered on the shelves
6	Styrofoam ~ 50 sheets	3'x3'x2"	Light	dirty	C&D	
7	Photocopier	3'x3'x3'	heavy	dirty	C&D	in very bad shape
8	Small boiler	1'x2'x3'	heavy	dirty	scrap	
9	Heat exchangers -3	plate - 2(2'x3') pipe 4 lengths of 1 $^{1}/_{4}$"pipe	light	all dirty, one plate exchanger (on shelf) is very contaminated	scrap	
10	immersion heater	1'x22'	light	contaminated	dispose	
11	Crate of wood, wood pieces	brick size - 4'x8"x*'	light - medium	dirty	C&D	
12	Small electrical & mechanical parts, piping, empty cans & glass jugs	various	light	dirty	scrap	
13	Heat exchanger	3 $^{1}/_{4}$"pipe	medium	contaminated w/ greenish powder	dispose	
14	Floor is littered w/ parts, ceiling tiles, plastic balls, drum liner, bricks, insulation	various ~ 2 yards	light	dirty	C&D	
15	Electrical box w/ 3" conduit	3'x4'		dirty	scrap	on wall
16	Fluorescent lights - 2				C&D	
17	Electrical boxes, switches - 4				scrap	on walls
18	Baskets, metal ~ 20			dirty	scrap	hanging from sanitary line
19	Conduit ~ 200'	3/4" - 3"		dirty	scrap	on walls
20	sanitary line					

2nd Floor - Parts Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal Shelving units -13	4.5'x7'x2' - 10'x2'x3'	medium	dirty/ very rusty	scrap	
2	Baseboard heaters - 12	1'x10'	medium	rusty	scrap	
3	Hot water heater	5'x2'	medium	dirty	C&D	
4	Furnace	2'x3'x6'	heavy	rusty	scrap	w/ piping attached
5	Furnace	2'x3'x6'	medium	dirty	scrap	free-standing
6	Electrical switch boxes ~ 50	2"x2" - 3'x3'	light - medium	dirty	scrap	on shelves/floor
7	Electric heater	2'	light	very rusty	scrap	
8	Fluorescent lights				C&D	1 hanging, 2 on floor
9	Ceiling tiles ~ 20	1'x1' - 2'x2'	light	dirty	C&D	
10	Light ballasts ~10		light	dirty	dispose	probably contain PCBs
11	Various electrical and	various	light	dirty	scrap	
12	Metal tank w/ insulation	2'x2'x3'	medium	contaminated, looks like caustic residue	dispose	
13	Floor is littered w/ ceiling tiles, Styrofoam, 1" plastic balls, cardboard	various ~ 1/2 yard	light	dirty	C&D	
14	Electrical boxes - 5				scrap	on walls
15	Conduit ~ 100'	3/4" - 1"			scrap	on walls

Items 6-10 are located on shelves and the floor in various locations throughout the room.

2nd Floor Parts Storage (Rear)

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Junction Box				scrap	on wall
2	Scrubber	5'Dx6'	heavy	dirty	scrap	full of pigeons, galvanized, exhaust attached (PWP-68)
3	Motors - 3	3'D x 7'L	heavy	dirty	scrap	
4	Control box	2'x3'x4'				VPPC-6
5	Scrubber	4'x5'	heavy		dispose?	Floor contaminated by scrubber
6	Rectifiers - 2	3'x4'x5'	heavy	dirty	scrap	(probably contain mercury)
7	Styrofoam sheets - hundreds	2'x8' (1/2-3")	light	dirty	C&D	
8	Metal shelving units -3	4'x3'x6'	medium	dirty	scrap	2-shelving units full of asbestos pipe wrap, third contains misc.
9	Misc. Lumber, wood doors, Styrofoam insulation	entire length of wall ~ 5 yards	light to medium	dirty	C&D	
10	Hangers/baskets for plating - hundreds hanging from racks	various ~ 2 yards	light	most clean, few contaminated	scrap	
11	Electrical equipment (in pieces)	4'x4'x4'	heavy	dirty	scrap	
12	Misc. piping, racks, steel, shopping carts full of steel	various ~ 5 yards	light to medium	dirty, but no visible contamination	scrap	
13	Metal/fabric bins full of misc. electrical cables	various~ 2 yards	light	dirty	scrap	
14	Metal Shelves	3'x4'x20'	heavy	dirty	scrap	
15	on shelf, misc.. steel, Styrofoam pieces	various ~ 1 yard	light to medium	dirty	scrap / C&D	
16	Piping (galvanized, black iron, plastic, copper)	3/4-3" 1'-20"	light to heavy	all dirty/rusty, but no visible contamination	metal-scrap,	plastic-C&D (some on racks, some on floor)
17	Generator	4'x8'x3.5'	heavy	dirty	scrap	
18	Steel Shelf	3'x5'x10'	heavy	dirty	scrap	misc. steel, plumbing supplies
19	Hose reels ~4	2' d	heavy	dirty	scrap	
20	Hanging baskets/plastic	various ~ 1/2 yard	light	no visible contam.	dispose	hanging from ceiling
21	Fluorescent lights ~ 10				C&D	
22	Conveyor belt tightener	1'dx3.5'high	heavy	rusty	scrap	(cast iron?)
23	1 Electrical box ~ 100' conduit				scrap	

2nd Floor Pipe & Spring Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal plating tanks	4'x3'x12'	heavy	white coating on interior	dispose	tanks consists of 2 long compartments
2	Roofing/ insulation (fiberglass)	various ~ 1 yard	medium		C&D	Partially on tanks, from roof collapse
3	Metal Plating tank	4'x4'x4'	heavy	clean	dispose	wood chair in tank
4	Metal Plating tank	4'x4'x8'	heavy	clean	dispose	ice in bottom
5	Metal Plating tank	4'x4'x4'	heavy	clean	dispose	1/3 full of ice
6	Pile of wood, Styrofoam, ceiling tiles, light fixture housing, poly, insulation, iron fence	various ~ 1/5 yards	light	dirty	C&D	
7	Generator & motor	3'x6'x1'(base)	heavy	dirty	scrap	
8	Misc. motors - 3	2'x3'	heavy	dirty	scrap	
9	Hoist frame-metal		heavy	dirty/rusty	scrap	on wheels
10	Generator w/ motor	<3'x6'x1'	heavy	dirty/rusty	scrap	
11	Wood work bench	4'x16'x3'	heavy	dirty	C&D	covered w/ newspapers/debris
12	2-Steel work benches, rolling rack	~ 4'x8'	heavy	dirty	scrap	
13	Metal tank w/heater	4'x4'x4'	heavy	dirty/rusty	dispose	
14	Wood stand/ bench	5'x2'x5'	medium	dirty	C&D	
15	Small stand (angle iron)	4'x2.5'	heavy	dirty	scrap	
16	Metal lockers/cabinets -3	largest 4'x3'x2'	medium	dirty	scrap	
17	Office chairs 2		light	dirty	C&D	
18	Electrical boxes - 4 w/2" conduit ~ 150'				scrap	
19	3/4" conduit ~ 150'				scrap	
20	Fluorescent lights - 4				C&D	hanging
21	Water line ~ 100'					
22	Gas line ~ 100'	1/2-3/4"				

Entire floor is littered w/ plastic, tiny metal parts, wood, leaves. A good portion of the floor is covered with ice. **Total volume ~ 1 yard**

2nd Floor - Anodizing Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Cardboard box of paper/debris	3'x3'	light	dusty	C&D	
2	Floor littered w/ briefcases(2), ceiling tiles, speaker, metal chair	various ~ 1.5 yards	light	moldy, wet. dusty	C&D	
3	Ceiling tiles, insulation	various~ 1 yard	light	dry, moldy, dusty	C&D	
4	Duct work, ceiling tiles, foam insulation	various~ 1/2 yard	light	dusty	C&D	
5	Scrap papers		light	dusty	C&D	
6	Window frames -2	4'x5'	light	dusty	C&D	
7	Ceiling tiles, plastic, wood	various ~ 2.5 yards	light	dusty/moldy	C&D	
8	Metal bookshelf, breaker panel	4'x3'	light	dusty	scrap	
9	Metal shelves -3	3'x6'	light	dusty	scrap	also scraps of wood shelves
10	Ceiling tiles, debris	various ~ 1.5 yards	light	moldy	C&D	
11	Wood work table	5'x24'	heavy	dusty	C&D	littered w/ garbage/animal waste
12	Scrap rugs(3), paper rolls, ceiling tiles, metal chairs	various ~ 1 yard	light	dusty	C&D	
13	Wood hand truck, wood table, sewing machines (2) Cabinets (2) small metal table	2'x3'-4'x8'	medium	dusty	C&D	Sewing machines are industrial type, may have scrap value
14	Metal chair, shelf	2'x2'x3'	light	dusty	C&D	
A	Suspended Ceiling, fluorescent lights (6), 6 outlets, 2 switches	Various	light	dusty	C&D	
B	Suspended Ceiling, Fluorescent lights (6), 11 outlets, 3 switches	Various	light	dusty	C&D	
C	Suspended Ceiling, Fluorescent lights (18), numerous outlets & switches, heating ductwork	Various	light	dusty	C&D	
15	Sink, toilet, debris		medium	dirty	C&D	
16	Metal desk, 4-drawer table, wood shelf units, drawers, debris	desk-5'x3' shelf 10'x2'x6'	medium	dusty	C&D	

2nd Floor - Large Office Area

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
17	4 drawer table, wood table, metal desks(2), debris	5'x3'-5'x5'	medium	dusty	C&D	
18	Metal table unit	2'x24'	medium	dusty	C&D	
19	Pile of asst metal pieces	various	light	dusty	scrap	
20	Small metal racks, duct pieces, wood table top	3'x2'x2'-5'x5'	light	dusty	C&D	metal may be scrapped
21	Couch(8'), metal table, debris	various ~ 1 yard	light - medium	dusty	C&D	
22	metal tables(2), chairs (3-metal,1-wood), small wood & metal racks	2'x3'x3'-2'x6'x3'	light	dusty	C&D	metal may be scrapped
23	Pile of papers ~1' high covers 80% of floor, metal desk, wood shelves, metal table, metal racks	Racks 1'x2'x2' Desk 3'x5'x3' shelves 4'x1'x5' table 3'x6'x3'	light	dusty	C&D	
24	Cardboard box & debris	2'x2'	light	dusty	C&D	

Areas 16-20 also had paper debris & pieces of wood shelving on floor (1'x10'x1')

Total volume ~ 1/3 yard

2nd Floor - Large Office Area

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Electrical control box	5'x1.5'x2'	heavy	dirty	scrap	(GE)
2	Steel door		light	dirty	scrap	
3	Lead smelter	3'x3.5'	heavy	contaminated w/ lead	???	
4	telephone booth (metal)	3'x2'x3'	medium	rusty/dirty	scrap	
5	stove	3'x3'x2'	medium	dirty	scrap	
6	heated cabinet on wheels	3'x4'x4'	heavy	dirty	dispose	covered w/ asbestos, plastic bag of some sort of powder sitting on top
7	Car seats, bucket (2)		light	dirty	dispose	
8	Furnace (2)	3'x3'x2'	heavy	contaminated w/ lead	??	
9	Metal stands (2)	3'x4'x2'	medium	dirty	scrap	
10	gas line 3/4"				scrap	goes ~ 3/4 around room
11	water line				scrap	goes ~ 3/4 around room
12	Electrical conduit				scrap	goes around entire room
13	Fluorescent lights - 4				C&D	hanging
14	electrical boxes -3				scrap	on wall
15	Pulley assembly, scoop, small metal pieces	various ~ 1/2 yard	light	dirty	scrap	

3rd Floor - Lead Smelting Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Metal shelves - 3	8/x18"x3'	light	rusty/dirty	scrap	
2	Parts cabinets 2 (metal/wood)	3'x1.5'x6'	medium	rusty	scrap	
3	Workbenches -3 (wood & metal)	6'	heavy	dirty	C&D	
4	metal shelves -8	5'x3'	heavy	dirty	scrap	
5	Tires -2		light		trash	
6	Fluorescent ballasts ~12				dispose	
7	Misc. small electrical/mechanical parts	various ~ 1/2 yard	light	dirty	scrap	
8	fluorescent light fixture w/ ~25' of conduit				C&D	
9	Exhaust fans -2	~2.5' diameter	light	dirty	scrap	

3rd Floor - Parts Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Water softener	4.5'x1'D	heavy	rusty	scrap	
2	Pallet of switches ~ 25	various	light	dirty	scrap	
3	Galvanized duct , misc. metal piping, plastic tumbling baskets	galvan. 3'Dx4"	light	dirty	scrap	
4	Motors -3	various	heavy	dirty	scrap	also, filter unit
5	Wood pallets ~ 5		light	dirty	C&D	
6	Voltage regulator	3.5'x3'x2'	heavy	dirty	scrap	
7	Electrical boxes w/ ~ 100' of conduit	3/4"			scrap	

3rd Floor - Mezzanine Area

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Misc. windows, doors, shelves (mostly wood), electrical boxes	various ~ 3 yards	light	dirty	C&D	~ 100 pieces total
2	Metal cans, 17.5 gallon ~ 50		light	dirty	scrap	empty water cans
3	Transformer	2.5'x1.5'x1'	heavy	rusty/dirty	scrap	
4	Metal shelves w/ misc. gauges & elec. components	8'x4'x3'	medium	rusty	scrap	all pieces small /light
5	Pyrometer	10" diameter	light	OK	Salvage?	
6	Pile of switches, breakers, glass, bricks, particle board, shelves, etc., 17 gal. drum of garbage, empty steel drum, 2 fiber drums of trash, drum w/ bottles, (2) 2-ton winches, pallets of bricks	various ~ 5 yards	light-medium	dirty	scrap-metal/ electrical, balance C&D	entire pile covers an area ~ 20'x50'
7	Black oval spacers ~ 60	18"/6'L	light	dirty	C&D	
8	Electrical boxes -3	4.5'x1'x2'	light	dirty	Scrap	
9	Electrical components ~ 15	3'x2'x1'	medium - heavy	dirty	scrap	motors, boxes, etc.
10	Black electrical component panels	3'x3'	light	dirty	C&D	
11	Gear boxes ~5	1'x1'x2'	heavy	dirty	scrap	
12	Corrugated roofing ~200 sheets	28"x6'	light	dirty	scrap	mostly galvanized, some fiberglass
13	Steel shelves	6'x4'	medium	dirty	scrap	
14	Electrical boxes, misc. pipes, flexible conduit, racks	various	light-medium	dirty	scrap	
15	Misc. mechanical supplies, bushings, motors, gear boxes, valves, conveyor belts	shelf dimensions 8'x3'x2'	light - medium	dirty	scrap	most on metal shelf
16	Electrical components, switches on metal shelves	shelf dimensions 4'x12'x3'	light - heavy	dirty	scrap	

4th Floor - Brewery Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
17	Wood tables covered w/ electrical box covers, switches, lifting cables, burners, black component boards	various ~ 1 yard	light	dirty	C&D	
18	Blower w/motor	2.5'x1'x2'	heavy	dirty	scrap	
19	Metal fume hoods ~5	6'wx5'l'6"deep	heavy	rusty, contaminated	dispose?	
20	Galvanized ductwork	4"-3' D	medium-heavy	dirty, covered w/ bird droppings	scrap	
21	Motors -2, ductwork		heavy	dirty	scrap	on stairs

4th Floor - Brewery Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Water cooler	4'x1'x1'	light	dirty	C&D	
2	Metal tub	1.5.'x3'x2'	heavy	dirty	scrap	upside-down
3	Metal shelves	6'x2'x4'	medium	dirty	scrap	few pieces of scrap, ceiling tile
4	5 metal tubs (rubber exterior), 2 electrical panels, metal rack, wood rack, hood vent	2'x2'x3'	light	dirty	dispose	also in pile, insulation, Vermex, wood crate
5	Metal plating tank	4'x4'x4'	heavy	dirty	dispose	coating is peeling from interior
6	Metal cart, rack	4.5'x3'x1'	heavy	rusty	scrap	
7	3-I beams & metal rack	6' long	medium	rusty	scrap	
8	Metal tubs -2	1.5'x3.5'x2'		rusty, no contamination	scrap	
9	Plastic cylindrical strainer	1.5'dx3'l	light	dusty	C&D	
10	Metal baskets 2	3'x3'	light	rusty	scrap	steel hangers
11	3 wood pallets, electrical cable					
12	Metal tub	3.5'x3'x3.5'	heavy	clean/rusty	scrap	
13	Wood credenza	2.5'x5'x3'	medium	dirty	C&D	
14	Metal tub	3'x4'x3.5'	heavy	no contamination	dispose	Rubber coated
15	Metal tub	2'x2'x3'	medium	no contamination	dispose	coating is peeling
16	Metal tub	4'x4'x4'	heavy	no contamination	dispose	UPWP74
17	Wood tub - rectangular	2.5'x5.5'x2'	heavy	green residue- nickel?	dispose	USPS41
18	Wood cart w/ pump		medium	dirty	C&D	
19	16 tanks- metal	1.5'x1'x1'- 2'x5.5'x5.5'	medium to heavy	all empty, rusty, contain some dirt, no contamination	scrap	
20	Metal cart - 6	1.5'x3'x4'	medium	dirty	scrap	with wheels, in poor shape
21	Metal shelves	1.5'x3'x4'	medium	dirty	scrap	
22	Metal frame, hood vent, metal plates, wheel	various ~ 1/2 yard	light - medium	rusty	scrap	
23	Wooden carts 3	2'x2'-5'x2'	medium	dirty	C&D	w/wheels
24	Metal (mesh) baskets -4	1-4'X3'X3' 4- 3'X1.5'X1.5'	LIGHT	rusty	scrap	

4th Floor - Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
25	Metal tank w/coating	4.5'x1'x2'	medium	no contamination	dispose	
26	Wood wire reel	3'D x 2.5'	medium	dirty	C&D	
27	30 gal ceramic container	1.5'Dx2'H	light	no contamination	C&D	
28	30 gallon poly drum		light	clean	C&D	empty
29	Metal rack on pallet	3'x4'x6'	medium	rusty	scrap	
30	Cart mounted pump		medium	rusty	scrap	
31	Heated tank	4'x3'x2'	heavy	very dirty, no contamination	scrap	
32	Gas fired heater	3'x4'x2'	heavy	dirty	scrap	
33	Metal parts containers	2'x1'x1'	heavy	rusty	scrap	
34	Metal plating tank	3'x3'x4'	heavy	clean	scrap	Contains paint chips
35	2-mechanical pulleys	1'D	heavy	rusty/dirty	scrap	
36	Mechanical equipment	3'x3'x4.5'	heavy	dirty	scrap	cast iron base
37	Blower/mixer	3'x5'x2'	heavy	contaminated	scrap	
38	Dual cage blower, metal	2.5'x2.5'x5'	heavy	dirty, no contamination	scrap	
39	Lathe	3'x3'x4'	heavy	rusty	scrap	
40	Electrical Equipment	3.5'x2'x2'	heavy	rusty	scrap	w/DC motor
41	Recto-plater	1.5'x2'x4.5'	heavy	dirty/rusty	scrap	
42	Debris, drum cart, baskets, screens, brackets, metal rack, wood door, window frame, hot water heater, wood cart	various ~ 1.5 yards	light to medium	dirty, no contamination	scrap metal pieces	balance C&D
43	Metal tub	4.5'x1.5'x2'		rusty	scrap	
44	Metal plating tank	4'x3'x'3'	light	rusty, no contamination	scrap	
45	Electrical equipment	4'x2'x3'	medium	rusty	scrap	
46	Metal plating tank	3'x3'x4'	heavy	no contamination	scrap	
47	Metal plates ~ 150	3'x3'	light	dusty	scrap	
48	Wood barrel w/ ceramic pieces, glass, metal	various	light	dusty	C&D	
49	Metal tub	4'x3'x3'	light	rusty, no contamination	scrap	
50	Acoustical telephone booth, metal	2.5'x2'x2'	light	no contamination	C&D	

4th Floor - Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
51	Metal ductwork		light	no contamination	scrap	
52	Metal tub	2'x2'x3'	light	no contamination	scrap	
53	Wood frame/stand, pallets, metal frame	various ~ 1 yard	light	no contamination	C&D	metal frame may be scraped
54	Electrical equipment	5'x2'x2.5'	heavy	no contamination	scrap	
55	Metal file cabinet	3.5'x3.5'x2'	light	dirty	scrap	
56	wood table, desk	3.5x2.x3	medium	dirty	C&D	
57	Wood crate full of metal piping & wiring	3'x3'x3'	medium	dirty, no contamination	C&D	pipes/wiring may be scrapped
58	Wood carts w/ wheels -2	4'x4'	heavy	dirty	C&D	
59	Small cage blower	1'x2'x2'	light	dirty	scrap	
60	Metal rack	3'x3'x3'	medium	dirty	scrap	
61	Steamer trunk- empty		light	dirty	salvage	(popular yard-sale item!)
62	Electrical equipment	2.5'x1.5'x3'	medium	dirty	scrap	
63	Chain link fence - 6 rolls	6' length	medium	dirty/rusty	C&D	
64	Wood frames/pallets		light	dirty	C&D	
65	Metal tub	4.5'x3'x2'	medium	no contamination	scrap	
66	Metal tub	1'x3'x3'	medium	no contamination	scrap	
67	1/2 drum & metal box		light	no contamination	C&D	contains chains, wood
68	6 Metal tubs	2'x3'x2'	light	no contamination	scrap	
69	Metal ducts -2	18"x6'	medium	no contamination	scrap	
70	heated pot w/ black solid inside	~ 3 gallons	light	???	dispose	
71	Oven	3.5'x2.5'x4.5'	heavy	rusty	C&D	
72	Wood desk	3'x2.5'x5'	medium	dirty	C&D	
73	Screen door, pallets, windows, metal shelves	various ~ 1/2 yard	light	dirty	C&D	
74	gas fired heating unit	2.5'x2.5'x2.5'	heavy	dirty	C&D	
75	Metal & wood carts	various	light	dirty	C&D	
76	Firebrick ~85		light	dirty, broken	C&D	on pallet
77	55 gallon drum of gears	various	light	dirty	scrap	
78	various metal racks	various	light-medium	dirty	scrap	

4th Floor - Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
79	shopping cart		light	dirty	C&D	
80	Fluorescent light				C&D	
81	Heat exchanger	6' l x 3 lengths	medium	contaminated	dispose	

4th Floor - Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Blower	3'x3'x3'	heavy	rusty	scrap	General Industrial
2	Pallet of scrap metal, motor, pump, wrought iron fence (8'x2')	various	light-heavy	dirty	scrap	heat vent covers (6x2')
3	Lathe	5'x3'x2'	heavy	rusty	scrap	
4	wood table & classroom desk	table 4'x3'x2'	light	dusty	C&D	
5	Equipment w/ motor & radiator	4.5'x2.5'x2.5'	heavy	rusty	scrap	
6	Tub of brackets	2.5'x2.5'	light	dirty/dusty	scrap	sitting on pallet w/ drum lid & fittings
7	Heater cover/shelving	2'x1'x1'	light	dirty	scrap	
8	Mechanical lift w/ air conditioner	3'x2'x3.5'	heavy	dirty/dusty	scrap	may be able to be rolled
9	Pallets, I-beams, shelving, heater covers	2 x4'	I-beam heavy, rest light	dirty/rusty	scrap	**<u>General debris throughout the area, wood, shovels, dirt, leaves, bricks</u>** **Total volume ~ 1 yard**
10	Oil fired furnace	2.5'x2'x4.5'	medium	dirty	scrap	
11	Cart w/ wood box containing classroom desk, pallets & scrap	cart 4'x3'	cart-heavy, rest light	dirty/rusty	scrap	
12	Piles of bricks ~ 30		light	dirty/broken	C&D	
13	Steel work table	1.5'x1.5'x3'	light	rusty/dirty	scrap	
14	Wood cabinets	1.5'x1.5'x3'	light	dirty	C&D	
15	2 steel drying racks	5'x2'	light	rusty/dirty	scrap	
16	Windows -4	4'x3.5'	light	dirty	C&D	
17	Floor lamps- metal		light	dirty/rusty	C&D	
18	Drying racks & 3-metal carts	1.5'x2.5'-4'x2'	light	dirty/rusty	scrap	
19	wood bench (trough)	6'x1'x3.5'	medium	dirty	C&D	
20	Metal cart, sump pump w/manhole cover, towel	4'x2'x2'	medium	dirty/rusty	scrap	
21	Heating unit	3.5'x2'x4.5'	heavy	covered/filled w/ bird droppings	scrap?	
22	Wood kitchen table w/ scale	4'x2.5'x2'	light	dirty	C&D	
23	Wood desk top, metal file drawers -2	4.5'x2.5'x1'	;light	dirty	C&D	

5th Floor - Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
24	2Lavoratory sinks	1.5'x2'x1'	light	dirty	C&D	
25	Wood keg	1.5'x2.5'	light	dirty/ bird droppings	C&D	
26	Electrical equipment w/ 2-CO_2 cylinders	2'x1.5'x4'	heavy	covered w/ bird droppings	scrap?	on wheels, has an articulated arm & flexible vent hose
27	4 Pumps	3'x1'x1.5'	heavy	covered w/ bird droppings	scrap	
28	Rectifiers -2	2.5'x2'x5.5'	heavy	dirty/rusty	scrap	(GE & Richardson) may contain oil
29	Metal drying rack holding up galvanized roof drain	5'x1.5'x1.5'	light	dirty/rusty	scrap	On wheels
30	Air pumps/scrap	4'x1.5'x2'	heavy	dirty/rusty	scrap	
31	Fiber drum ~ 3/4 full of trash/ floor sweepings				C&D?	
32	Electrical equipment w/fan & pile of tangled pieces on cart	2'x1.5'x3'	heavy	dirty/rusty	scrap	on pallet/on tarp
33	Electrical control box	2'x1.5'x4'	heavy	dirty/rusty	scrap	on pallet
34	Slate slab leaning on file cabinet	5'x2.5'x2'	heavy	dirty, covered w/ bird droppings	C&D	
35	Electrical equipment	3'x1.5'x1'	medium	dirty	scrap	
36	Lathe	5'x3'x2'	heavy	rusty/dirty	scrap	
37	Tires, headboard, chunks of concrete	concrete 1'x1'x3"	light	dirty	C&D	
38	Electrical equipment	2'x1.5'x3.5'	heavy	dirty/rusty	scrap	
39	Pile of bricks/concrete, 2-kitchen chairs	~ 40 bricks	light	dirty/broken	C&D	
40	Ceramic "sink"	1.5'x1'x1'	medium	dirty	C&D	

5th Floor - Storage Room

UNITED PLATING INVENTORY

Item #	General Description	Dimensions	Weight	Level of Contamination	Scrap or Dispose	Notes
1	Electric Motor	3'x2.5'x3'	heavy	oil & dust	scrap	
2	Electrical panel	2'x1.5'	light	dusty	scrap	
3	Wooden chair		light	dirty	C&D	
4	Wood box	3'x2'x3'	light	dusty	C&D	Covered w/ trash
5	Wood box	4'x3'x3.5'	light	dusty	C&D	
6	Motor	1'x1'x1'	medium	dirty	scrap	
7	Pulleys -2	~1' D	heavy?	rusty	scrap	on ceiling
8	Chain link fence	Height 4"-6' , 2' sections	light	rusty	C&D	
9	Conduit from panel to wall box to ceiling light				scrap	

6th Floor - Storage Room

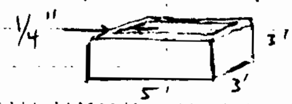
APPENDIX B

SUPPORTING CALCULATIONS FOR DEBRIS ESTIMATE

SUBJECT Representative Articles of Debris

Metal Category

- Representative Article of Debris: Steel Tank
- Dimensions of Typical Steel Tank at Site:
  5' L x 3' W x 3' H x 1/4" thick Open Top



Find:
1) Volume of steel material
2) Weight of steel material
3) Volume and Weight of dust on tank
4) $TCLP_{dust}$
5) $TCLP_{waste}$

1) Volume of steel

$$V_{steel} = [3(5' \times 3') + 2(3' \times 3')](1/4'')\left(\frac{1'}{12''}\right)$$
$$= 1.31\ ft^3$$

2) Weight of steel

- Assume density of steel = 490 lb/ft³

$$W_{steel} = (1.31\ ft^3)(490\ lb/ft^3) = 642\ lb$$

3) Volume and weight of dust covering tank

- Assume tank is covered on both sides with 1/100" dust layer. (except underside of tank)
- Assume density of dust = 94 lb/ft³

$$\text{Exposed Surface Area} = 5(5' \times 3') + 4(3' \times 3') = 111\ ft^2$$

$$V_{dust} = 111\ ft^2 \times (1/100''\ \text{dust layer})\left(\frac{1'}{12''}\right) = 0.093\ ft^3$$

$$W_{dust} = (0.093\ ft^3)(94\ lb/ft^3) = 8.7\ lb$$

SUBJECT Representative Articles of Debris

Metal Category continued...

4) $TCLP_{dust}$

a) For wipe sample data (reported in $\mu g/100cm^2$):

Find the weight of dust covering a $100\ cm^2$ sample area.

$$W_{\text{dust in wipe sample area}} = (100\ cm^2)\left(\frac{1}{100}\text{'' dust}\right)\left(\frac{2.54\ cm}{1''}\right)\left(\frac{1.5\ g}{cm^3}\right)\left(\frac{1\ kg}{1000\ g}\right)$$

$$= 3.81 \times 10^{-3}\ \text{kg dust on } 100\ cm^2 \text{ surface}$$

$$\text{Wipe sample reported} = \frac{\text{mass of contaminant } [\mu g]}{100\ cm^2 \text{ surface}} = \frac{m_c}{100\ cm^2}$$

Substitute:

$$\text{Contaminant Concentration in Dust } (c_{dust}) = \frac{m_c}{3.81 \times 10^{-3}\ \text{kg dust}} = c_{dust}$$

$$TCLP_{dust}\ [\tfrac{mg}{L}] = c_{dust} \times \frac{1}{20}$$

← dilution factor

Using wipe sample data:

$$TCLP_{dust}\ [mg/l] = \frac{WS\ [\frac{\mu g}{100\ cm^2}]}{3.81 \times 10^{-3}\ \frac{\text{kg dust}}{100\ cm^2}} \times \frac{1}{20} \times \frac{1\ mg}{1000\ \mu g}$$

$$TCLP_{dust}\ [mg/l] = 0.0131 \times WS$$

where WS is the wipe sample result in $\mu g/100\ cm^2$.

BY AGL DATE 2/21/96

LAWLER, MATUSKY & SKELLY ENGINEERS

ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

ONE BLUE HILL PLAZA
POST OFFICE BOX 1509
PEARL RIVER, NEW YORK 10965

CHKD. BY ____ DATE ____

JOB NO. 650093

SUBJECT Representative Articles of Debris

Metal Category continued...

b) For sweep sample data:

TCLP analysis was performed on the dust collected off of metallic debris surfaces (e.g., from the tank bottom)

$$\therefore TCLP_{dust} = TCLP\ SS$$

where SS is the sweep sample TCLP result reported in mg/L.

Metal Category continued...

c) For paint chip sample data:

A total contaminant analysis was performed on the paint chips rather than TCLP, so convert:

$$\therefore TCLP_{paint} = PC \times \frac{1}{20} = 0.05\ PC$$

where PC is the paint chip sample result in mg/kg.

5) $TCLP_{waste}$

From the Mass Balance TCLP Method:

$$TCLP_{waste} = \frac{m_d}{m_w} \times TCLP_{dust}$$

where m_d is the mass of the dust or paint
m_w is the mass of the waste debris

For steel tank:

$$m_d = W_{dust} = 8.7\ lb$$

$$m_w = W_{steel} = 642\ lb$$

Substituting:

$$TCLP_{waste} = \frac{8.7\ lb}{642\ lb} \times TCLP_{dust} = 0.0136\ TCLP_{dust}$$

Table B-1 summarizes the $TCLP_{dust}$ and $TCLP_{waste}$ hypothetical values for metallic debris. Wipe, paint chip, and sweep sample data collected from metallic debris was used. For the purposes of this estimate, non-detect (ND) values were set equal to Ø and all concentrations that were reported, regardless of their qualifier,

TABLE B-1 (Page 1 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR METALLIC DEBRIS

United Plating

SAMPLE LOCATION	CADIMIUM Hypothetical TCLP(Dust) (mg/l)	CADIMIUM TCLP(Waste) (mg/l)	CHROMIUM Hypothetical TCLP(Dust) (mg/l)	CHROMIUM TCLP(Waste) (mg/l)	LEAD Hypothetical TCLP(Dust) (mg/l)	LEAD TCLP(Waste) (mg/l)	COMMENTS
Wastewater Treatment Room							
UPWP-42	11.63	0.158	2.04	0.028	0.39	0.005	
UPWP-45	2.03	0.028	21.35	0.290	42.44	0.577	
UPWP-46	150.65	***2.049***	1.44	0.020	1.05	0.014	
UPSP-48	14.00	0.190	0.22	0.003	0.00	0.000	
Mean Value:	44.58	**0.606**	6.26	0.085	10.97	0.149	25% Hazardous; 75% Contaminated
Main Plating Room							
UPWP-26	1.83	0.025	145.41	1.978	18.08	0.246	
UPWP-27	1.23	0.017	13.49	0.184	26.33	0.358	
UPWP-28	0.38	0.005	1.36	0.019	3.75	0.051	
UPWP-29	2.57	0.035	0.96	0.013	2.11	0.029	
UPWP-32	6.66	0.091	15.07	0.205	21.62	0.294	
UPWP-33	126.02	***1.714***	13.49	0.184	19.78	0.269	
UPWP-34	3.21	0.044	8.55	0.116	32.49	0.442	
UPWP-36	736.22	***10.013***	32.75	0.445	29.87	0.406	
UPWP-37	59.87	0.814	605.22	***8.231***	15.72	0.214	
UPSP-17	1.30	0.018	0.18	0.002	4.40	0.060	
UPSP-24	5.30	0.072	0.59	0.008	0.69	0.009	
UPPC-12	-	-	-	-	23.90	0.325	
Mean Value:	85.87	***1.768***	76.10	**1.035**	16.56	**0.225**	25% Hazardous; 75% Contaminated
Chrome Plating Room							
UPWP-18	0.12	0.002	5.55	0.076	2.82	0.038	
UPWP-19	0.03	0.000	19.00	0.258	12.04	0.164	
UPWP-20	0.00	0.000	93.40	1.270	49.26	0.670	
UPWP-21	0.02	0.000	0.00	0.000	209.60	2.851	
UPWP-22	0.03	0.000	10.32	0.140	2.84	0.039	
UPWP-23	0.00	0.000	9.45	0.128	5.59	0.076	
UPWP-24	0.75	0.010	16.24	0.221	43.62	0.593	
UPPC-16	-	-	-	-	2200.00	***29.920***	
Mean Value:	0.14	0.002	21.99	0.299	315.72	**4.294**	12.5% Hazardous 87.5% Contaminated
Silver Plating Room							
UPWP-2	0.45	0.006	34.58	0.470	4.65	0.063	
UPWP-3	0.30	0.004	4.55	0.062	0.63	0.009	
UPWP-6	0.51	0.007	0.87	0.012	1.05	0.014	
UPWP-8	0.16	0.002	19.52	0.265	4.86	0.066	
UPWP-10	0.05	0.001	23.58	0.321	0.52	0.007	
UPWP-11	14.80	0.201	0.00	0.000	67.47	0.918	
UPWP-12	0.03	0.000	0.38	0.005	0.10	0.001	
UPWP-13	0.50	0.007	10.56	0.144	30.13	0.410	
UPSP-7	0.02	0.000	0.08	0.001	0.00	0.000	
UPPC-18	-	-	-	-	345.00	4.692	
Mean Value:	1.87	0.025	10.46	0.142	45.44	**0.618**	Contaminated Debris

TABLE B-1 (Page 2 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR METALLIC DEBRIS

United Plating

SAMPLE LOCATION	CADIMIUM Hypothetical TCLP(Dust) (mg/l)	CADIMIUM TCLP(Waste) (mg/l)	CHROMIUM Hypothetical TCLP(Dust) (mg/l)	CHROMIUM TCLP(Waste) (mg/l)	LEAD Hypothetical TCLP(Dust) (mg/l)	LEAD TCLP(Waste) (mg/l)	COMMENTS
Office - First Floor							
UPWP-48	0.09	0.001	0.58	0.008	0.25	0.003	
UPWP-49	0.02	0.000	0.12	0.002	0.08	0.001	
Mean Value:	0.06	0.001	0.35	0.005	0.16	0.002	Uncontaminated Debris
Chemical Storage Mezzanine							
UPWP-61	0.12	0.002	0.96	0.013	1.02	0.014	
UPWP-62	0.43	0.006	36.16	0.492	3.80	0.052	
UPWP-63	0.30	0.004	334.05	4.543	4.28	0.058	
Mean Value:	0.28	0.004	123.72	**1.683**	3.04	0.041	Contaminated Debris
Anodizing Room							
UPWP-51	0.03	0.000	0.33	0.004	0.24	0.003	
UPWP-52	0.17	0.002	1.31	0.018	5.42	0.074	
UPWP-53	0.03	0.000	0.71	0.010	4.09	0.056	
Mean Value:	0.07	0.001	0.78	0.011	3.25	0.044	Uncontaminated Debris
Pipe & Spring Room							
UPWP-67	0.60	0.008	797.79	***10.850***	42.31	0.575	
UPWP-68	0.84	0.011	201.74	2.744	81.74	1.112	
UPPC-06	-	-	-	-	361.50	4.916	
Mean Value:	0.72	0.010	499.77	***6.797***	161.85	**2.201**	Hazardous Debris
Lead Smelting Room							
UPSP-39	0	-	0.85	-	0	-	
UPSP-40	6.1	-	3.8	-	0.23	-	
Mean Value:	3.05	0.041	2.33	0.032	0.12	0.002	Uncontaminated Debris
Brewery Room							
UPWP-78	0.08	0.001	5.74	0.078	2.28	0.031	
UPWP-79	0.03	0.000	0.00	0.000	1.45	0.020	
Mean Value:	0.05	0.001	2.87	0.039	1.87	0.026	Uncontaminated Debris
Storage Room - Fourth Floor							
UPWP-74	2.74	0.037	17.55	0.239	54.37	0.739	
UPWP-76	11.71	0.159	1.83	0.025	1.39	0.019	
UPWP-77	0.11	0.002	3.92	0.053	0.49	0.007	
UPSP-41	1.20	0.016	1.20	0.016	54.00	0.734	
Mean Value:	3.94	0.054	6.13	0.083	27.56	**0.375**	Contaminated Debris

Unbolded value represents uncontaminated debris - less than 0.19 mg/l cadmium TCLP (waste), 0.86 mg/l chromium TCLP (waste), or 0.37 mg/l lead TCLP (waste).
Bolded value represents contaminated debris - between 0.19 and 1 mg/l cadmium TCLP (waste), 0.86 and 5 mg/l chromium TCLP (waste), or 0.37 and 5 mg/l lead TCLP (waste).
Italicized value represents hazardous debris - greater than 1 mg/l cadmium TCLP (waste), 5 mg/l chromium TCLP (waste), or 5 mg/l lead TCLP (waste).
NA - Not analyzed.

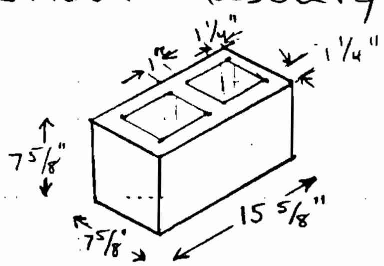
SUBJECT Representative Articles of Debris

Concrete and Brick Category

Use same procedure as metal category

- Representative Article of Debris: Masonry Block

Size of Hollow Concrete Masonry Unit
(from Masonry Institute of America 1992)



Concrete Masonry
Unit (CMU)

- Assume density of concrete = 145 lb/cf

1) $V_{CMU} = 434.6 \text{ in}^3 = 0.25 \text{ ft}^3$

2) $W_{CMU} = 0.25 \text{ ft}^3 \times 145 \frac{\text{lb}}{\text{cf}} = 36.3 \text{ lb}$

Exposed Surface Area $= 810.66 \text{ in}^2 = 5.63 \text{ ft}^2$

3) Volume and weight of dust covering CMU

$V_{dust} = 5.63 \text{ ft}^2 \times (1/100'' \text{ dust layer})(\frac{1'}{12''}) = 0.0047 \text{ ft}^3$

$W_{dust} = (0.0047 \text{ ft}^3)(94 \text{ lb/ft}^3) = 0.44 \text{ lb}$

Concrete and Brick Category continued...

4) $TCLP_{dust}$

During the Interim RI, several samples were collected from concrete and brick interior surfaces but none were collected from concrete and brick debris. Therefore to calculate the $TCLP_{dust}$ value for this category, the average TCLP cadmium, chromium, and lead concentrations of the floor dust sample is assumed to be present on the dust covering the concrete and brick debris surfaces. Most of the concrete and brick debris is not painted and only covered with dust.

The average $TCLP_{dust}$ concentration was calculated in each room and is presented in Table B-2.

5) $TCLP_{waste}$

From the Mass Balance TCLP Method:

$$TCLP_{waste} = \frac{m_d}{m_w} \times TCLP_{dust}$$

For a concrete masonry unit:

$m_d = W_{dust} = 0.44$ lb.

$m_w = W_{cmu} = 36.3$ lb.

Substitute:

$$TCLP_{waste} = \frac{0.44 \text{ lb}}{36.3 \text{ lb}} TCLP_{dust} = 0.012 \, TCLP_{dust}$$

Average $TCLP_{waste}$ concentrations were calculated for each room and are also presented in Table B-2.

TABLE B-2 (Page 1 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR CONCRETE & BRICK DEBRIS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(DUST) (mg/l)	CHROMIUM (mg/l)	LEAD TCLP(DUST) (mg/l)	COMMENTS
Wastewater Treatment Room				
UPSP-45	0.53	2.2	2.7	
UPSP-46	0.035	0.17	0	
UPSP-47	1.1	0.8	2.1	
UPSP-48	14	0.22	0	
UPSP-49	0.75	0.21	0	
UPSP-50	0.94	0.28	1.5	
UPSP-9	0	4.7	0	
Mean TCLP(Dust):	2.48	1.23	0.90	Uncontaminated
Mean TCLP(Waste):	0.030	0.015	0.011	Debris
Main Plating Room				
UPSP-17	1.3	0.18	4.4	
UPSP-18	0.55	0.15	0.21	
UPSP-19	2.4	0.044	0.47	
UPSP-20	0	0.56	0.073	
UPSP-21	17	2	0.75	
UPSP-22	3.1	0.44	0.59	
UPSP-23	0	0.52	0.075	
UPSP-24	5.3	0.59	0.69	
UPSP-25	7.1	13	0	
UPSP-26	20	1.3	26	
Mean TCLP(Dust):	5.68	1.88	3.33	Uncontaminated
Mean TCLP(Waste):	0.068	0.023	0.040	Debris
Silver Plating Room				
UPSP-1	0.77	1.8	0.034	
UPSP-2	0.12	14	1.8	
UPSP-3	5.7	0.069	0.035	
UPSP-4	0.38	49	0	
UPSP-5	0.76	2336	0	
UPSP-6	2.1	4.3	1.1	
UPSP-7	0.024	0.083	0	
UPSP-8	0.066	2.7	0.51	
Mean TCLP(Dust):	1.24	300.99	0.43	Contaminated
Mean TCLP(Waste):	0.015	**3.612**	0.005	Debris
Chemical Storage Mezzanine				
UPSP-31	1.2	56	2.9	
UPSP-32	0.44	36	0.082	
UPSP-33	0.9	164	0.61	
UPSP-34	1.5	11	0	
Mean TCLP(Dust):	1.01	66.75	0.90	Uncontaminated
Mean TCLP(Waste):	0.012	0.801	0.011	Debris
Anodizing Room				
UPSP-27	0.032	0	0	
UPSP-28	0.17	0.06	0.73	
UPSP-29	0.92	0.087	0.65	
UPSP-30	3.7	0.91	11	
Mean TCLP(Dust):	1.21	0.26	3.10	Uncontaminated
Mean TCLP(Waste):	0.014	0.003	0.037	Debris

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR CONCRETE & BRICK DEBRIS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(DUST) (mg/l)	CHROMIUM (mg/l)	LEAD TCLP(DUST) (mg/l)	COMMENTS
Lead Smelting Room				
UPSP-39	0	0.85	0	
UPSP-40	6.1	3.8	0.23	
Mean TCLP(Dust):	3.05	2.33	0.12	Uncontaminated
Mean TCLP(Waste):	0.037	0.028	0.001	Debris
Brewery Room				
UPSP-43	1.1	0.025	55	
Mean TCLP(Dust):	1.1	0.025	55	Contaminated
Mean TCLP(Waste):	0.013	0	**0.660**	Debris
Storage Room - Fourth Floor				
UPSP-41	1.2	1.2	54	
UPSP-42	6.2	0.24	0	
UPSP-44	7.1	108	0.065	
Mean TCLP(Dust):	4.83	36.48	18.02	Uncontaminated
Mean TCLP(Waste):	0.058	0.438	0.216	Debris

Unbolded value represents uncontaminated debris - less than 0.19 mg/l cadmium TCLP (waste), 0.86 mg/l chromium TCLP (waste), or 0.37 mg/l lead TCLP (waste).
Bolded value represents contaminated debris - between 0.19 and 1 mg/l cadmium TCLP (waste), 0.86 and 5 mg/l chromium TCLP (waste), or 0.37 and 5 mg/l lead TCLP (waste).
Italicized value represents hazardous debris - greater than 1 mg/l cadmium TCLP (waste), 5 mg/l chromium TCLP (waste), or 5 mg/l lead TCLP (waste).

SUBJECT Representative Articles of Debris

Wood Category

- Representative Article of Debris: Wooden Pallet
- Dimensions of Typical Wooden Pallet
  48"L x 40"W x 6"H x 1"Thick
- Assume density of wood = 40 lb/ft³

1) $V_w = 3136 in^3 = 1.81 ft^3$

2) $W_w = 1.81 ft^3 \times 40 \frac{lb}{ft^3} = 72.4 lb = m_w$

3) Volume and weight of dust covering pallet

Exposed surface area = $47.4 ft^2$

$V_{dust} = 47.4 ft^2 \times (1/100" \text{ dust layer}) (\frac{1'}{12"}) = 0.0395 ft^3$

$W_{dust} = (0.0395 ft^3)(94 lb/ft^3) = 3.71 lb = m_d$

4) $TCLP_{dust}$

Sufficient data was not collected during the Interim RI to characterize wooden debris in each of the rooms. An analysis similar to the one conducted for Concrete and brick debris will be conducted whereby the sweep sample data from each room will be used to estimate the dust concentration covering the wooden debris. Table B-3 summarizes the results of this analysis.

5) TCLP waste

From the Mass Balance TCLP Method:

$$TCLP_{waste} = \frac{m_d}{m_w} \times TCLP_{dust} = 0.051\, TCLP_{dust}$$

Average $TCLP_{waste}$ concentrations were calculated in each room and are also

TABLE B-3 (Page 1 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR WOODEN DEBRIS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(DUST) (mg/l)	CHROMIUM TCLP(DUST) (mg/l)	LEAD TCLP(DUST) (mg/l)	COMMENTS
Wastewater Treatment Room				
UPSP-45	0.53	2.2	2.7	
UPSP-46	0.035	0.17	0	
UPSP-47	1.1	0.8	2.1	
UPSP-48	14	0.22	0	
UPSP-49	0.75	0.21	0	
UPSP-50	0.94	0.28	1.5	
UPSP-9	0	4.7	0	
Mean TCLP(Dust):	2.48	1.23	0.90	Uncontaminated
Mean TCLP(Waste):	0.126	0.063	0.046	Debris
Main Plating Room				
UPSP-17	1.3	0.18	4.4	
UPSP-18	0.55	0.15	0.21	
UPSP-19	2.4	0.044	0.47	
UPSP-20	0	0.56	0.073	
UPSP-21	17	2	0.75	
UPSP-22	3.1	0.44	0.59	
UPSP-23	0	0.52	0.075	
UPSP-24	5.3	0.59	0.69	
UPSP-25	7.1	13	0	
UPSP-26	20	1.3	26	
Mean TCLP(Dust):	5.68	1.88	3.33	Contaminated
Mean TCLP(Waste):	**0.289**	0.096	0.170	Debris
Chrome Plating Room				
UPSP-13	2	0.78	55	
UPSP-14	4.4	0	5.8	
UPSP-15	1.7	138	20	
UPSP-16	7.1	1.5	144	
Mean TCLP(Dust):	3.80	35.07	56.20	Contaminated
Mean TCLP(Waste):	**0.194**	**1.789**	**2.866**	Debris
Silver Plating Room				
UPSP-1	0.77	1.8	0.034	
UPSP-2	0.12	14	1.8	
UPSP-3	5.7	0.069	0.035	
UPSP-4	0.38	49	0	
UPSP-5	0.76	2336	0	
UPSP-6	2.1	4.3	1.1	
UPSP-7	0.024	0.083	0	
UPSP-8	0.066	2.7	0.51	
Mean TCLP(Dust):	1.24	300.99	0.43	Hazardous
Mean TCLP(Waste):	0.063	***15.351***	0.022	Debris
Office - First Floor				
UPSP-10	0.15	0.097	9.7	
UPSP-11	16	4.2	18	
UPSP-12	4.8	0.88	0.78	
Mean TCLP(Dust):	3.19	46.33	4.21	Contaminated
Mean TCLP(Waste):	0.163	**2.363**	0.215	Debris

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TABLE B-3 (Page 2 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR WOODEN DEBRIS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(DUST) (mg/l)	CHROMIUM TCLP(DUST) (mg/l)	LEAD TCLP(DUST) (mg/l)	COMMENTS
Chemical Storage Mezzanine				
UPSP-31	1.2	56	2.9	
UPSP-32	0.44	36	0.082	
UPSP-33	0.9	164	0.61	
UPSP-34	1.5	11	0	
Mean TCLP(Dust):	1.01	66.75	0.90	Uncontaminated
Mean TCLP(Waste):	0.052	3.404	0.046	Debris
Anodizing Room				
UPSP-27	0.032	0	0	
UPSP-28	0.17	0.06	0.73	
UPSP-29	0.92	0.087	0.65	
UPSP-30	3.7	0.91	11	
Mean TCLP(Dust):	1.21	0.26	3.10	Uncontaminated
Mean TCLP(Waste):	0.061	0.013	0.158	Debris
Pipe and Spring Room				
UPSP-36	1.1	0.03	2.2	
UPSP-37	0.38	5082	0	
UPSP-38	1	0.98	0.67	
Mean TCLP(Dust):	0.83	1694.34	0.96	10% Hazardous
Mean TCLP(Waste):	0.042	*86.411*	0.049	90% Uncontaminated
Office/Sewing Room				
UPSP-35	0.9	2	0.91	
Mean TCLP(Dust):	0.9	2	0.91	Uncontaminated
Mean TCLP(Waste):	0.046	0.102	0.046	Debris
Lead Smelting Room				
UPSP-39	0	0.85	0	
UPSP-40	6.1	3.8	0.23	
Mean TCLP(Dust):	3.05	2.33	0.12	Contaminated
Mean TCLP(Waste):	0.156	0.119	0.006	Debris
Brewery Room				
UPSP-43	1.1	0.025	55	
Mean TCLP(Dust):	1.1	0.025	55	Contaminated
Mean TCLP(Waste):	0.056	0.001	**2.805**	Debris
Storage Room - Fourth Floor				
UPSP-41	1.2	1.2	54	
UPSP-42	6.2	0.24	0	
UPSP-44	7.1	108	0.065	
Mean TCLP(Dust):	4.83	36.48	18.02	Contaminated
Mean TCLP(Waste):	**0.247**	**1.860**	**0.919**	Debris

Unbolded value represents uncontaminated debris - less than 0.19 mg/l cadmium TCLP (waste), 0.86 mg/l chromium TCLP (waste), or 0.37 mg/l lead TCLP (waste).
Bolded value represents contaminated debris - between 0.19 and 1 mg/l cadmium TCLP (waste), 0.86 and 5 mg/l chromium TCLP (waste), or 0.37 and 5 mg/l lead TCLP (waste).
Italicized value represents hazardous debris - greater than 1 mg/l cadmium TCLP (waste), 5 mg/l chromium TCLP (waste), or 5 mg/l lead TCLP (waste).

BY AGL DATE 2/26/96 **LAWLER, MATUSKY & SKELLY ENGINEERS LLP** SHEET NO. 8 OF 11

ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

CHKD. BY ____ DATE ____ JOB NO. 650093

ONE BLUE HILL PLAZA
POST OFFICE BOX 1509
PEARL RIVER, NEW YORK 10965

SUBJECT Representative Articles of Debris

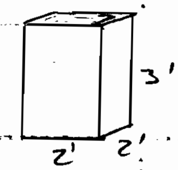
Plastic Category

- Representative Article of Debris : PVC Tank
- Dimensions vary widely; a smaller size tank was selected as the typical sample:

  2' L × 2' W × 3' H × 1/2" thick

- Assume density of plastic = 86 lb/ft^3

1) $V_{P1} = 1.17 \text{ ft}^3$



2) $W_{P1} = 1.17 \text{ ft}^3 \times 86 \text{ lb/ft}^3 = 100.6 \text{ lb}$

3) Volume and weight of dust covering PVC tank

Exposed surface area = 56 ft^2

$V_{dust} = 56 \text{ ft}^2 \times (1/100\text{" dust layer})(\frac{1'}{12"}) = 0.0467 \text{ ft}^3$

$W_{dust} = (0.0467 \text{ ft}^3) \times (94 \text{ lb/ft}^3) = 4.39 \text{ lb}$

4) $TCLP_{dust}$

The results of wipe and sweep samples collected from plastic debris surfaces were used to calculate $TCLP_{dust}$ concentrations. Results were available in most rooms where plastic debris was found; in rooms where data was unavailable, the average $TCLP_{dust}$ concentration of floor sweep samples was used to estimate the contamination level on the debris surface. The average TCLP values for each room are summarized in Table B-4.

SUBJECT Representative Articles of Debris

Plastic Category continued

5) $TCLP_{waste}$

From the Mass Balance TCLP Method:

$$TCLP_{waste} = \frac{m_d}{m_w} \times TCLP_{dust}$$

$$= \frac{4.39\ lb}{100.6\ lb} \times TCLP_{dust}$$

$$TCLP_{waste} = 0.0436 \times TCLP_{dust}$$

Average $TCLP_{waste}$ concentrations were calculated in each room and are also presented in Table B-4.

TABLE B-4 (Page 1 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR PLASTIC DEBRIS

United Plating

SAMPLE LOCATION	CADMIUM		CHROMIUM		LEAD		COMMENTS
	Hypothetical TCLP(Dust) (mg/l)	TCLP(Waste) (mg/l)	Hypothetical TCLP(Dust) (mg/l)	TCLP(Waste) (mg/l)	Hypothetical TCLP(Dust) (mg/l)	TCLP(Waste) (mg/l)	
Wastewater Treatment Room							
UPWP-44	0.14	0.006	2.06	0.090	3.33	0.145	
UPWP-46	150.65	6.568	1.44	0.063	1.05	0.046	
UPWP-47	1.35	0.059	816.13	35.583	416.58	18.163	Hazardous
Mean Value:	50.71	***2.211***	273.21	***11.912***	140.32	***6.118***	Debris
Main Plating Room							
UPWP-30	34.32	1.496	38.51	1.679	83.97	3.661	
UPSP-21	17.00	0.741	2.00	0.087	0.75	0.033	
UPSP-23	0.00	0.000	0.52	0.023	0.08	0.003	Contaminated
Mean Value:	17.11	**0.746**	13.68	0.596	28.27	**1.232**	Debris
Silver Plating Room							
UPWP-4	0.46	0.020	86.98	3.793	4.97	0.216	
UPWP-5	0.38	0.017	61.70	2.690	19.13	0.834	
UPWP-14	0.10	0.004	0.00	0.000	1.90	0.083	Contaminated
Mean Value:	0.31	**0.014**	49.56	2.161	8.66	**0.378**	Debris
Office - First Floor							
UPSP-10	0.15	0.007	0.097	0.004	9.7	0.423	
UPSP-11	16	0.698	4.2	0.183	18	0.785	
UPSP-12	4.8	0.209	0.88	0.038	0.78	0.034	Contaminated
Mean Value:	6.98	**0.30**	1.73	0.08	9.49	**0.41**	Debris
Chemical Storage Mezzanine							
UPSP-31	1.2	0.052	56	2.442	2.9	0.126	
UPSP-32	0.44	0.019	36	1.570	0.082	0.004	
UPSP-33	0.9	0.039	164	7.150	0.61	0.027	
UPSP-34	1.5	0.065	11	0.480	0	0.000	Contaminated
Mean Value:	1.01	0.04	66.75	**2.91**	0.90	0.04	Debris
Anodizing Room							
UPWP-55	0.72	0.031	12.04	0.525	8.86	0.386	Contaminated
Mean Value:	0.72	0.031	12.04	0.525	8.86	**0.386**	Debris
Pipe and Spring Room							
UPSP-36	1.1	0.048	0.03	0.001	2.2	0.096	
UPSP-37	0.38	0.017	5082	221.575	0	0.000	
UPSP-38	1	0.044	0.98	0.043	0.67	0.029	Uncontaminated
Mean Value:	0.83	0.04	1694.34	***73.87***	0.96	0.04	Debris

TABLE B-4 (Page 2 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR PLASTIC DEBRIS

United Plating

SAMPLE LOCATION	CADIUM		CHROMIUM		LEAD		COMMENTS
	Hypothetical TCLP(Dust) (mg/l)	TCLP(Waste) (mg/l)	Hypothetical TCLP(Dust) (mg/l)	TCLP(Waste) (mg/l)	Hypothetical TCLP(Dust) (mg/l)	TCLP(Waste) (mg/l)	
Office/Sewing Room							
UPSP-35	0.9	0.039	2	0.087	0.91	0.040	Uncontaminated
Mean Value:	0.9	0.039	2	0.087	0.91	0.04	Debris
Brewery Room							
UPSP-43	1.1	0.048	0.025	0.001	55	2.398	Contaminated
Mean Value:	1.10	0.05	0.03	0.00	55.00	**2.40**	Debris
Storage Room - Fourth Floor							
UPWP-75	4.01	0.175	71.26	3.107	25.55	1.114	Contaminated
Mean Value:	4.01	0.175	71.26	**3.107**	25.55	**1.114**	Debris

Unbolded value represents uncontaminated debris - less than 0.19 mg/l cadmium TCLP (waste), 0.86 mg/l chromium TCLP (waste), or 0.37 mg/l lead TCLP (waste).
Bolded value represents contaminated debris - between 0.19 and 1 mg/l cadmium TCLP (waste), 0.86 and 5 mg/l chromium TCLP (waste), or 0.37 and 5 mg/l lead TCLP (waste).
Italicized value represents hazardous debris - greater than 1 mg/l cadmium TCLP (waste), 5 mg/l chromium TCLP (waste), or 5 mg/l lead TCLP (waste).

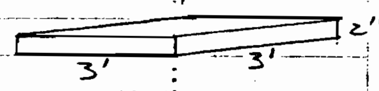
SUBJECT Representative Articles of Debris

"Other" Debris Category

- Representative Article of Debris: "Other" debris types vary widely. Based on visual observation, large boards of styrofoam are present in the greatest quantities as "other" debris.

  Styrofoam has an approximate density of 15 lb/ft³. Since the other category is comprised of several types of debris (e.g. glass, rubber, etc.) that have higher densities than styrofoam, a density of 0.801 tons/yd³ (or about 50 lb/ft³) will be used in calculating the total mass of debris in this category.

- Dimensions for the representative styrofoam piece (solid piece).



  3' L x 3' W x 2" Thick

- Assume density of styrofoam = 15 lb/ft³

1) $V_{OD} = 1.5\ ft^3$

2) $W_{OD} = 1.5\ ft^3 \times 15\ lb/ft^3 = 22.5\ lb$

3) Volume and weight of dust covering styrofoam piece.

Exposed surface area = 20 ft²

$V_{dust} = 20\ ft^2 \times (1/100"\ \text{dust layer}) \left(\frac{1'}{12"}\right)$
$= 0.017\ ft^3$

$W_{dust} = (0.017\ ft^3) \times (94\ lb/ft^3) = 1.60\ lb$

SUBJECT Representative Articles of Debris

"Other" Category continued

4) $TCLP_{dust}$

A sufficient quantity of samples was not collected from debris in the "other" category to evaluate $TCLP_{dust}$ concentrations. As with concrete and brick debris, the floor sweep sample data from each room was averaged and used to represent the average contaminant concentrations on debris in those rooms. Table B-5 presents these calculations.

5) $TCLP_{waste}$

From the Mass Balance TCLP Method:

$$TCLP_{waste} = \frac{m_d}{m_w} \times TCLP_{dust}$$

For the representative styrofoam piece:

$m_d = W_{dust} = 1.60$ lb

$m_w = W_{OD} = 22.5$ lb

Substitute:

$$TCLP_{waste} = \frac{1.60\ lb}{22.5\ lb}\ TCLP_{dust} = 0.071\ TCLP_{dust}$$

Average $TCLP_{waste}$ concentrations were calculated for each room and are also presented in Table B-5.

TABLE B-5 (Page 1 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR OTHER DEBRIS
United Plating Site

SAMPLE LOCATION	CADMIUM TCLP(DUST) (mg/l)	CHROMIUM TCLP(DUST) (mg/l)	LEAD TCLP(DUST) (mg/l)	COMMENTS
Wastewater Treatment Room				
UPSP-45	0.53	2.2	2.7	
UPSP-46	0.035	0.17	0	
UPSP-47	1.1	0.8	2.1	
UPSP-48	14	0.22	0	
UPSP-49	0.75	0.21	0	
UPSP-50	0.94	0.28	1.5	
UPSP-9	0	4.7	0	
Mean TCLP(Dust):	2.48	1.23	0.90	Uncontaminated
Mean TCLP(Waste):	0.176	0.087	0.064	Debris
Main Plating Room				
UPSP-17	1.3	0.18	4.4	
UPSP-18	0.55	0.15	0.21	
UPSP-19	2.4	0.044	0.47	
UPSP-20	0	0.56	0.073	
UPSP-21	17	2	0.75	
UPSP-22	3.1	0.44	0.59	
UPSP-23	0	0.52	0.075	
UPSP-24	5.3	0.59	0.69	
UPSP-25	7.1	13	0	
UPSP-26	20	1.3	26	
Mean TCLP(Dust):	5.68	1.88	3.33	Contaminated
Mean TCLP(Waste):	**0.403**	0.133	0.236	Debris
Chrome Plating Room				
UPSP-13	2	0.78	55	
UPSP-14	4.4	0	5.8	
UPSP-15	1.7	138	20	
UPSP-16	7.1	1.5	144	
Mean TCLP(Dust):	3.80	35.07	56.20	Contaminated
Mean TCLP(Waste):	**0.270**	**2.490**	**3.990**	Debris
Silver Plating Room				
UPSP-1	0.77	1.8	0.034	
UPSP-2	0.12	14	1.8	
UPSP-3	5.7	0.069	0.035	
UPSP-4	0.38	49	0	
UPSP-5	0.76	2336	0	
UPSP-6	2.1	4.3	1.1	
UPSP-7	0.024	0.083	0	
UPSP-8	0.066	2.7	0.51	
Mean TCLP(Dust):	1.24	300.99	0.43	Hazardous
Mean TCLP(Waste):	0.088	***21.371***	0.031	Debris
Office - First Floor				
UPSP-10	0.15	0.097	9.7	
UPSP-11	16	4.2	18	
UPSP-12	12	0.88	0.78	
Mean TCLP(Dust):	9.38	1.73	9.49	Contaminated
Mean TCLP(Waste):	**0.666**	0.123	**0.674**	Debris

TABLE B-5 (Page 2 of 2)

HYPOTHETICAL TCLP(DUST) AND TCLP(WASTE) CALCULATIONS FOR OTHER DEBRIS
United Plating Site

SAMPLE LOCATION	CADMIUM TCLP(DUST) (mg/l)	CHROMIUM TCLP(DUST) (mg/l)	LEAD TCLP(DUST) (mg/l)	COMMENTS
Chemical Storage Mezzanine				
UPSP-31	1.2	56	2.9	
UPSP-32	0.44	36	0.082	
UPSP-33	0.9	164	0.61	
UPSP-34	1.5	11	0	
Mean TCLP(Dust):	1.01	66.75	0.90	
Mean TCLP(Waste):	0.072	**4.739**	0.064	Contaminated Debris
Anodizing Room				
UPSP-27	0.032	0	0	
UPSP-28	0.17	0.06	0.73	
UPSP-29	0.92	0.087	0.65	
UPSP-30	3.7	0.91	11	
Mean TCLP(Dust):	1.21	0.26	3.10	Uncontaminated
Mean TCLP(Waste):	0.086	0.019	0.220	Debris
Pipe and Spring Room				
UPSP-36	1.1	0.03	2.2	
UPSP-37	0.38	5082[A]	0	
UPSP-38	1	0.98	0.67	
Mean TCLP(Dust):	0.83	0.51	0.96	10% Hazardous
Mean TCLP(Waste):	0.059	***0.036***	0.068	90% Uncontaminated
Office/Sewing Room				
UPSP-35	0.9	2	0.91	
Mean TCLP(Dust):	0.90	2.00	0.91	Uncontaminated
Mean TCLP(Waste):	0.064	0.142	0.065	Debris
Lead Smelting Room				
UPSP-39	0	0.85	0	
UPSP-40	6.1	3.8	0.23	
Mean TCLP(Dust):	3.05	2.33	0.12	Contaminated
Mean TCLP(Waste):	**0.217**	0.165	0.008	Debris
Brewery Room				
UPSP-43	1.1	0.025	55	
Mean TCLP(Dust):	1.1	0.025	55	Contaminated
Mean TCLP(Waste):	0.078	0.002	**3.905**	Debris
Storage Room - Fourth Floor				
UPSP-41	1.2	1.2	54	
UPSP-42	6.2	0.24	0	
UPSP-44	7.1	108	0.065	
Mean TCLP(Dust):	4.83	36.48	18.02	Contaminated
Mean TCLP(Waste):	**0.343**	**2.590**	**1.280**	Debris

A - Sample not representative of entire room debris.
Unbolded value represents uncontaminated debris - less than 0.19 mg/l cadmium TCLP (waste), 0.86 mg/l chromium TCLP (waste), or 0.37 mg/l lead TCLP (waste).
Bolded value represents contaminated debris - between 0.19 and 1 mg/l cadmium TCLP (waste), 0.86 and 5 mg/l chromium TCLP (waste), or 0.37 and 5 mg/l lead TCLP (waste).
Italicized value represents hazardous debris - greater than 1 mg/l cadmium TCLP (waste), 5 mg/l chromium TCLP (waste), or 5 mg/l lead TCLP (waste).

APPENDIX C

SUPPORTING CALCULATIONS FOR INTERIOR SURFACES ESTIMATE

SUBJECT Interior Surfaces Estimate

Interior Surfaces

Based on the results of Table C-1 the average TCLP dust values for the building were below TC limits for hazardous waste. This suggests that the demolition debris, when considered as a whole (as per EPA Guidance 1994), is nonhazardous for disposal.

Many elevated readings were noted in the summary table. To protect the safety of on-site workers and the surrounding environment, characteristically hazardous residues will be removed as part of the remediation project.

The data was divided by interior surface category to define the areas that will require treatment.

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR INTERIOR SURFACES

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)
Wastewater Treatment Room			
UPSP-45	0.53	2.2	2.7
UPSP-46	0.035	0.17	0
UPSP-47	1.1	0.8	2.1
UPSP-49	0.75	0.21	0
UPSP-50	0.94	0.28	1.5
UPFC-18	0	1.1	0
UPFC-19	3.6	0	0
UPFC-20	0.1	2.1	0.00036
UPWP-41	0.02	0.18	0.39
UPWP-43	0.80	18.08	110.70
Collapsed Room			
No data available. This section of the building was not used by United Plating and is assumed to be uncontaminated.			
Main Plating Room			
UPSP-18	0.55	0.15	0.21
UPSP-19	2.4	0.044	0.47
UPSP-20	0	0.56	0.073
UPSP-22	3.1	0.44	0.59
UPSP-25	7.1	13	0
UPSP-26	20	1.3	26
UPFC-8	0.33	1.9	0.23
UPFC-9	0.19	1.3	0
UPFC-10	1.5	0	0.00024
UPFC-11	0	5	0
UPWC-1	0.055	1.2	0.89
UPWC-2	0	0.11	0.11
UPWC-3	0.013	0.45	0.435
UPWC-4	0	0.055	0.19
UPWC-5	0.015	0.18	0.135
UPWC-6	0.027	0.21	0.21
UPWC-7	0.015	0.3	4.15
UPWC-8	0.015	0.29	0.29
UPWC-9	0	0.046	0.46
UPWC-10	0	0.215	0.21
UPWC-11	0	0	0.29
UPWC-12	0.65	2.1	339.5
UPWC-13	0.44	0.1	125
UPWC-14	0.56	0.2	97
UPWC-15	1.6	1.2	369.5
UPWC-16	5.5	15.45	2080
UPPC-10	NA	NA	15.7
UPPC-11	NA	NA	11.15
UPPC-13	NA	NA	29.25
UPPC-14	NA	NA	4.75
UPPC-15	NA	NA	3.05
UPWP-25	0.12	9.80	282.96
UPWP-31	0.18	2.66	4.05
UPWP-38	0.25	5.65	1.48
UPWP-39	0.09	1.41	1.70
UPWP-40	0.07	0.22	0.73
UPWP-50	0.00	0.30	0.13
UPWP-81	0.30	1.62	1.15
UPWP-82	0.06	0.46	19.52
UPWP-83	0.31	4.15	52.14
UPWP-84	0.48	23.06	3.21

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR INTERIOR SURFACES

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)
Chrome Plating Room			
UPSP-12	12	0.88	0.78
UPSP-13	2	0.78	55
UPSP-14	4.4	0	5.8
UPSP-16	7.1	1.5	144
UPFC-4	0	2.2	0
UPFC-5	0.015	1.6	0
UPFC-6	0.35	1.2	0
UPFC-7	0.36	1.6	0.16
UPPC-17	NA	NA	17.4
UPWP-17	0.03	2.06	0.34
Silver Plating Room			
UPSP-1	0.77	1.8	0.034
UPSP-2	0.12	14	1.8
UPSP-3	5.7	0.069	0.035
UPSP-4	0.38	49	0
UPSP-5	0.76	2336	0
UPSP-6	2.1	4.3	1.1
UPSP-8	0.066	2.7	0.51
UPFC-1	0	0	0
UPFC-2	0	0.76	0
UPFC-3	0	0.15	0
UPPC-19	NA	NA	61.5
UPPC-20	NA	NA	2795
UPWP-7	0.05	3.67	2.96
Office - First Floor			
UPSP-10	0.15	0.097	9.7
UPSP-11	16	4.2	18
Chemical Storage Mezzanine			
UPSP-31	1.2	56	2.9
UPSP-32	0.44	36	0.082
UPSP-33	0.9	164	0.61
UPSP-34	1.5	11	0
UPFC-14	0.051	4	0.035
UPFC-15	0.014	27	0
UPPC-3	NA	NA	13.15
UPPC-9	NA	NA	5850
UPWP-56	0.01	0.26	0.24
UPWP-57	0.00	0.29	0.38
UPWP-58	0.30	25.15	111.61
UPWP-59	0.00	0.21	0.42
UPWP-60	0.02	0.37	1.15
Parts Storage Room - Second Floor			
No data available. This room is believed to have been used solely for storage of nonhazardous equipment and materials. The floors are assumed to be contaminated as the surrounding rooms have contaminated floors. The walls and ceiling are assumed to be uncontaminated.			
Anodizing Room			
UPSP-27	0.032	0	0
UPSP-28	0.17	0.06	0.73
UPSP-29	0.92	0.087	0.65
UPSP-30	3.7	0.91	11
UPFC-12	0	0.15	0
UPFC-13	0	0.022	0
UPPC-7	NA	NA	5.35
UPPC-8	NA	NA	5.95
UPWP-54	0.02	0.28	0.17

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR INTERIOR SURFACES

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)
Pipe and Spring Room			
UPSP-36	1.1	0.03	2.2
UPSP-37	0.38	5082	0
UPSP-38	1	0.98	0.67
UPWP-66	0.10	11.78	1.43
Office/Sewing Room			
UPSP-35	0.9	2	0.91
UPPC-4	NA	NA	79
UPPC-5	NA	NA	2.75
UPWP-64	0.00	0.46	0.03
UPWP-65	0.00	0.17	0.04
Parts Storage Room - Third Floor			
No data available. This area is believed to have been used solely for storage of nonhazardous equipment and materials and is therefore assumed to be uncontaminated.			
Lead Smelting Room			
UPSP-39	0	0.85	0
UPSP-40	6.1	3.8	0.23
UPFC-16	0	0	0
UPPC-1	NA	NA	7.25
UPWP-70	0.00	0.17	3.93
UPWP-71	0.01	2.70	0.55
UPWP-72	0.04	5.41	16.51
Parts Storage Room - Third Floor			
No data available. This room is believed to have been used solely for storage of nonhazardous equipment and materials. The floors are assumed to be contaminated as the surrounding rooms have contaminated floors. The walls and ceiling are assumed to be uncontaminated.			
Brewery Room			
UPSP-43	1.1	0.025	55
UPWP-80	0.03	0.34	34.32
Storage Room - Fourth Floor			
UPSP-42	6.2	0.24	0
UPSP-44	7.1	108	0.065
UPFC-17	0.042	0	0
UPPC-2	NA	NA	7450
Storage Room - Fifth Floor			
No data available. This room is believed to have been used solely for storage of nonhazardous equipment and materials and is therefore assumed to be uncontaminated.			
Storage Room - Sixth Floor			
No data available. This room is believed to have been used solely for storage of nonhazardous equipment and materials and is therefore assumed to be uncontaminated.			

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR INTERIOR SURFACES

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)
AVERAGE TCLP(DUST) CONCENTRATION INSIDE BUILDING:	1.21	162.48	280.51
TCLP(DUST) CONCENTRATION ABOVE WHICH ALL DEMOLITION DEBRIS IS CONSIDERED HAZARDOUS: @	938	4690	4690

@ - Method follows USEPA Technical Assistance Document for complying with the TC Rule and Implementing the TCLP (1994).

SUBJECT Interior Surfaces Estimate

Interior Surfaces Equation

$$TCLP_{waste} < \frac{m_d}{m_w} \times TCLP_{dust}$$

where $TCLP_{waste}$ is TC limit
m_d is mass of dust on surfaces
m_w is mass of building

1) Approximate m_d

$$m_d = A_{IS} \times d_d \times \rho_d$$

where A_{IS} is the area of interior surface
d_d is the thickness of dust layer
ρ_d is dust density

From previous calcs,
$A_{IS} = 220,392 \ ft^2$
$d_d = 1/100 \ in = 8.33 \times 10^{-4} \ ft$
$\rho_d = 94 \ lb/cf$

$m_d = (220,392 \ ft^2)(8.33 \times 10^{-4} \ ft)(94 \ lb/cf)$
$m_d = 17257 \ lb$ dust

2) Approximate m_w

$$m_w = V_i \times \rho_i$$

where V_i is the volume of substrate i (floor, wall, ceiling, or support)
ρ_i is the density of i

$V_{floor} = (57,450 \ sf)(6 \ in)(1'/12'')$
$= 28,725 \ ft^3$

$V_{walls} = (94,783 \ sf)(8 \ in)(1'/12'')$
$= 63,189 \ ft^3$

SUBJECT Interior Surfaces Estimate

m_w continued ...

$$V_{roof} = (27809\ ft^2)(12'')(1'/12'')$$
$$= 27809\ ft^3$$

$$V_{steel\ supports} = 440\ ft^3$$

$$V_{wood\ supports} = 675\ ft^3$$

For floors and walls, $\rho = \rho_{concrete} = 145$ lb/cf.

For roof, $\rho = \rho_{asphalt} = 94$ lb/cf.

For supports $\rho_{steel} = 490$ lb/cf and $\rho_{wood} = 40$ lb/cf.

$$m_w = m_{floor} + m_{walls} + m_{roof} + m_{steel\ supports} + m_{wood\ supports}$$
$$= (28{,}725\ ft^3 + 63{,}189\ ft^3)(145\ lb/cf) +$$
$$(27{,}809\ ft^3)(94\ lb/cf) +$$
$$(440\ ft^3)(490\ lb/cf) +$$
$$(675\ ft^3)(40\ lb/cf)$$
$$= 16{,}184{,}176\ lb$$

3) $TCLP_{waste}$

max $TCLP_{waste}$ = TC limit = 1 mg/l for Cd
= 5 mg/l for Cr and Pb

SUBJECT Interior Surfaces Estimate

4) Mass Balance

$$TCLP_{dust} < \frac{m_w}{m_d} \times TCLP_{waste}$$

For Cadmium

$$< \frac{16184176 \text{ lb}}{17257 \text{ lb}} (1 \text{ mg/l})$$

$$TCLP_{Cd\ dust} < 938 \text{ mg/l}$$

In other words, if the average of all $TCLP_{dust}$ values exceeds 938 mg/l Cd, the entire building demolition debris would be considered hazardous.

LMS' interpretation: If a $TCLP_{Cd\ dust}$ value exceeds 938 mg/l, the demolition debris within the room where this value was found will be considered hazardous.

Similarly for chromium and lead,

$$TCLP_{Cr\ dust,\ Pb\ paint} < 938 \ (5 \text{ mg/l})$$

$$TCLP_{Cr\ dust,\ Pb\ paint} < 4690 \text{ mg/l}$$

a) "Hazardous Rooms"

Hazardous rooms were defined as rooms containing a sample which exceeded the $TCLP_{waste}$ TC limit for hazardous debris, as explained in (4) above.

Cd	$TCLP_{dust}$	> 938 mg/l
Cr	$TCLP_{dust}$	> 4690 mg/l
Pb	$TCLP_{dust\ or\ paint}$	> 4690 mg/l

SUBJECT Interior Surfaces Estimate

b) "Contaminated Rooms"

Contaminated rooms were defined as rooms whose surfaces were covered with a hazardous waste (ie. dust or paint characteristic exceeded TC limit) but are not "hazardous rooms."

Cd	1 mg/l < $TCLP_{dust}$ < 938 mg/l
Cr	5 mg/l < $TCLP_{dust}$ < 4690 mg/l
Pb	5 mg/l < $TCLP_{dust\ or\ paint}$ < 4690 mg/l

c) "Uncontaminated Rooms"

Uncontaminated rooms were defined as rooms that were not covered with hazardous waste or where sampling was not performed because contamination was not suspected.

Tables C-2, C-3, and C-4 list the hazardous, contaminated, and uncontaminated interior surfaces

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR FLOORS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)	COMMENTS ON LEVEL OF CONTAMINATION
Wastewater Treatment Room				
UPSP-45	0.53	2.2	2.7	
UPSP-46	0.035	0.17	0	
UPSP-47	**1.1**	0.8	2.1	
UPSP-49	0.75	0.21	0	
UPSP-50	0.94	0.28	1.5	
UPFC-18	0	1.1	0	
UPFC-19	**3.6**	0	0	
UPFC-20	0.1	2.1	0.00036	Floor
Mean Value:	0.88	0.86	0.79	Contaminated*
Main Plating Room				
UPSP-18	0.55	0.15	0.21	
UPSP-19	**2.4**	0.044	0.47	
UPSP-20	0	0.56	0.073	
UPSP-22	**3.1**	0.44	0.59	
UPSP-25	**7.1**	**13**	0	
UPSP-26	**20**	1.3	**26**	
UPFC-8	0.33	1.9	0.23	
UPFC-9	0.19	1.3	0	
UPFC-10	**1.5**	0	0.00024	
UPFC-11	0	5	0	Floor
Mean Value:	**3.52**	2.37	2.76	Contaminated
Chrome Plating Room				
UPSP-12	**12**	0.88	0.78	
UPSP-13	**2**	0.78	**55**	
UPSP-14	**4.4**	0	**5.8**	
UPSP-16	**7.1**	1.5	**144**	
UPFC-4	0	2.2	0	
UPFC-5	0.015	1.6	0	
UPFC-6	0.35	1.2	0	
UPFC-7	0.36	1.6	0.16	Floor
Mean Value:	**3.28**	1.22	**25.72**	Contaminated
Silver Plating Room				
UPSP-1	0.77	1.8	0.034	
UPSP-2	0.12	**14**	1.8	
UPSP-3	**5.7**	0.069	0.035	
UPSP-4	0.38	**49**	0	
UPSP-5	0.76	**2336**	0	
UPSP-6	**2.1**	4.3	1.1	
UPSP-8	0.066	2.7	0.51	
UPFC-1	0	0	0	
UPFC-2	0	0.76	0	
UPFC-3	0	0.15	0	
UPWP-7	0.05	3.67	2.96	Floor
Mean Value:	0.90	**219.31**	0.59	Contaminated
Office - First Floor				
UPSP-10	0.15	0.097	**9.7**	
UPSP-11	**16**	4.2	**18**	Floor
Mean Value:	**8.08**	2.15	**13.85**	Contaminated
Chemical Storage Mezzanine				
UPSP-31	**1.2**	**56**	2.9	
UPSP-32	0.44	**36**	0.082	
UPSP-33	0.9	**164**	0.61	
UPSP-34	**1.5**	**11**	0	
UPFC-14	0.051	4	0.035	
UPFC-15	0.014	**27**	0	Floor
Mean Value:	0.68	**49.67**	0.60	Contaminated

TABLE C-2 (Page 2 of 2)

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR FLOORS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)	COMMENTS ON LEVEL OF CONTAMINATION
Anodizing Room				
UPSP-27	0.032	0	0	
UPSP-28	0.17	0.06	0.73	
UPSP-29	0.92	0.087	0.65	
UPSP-30	**3.7**	0.91	**11**	
UPFC-12	0	0.15	0	
UPFC-13	0	0.022	0	
Mean Value:	0.80	0.20	2.06	Floor Contaminated*
Pipe and Spring Room				
UPSP-36	**1.1**	0.03	2.2	
UPSP-37	0.38	***5082***	0	
UPSP-38	1	0.98	0.67	
Mean Value:	0.83	**1694.34**	0.96	Floor Contaminated
Office/Sewing Room				
UPSP-35	0.9	2	0.91	
Mean Value:	0.90	2.00	0.91	Floor Contaminated*
Lead Smelting Room				
UPSP-39	0	0.85	0	
UPSP-40	**6.1**	3.8	0.23	
UPFC-16	0	0	0	
UPPC-1	NA	NA	**7.25**	
Mean Value:	**2.03**	1.55	1.87	Floor Contaminated
Brewery Room				
UPSP-43	**1.1**	0.025	**55**	
Mean Value:	**1.10**	0.03	**55.00**	Floor Contaminated
Storage Room - Fourth Floor				
UPSP-42	**6.2**	0.24	0	
UPSP-44	**7.1**	**108**	0.065	
UPFC-17	0.042	0	0	
Mean Value:	**4.45**	**36.08**	0.02	Floor Contaminated

* - Elevated data was obtained from other interior surfaces in this room causing the floor to also be considered contaminated.
Unbolded value represents uncontaminated surface - less than 1 mg/l cadmium TCLP (dust) or less than 5 mg/l chromium and lead TCLP (dust).
Bolded value represents contaminated surface - between 1 and 938 mg/l cadmium TCLP (dust) or between 5 and 4690 mg/l chromium and lead TCLP (dust).
Italicized value represents hazardous surface - greater than 938 mg/l cadmium TCLP (dust) or greater than 4690 mg/l chromium and lead TCLP (dust).

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR WALLS & CEILINGS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)	COMMENTS ON LEVEL OF CONTAMINATION
Wastewater Treatment Room				
UPWP-41	0.02	0.18	0.39	
UPWP-43	0.80	18.08	110.70	Walls & Ceiling
Mean Value:	0.41	9.13	55.54	Contaminated
Main Plating Room				
UPWC-1	0.055	1.2	0.89	
UPWC-2	0	0.11	0.11	
UPWC-3	0.013	0.45	0.435	
UPWC-4	0	0.055	0.19	Wood chip samples (UPWC)
UPWC-5	0.015	0.18	0.135	collected from
UPWC-6	0.027	0.21	0.21	ceiling are uncontaminated
UPWC-7	0.015	0.3	4.15	
UPWC-8	0.015	0.29	0.29	
UPWC-9	0	0.046	0.46	
UPWC-10	0	0.215	0.21	
UPPC-10	NA	NA	15.7	
UPPC-11	NA	NA	11.15	
UPPC-13	NA	NA	29.25	
UPPC-14	NA	NA	4.75	
UPPC-15	NA	NA	3.05	
UPWP-31	0.18	2.66	4.05	
UPWP-38	0.25	5.65	1.48	
UPWP-39	0.09	1.41	1.70	
UPWP-40	0.07	0.22	0.73	
UPWP-50	0.00	0.30	0.13	
UPWP-81	0.30	1.62	1.15	
UPWP-82	0.06	0.46	19.52	
UPWP-83	0.31	4.15	52.14	
UPWP-84	0.48	23.06	3.21	Walls Contaminated
Mean Value:	0.10	2.24	6.46	Ceiling Uncontaminated
Chrome Plating Room				
UPPC-17	NA	NA	17.4	Walls & Ceiling
Mean Value:	-	-	17.40	Contaminated
Silver Plating Room				
UPWC-11	0	0	0.29	
UPWC-12	*0.65	2.1	339.5	
UPWC-13	0.44	0.1	125	
UPWC-14	0.56	0.2	97	
UPWC-15	1.6	1.2	369.5	
UPWC-16	5.5	15.45	2080	Walls & Ceiling
UPPC-19	NA	NA	61.5	Contaminated
Mean Value:	1.46	3.18	438.97	
Office - First Floor				Assume Walls & Ceiling
No Data Available				Uncontaminated
Chemical Storage Mezzanine				
UPPC-3	NA	NA	13.15	
UPPC-9	NA	NA	*5850*	
UPWP-56	0.01	0.26	0.24	
UPWP-57	0.00	0.29	0.38	
UPWP-58	0.30	25.15	111.61	
UPWP-59	0.00	0.21	0.42	
UPWP-60	0.02	0.37	1.15	Walls Contaminated
Mean Value:	0.07	5.26	853.85	Ceiling Uncontaminated
Anodizing Room				
UPPC-7	NA	NA	5.35	
UPPC-8	NA	NA	5.95	
UPWP-54	0.02	0.28	0.17	Walls & Ceiling
Mean Value:	0.02	0.28	3.82	Uncontaminated

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR WALLS & CEILINGS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)	COMMENTS ON LEVEL OF CONTAMINATION
Pipe and Spring Room				
UPWP-66	0.10	**11.78**	**1.43**	Walls & Ceiling Contaminated (due to elevated debris and floor sample readings)
Mean Value:	0.10	**11.78**	1.43	
Office/Sewing Room				
UPPC-4	NA	NA	**79**	
UPPC-5	NA	NA	2.75	
UPWP-64	0.00	0.46	0.03	
UPWP-65	0.00	0.17	0.04	Ceiling Uncontaminated
Mean Value:	0.00	0.31	**20.46**	Walls Contaminated
Lead Smelting Room				
UPPC-1	NA	NA	**7.25**	
UPWP-70	0.00	0.17	3.93	
UPWP-71	0.01	2.70	0.55	
UPWP-72	0.04	**5.41**	**16.51**	
Mean Value:	0.02	2.76	**7.06**	Walls & Ceiling Contaminated
Brewery Room				
No Data Available				Assume Walls & Ceiling Uncontaminated
Storage Room - Fourth Floor				
UPPC-2	NA	NA	***7450***	Ceiling Uncontaminated
Mean Value:	-	-	***7450.00***	Walls Contaminated

Unbolded value represents uncontaminated surface - less than 1 mg/l cadmium TCLP (dust) or less than 5 mg/l chromium and lead TCLP (dust).
Bolded value represents contaminated surface - between 1 and 938 mg/l cadmium TCLP (dust) or between 5 and 4690 mg/l chromium and lead TCLP (dust).
Italicized value represents hazardous surface - greater than 938 mg/l cadmium TCLP (dust) or greater than 4690 mg/l chromium and lead TCLP (dust).

TABLE C- 4

HYPOTHETICAL TCLP(DUST) CALCULATIONS FOR STRUCTURAL SUPPORTS

United Plating

SAMPLE LOCATION	CADMIUM TCLP(Dust) (mg/l)	CHROMIUM TCLP(Dust) (mg/l)	LEAD TCLP(Dust) (mg/l)	COMMENTS
Main Plating Room				
UPWP-25	0.12	**9.80**	**282.96**	Supports
Mean Value:	0.12	**9.80**	**282.96**	Contaminated
Chrome Plating Room				
UPWP-17	0.03	2.06	0.34	Supports
Mean Value:	0.03	2.06	0.34	Uncontaminated
Silver Plating Room				
UPPC-20	NA	NA	**2795**	
UPWP-7	0.05	3.67	2.96	Supports
Mean Value:	0.05	3.67	**1398.98**	Contaminated
Brewery Room				
UPWP-80	0.03	0.34	**34.32**	Supports
Mean Value:	0.03	0.34	**34.32**	Contaminated
Remaining Rooms				

Data were not available for structural support surfaces in the remaining rooms. It is assumed that the structural supports contain the same level of contamination as the walls in the same rooms.

Unbolded value represents uncontaminated surface - less than 1 mg/l cadmium TCLP (dust) or less than 5 mg/l chromium and lead TCLP (dust).
Bolded value represents contaminated surface - between 1 and 938 mg/l cadmium TCLP (dust) or between 5 and 4690 mg/l chromium and lead TCLP (dust).
Italicized value represents hazardous surface - greater than 938 mg/l cadmium TCLP (dust) or greater than 4690 mg/l chromium and 5 mg/l lead TCLP (dust).

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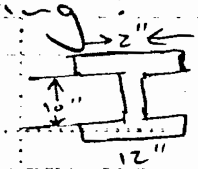
SUBJECT Interior Surfaces Estimate

Structural Supports.

- Based on visual observation, all rooms but silver plating wing have steel I-beam columns. Silverplating wing has solid wood columns.

1) For I-beams, surface area (SA) is determined using the following:

$$SA = \text{Perimeter} \times \text{Height}$$
$$= [4(12") + 4(5")]\, H \times \frac{1\,in}{12\,ft}$$
$$= 5.67\ ft \times H$$



where H is room height.

Volume of I-beams:

$$\forall = [(12" \times 12") - 2(5" \times 10")]\, H = 44\ in^2 = 0.31\ ft^2 \times H$$

Relationship of Volume to SA:

$$\frac{\forall}{SA} = \frac{0.31\ ft^2 \times H}{5.67\ ft \times H} = 0.055\ ft$$

$$\forall = (0.055\ ft)\, SA \quad \text{for I beam}$$

2) For wooden columns (solid □), surface area and volume are:

$$SA = 4L \times H = 4(1') \times H = 4\ ft \times H$$

$$\forall = L \times L \times H = (1')^2 \times H = 1\ ft^2 \times H$$

$$\frac{\forall}{SA} = \frac{1\ ft^2 \times H}{4\ ft \times H} = \frac{1}{4}\ ft$$

$$\forall = (0.25\ ft)\, SA \quad \text{for wood columns}$$

SUBJECT Interior Surfaces Estimate

$V_{\text{steel supports}} = (10709\ sf - 2700\ sf)(0.055\ ft) = 440\ ft^3$

SA

$V_{\text{wood supports}} = (2700\ sf)(0.25\ ft) = 675\ ft^3$

$M_{\text{supports}} = (440\ ft^3)(490\ lb/cf) + (675\ ft^3)(40\ lb/cf)$

$= 242600\ lb$