2.0 SITE CHARACTERIZATION

This section provides a general description of Hangar 1 and its historical background, previous investigations and removal actions, and a summary of the nature and extent of contamination.

2.1 SITE DESCRIPTION AND BACKGROUND

A general site description of former NAS Moffett Field and Hangar 1, as well as background information, is provided below.

2.1.1 Site Description

Moffett encompasses approximately 2,200 acres in Santa Clara County, California. It is located approximately 35 miles south of San Francisco, 10 miles north of San Jose, and approximately 1 mile south of San Francisco Bay (Figure 2-1). Located immediately adjacent to Moffett, but physically separated by dikes, are U.S. Fish and Wildlife Service ponds, the Stormwater Retention Pond, and wetlands to the north; a Lockheed Martin facility to the east; U.S. Highway 101 (Bayshore Freeway) to the south; and Stevens Creek to the west and the Midpeninsula Regional Open Space District (MROSD) to the northwest.

Hangar 1 is situated west of the Moffett runways between Sayre Avenue and Cummins Avenue (Figure 2-2). It is a large structure measuring 1,133 feet long, 308 feet wide, 198 feet high, and is constructed with a steel frame and corrugated siding. The siding consists of Robertson Protected Metal, known to contain both PCBs and asbestos. In addition, Hangar 1 was coated with lead-based paint. In 2003, the Hangar 1 exterior was coated with an asphalt-emulsion. The area surrounding the hangar is paved, with the exception of several small areas of sod located adjacent to the hangar. The hangar frame is structural steel, which was coated with a lead-based paint that contains PCBs. The interior floor is concrete. An aerial photograph of Hangar 1 is included as Figure 2-3.

2.1.2 Site Background

Moffett was commissioned as NAS Sunnyvale in 1933 to support the West Coast dirigibles for the Lighter-than-Air program. In 1935, NAS Sunnyvale was transferred to the U.S. Army Air Corps. In 1939, the National Advisory Committee for Aeronautics, the predecessor to the National Aeronautics and Space Administration (NASA), established Ames Aeronautical Laboratory on land northwest of Moffett, which later became NASA Ames Research Center. NAS Sunnyvale was returned to Navy control in 1942 and was renamed NAS Moffett Field. Since the 1950s, the primary mission of NAS Moffett Field was to support anti-submarine warfare training and patrol squadrons.

Environmental restoration activities began at Moffett in 1983 as part of the Navy's IRP. Under the IRP, the Navy is responsible for assessing, investigating, and responding to releases of hazardous substances that present a potential risk to human health and the environment. Under CERCLA, as stated in 40 Code of Federal Regulations (C.F.R.), Part 300.175(b)(4), "[Department of Defense] DoD has responsibility to take all action necessary with respect to releases where either the release is on, or the sole source of the release is from, any facility or vessel under the jurisdiction, custody, or control of DoD." All of the sites identified through the IRP were investigated, and many have been closed.

In 1987, the USEPA placed Moffett on the National Priorities List (NPL). Environmental investigation and restoration activities at Moffett are coordinated under a Federal Facility Agreement (FFA) signed by the Navy, USEPA, and the California Environmental Protection Agency, including the Water Board, on September 14, 1990.

In 1992, NAS Moffett was designated for closure as an active military base under the DoD BRAC Program. NASA, which already operated the Ames Research Center on the northern side of the base, assumed control of the facility in July 1994 and currently is the federal property manager for Moffett. Current federal and state agencies located at Moffett include the U.S. Department of the Army, U.S. Department of the Air Force, and California Air National Guard. These resident agencies use the federal airport and provide facilities for military personnel and their families, including family housing, a commissary, a military clinic, a service station, tennis courts, and an 18-hole golf course.

2.1.3 Hangar 1 History

Hangar 1 was built in 1932 to house the airship *U.S.S. Macon*. After Hangar 1 was no longer used to house Navy Lighter-than-Air program aircraft, both the Army and the Navy used the hangar for aircraft maintenance, training facilities, and office space. In 1994, as part of the transfer of Moffett to NASA under the BRAC program, the property management responsibility for Hangar 1 was transferred to NASA. NASA used Hangar 1 for air shows, open houses, the Moffett Field Museum, and various commercial and public functions until building occupants were relocated due to concerns about potential exposure to PCB and lead contamination. Hangar 1 has been closed to all uses except access by essential maintenance, abatement, or environmental cleanup personnel since May 2003.

2.1.4 Hangar 1 National Register Eligibility

Hangar 1 is individually eligible for the National Register of Historic Places (NRHP) and is a contributing element of the United States NAS Sunnyvale California - Historic District (Moffett Field) (hereinafter referred to as the Historic District), which is listed on the NRHP. The NRHP lists districts, sites, buildings, structures, and objects that are significant in American history, architecture, archaeology, engineering, and culture. To be eligible for listing in the NRHP, a

property must possess both "significance" and "integrity" of location, design, setting, materials, workmanship, feeling, and association. When evaluated within its historic context, a property's significance is judged by the application of the four National Register Criteria for Evaluation. In accordance with 36 C.F.R., Part 60.4, a property may be determined eligible for listing in the NRHP if it meets at least one of four main criteria:

- **Criterion A:** Properties that are associated with events that have made a significant contribution to the broad patterns of our history.
- **Criterion B:** Properties that are associated with the lives of persons significant in history.
- **Criterion C:** Properties that embody the distinct characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- **Criterion D:** Properties that have yielded, or may be likely to yield, information important in prehistory or history.

The Historic District is eligible at the national level of significance under Criteria A and C and has two periods of significance: 1930–1935 and 1942–1946. The noncontiguous Historic District is eligible under Criterion A for its associations with the Lighter-than-Air program and the contributing element of the Historic District, which is based on the contributions that program has made to history under the themes of coastal defense and naval technology. The Historic District is also eligible under Criterion C for its distinctive master plan and architecture, including a landscaped "commons," massive airship hangars (Hangar 1 and two smaller hangars), and "fine regional examples of Spanish Colonial Revival design" (Navy, 1994).

The NRHP nomination for the Historic District indicates that Hangar 1 is eligible for the NRHP under Criteria A and C for its association with a significant episode in the development of naval aviation prior to World War II, and as an example of early twentieth-century military planning, engineering, and construction in the Streamline Moderne architectural style (Navy, 1994). As part of the Art Deco movement, Streamline Moderne "emphasized horizontal aspects of design and is characterized by curved end walls, rounded corners, and flush windows" (Navy, 1994). Reuse guidelines for Hangar 1 that were developed in 2001, before knowledge of the PCB contamination, identified these Streamline Moderne elements at Hangar 1 and explained that the hangar's materials and construction method were innovative for the time (Page & Turnbull, Inc., 2001). Thus, the guidelines identified both the Streamline Moderne form and the corrugated metal panels on the exterior as two of several character-defining exterior features (Page & Turnbull, Inc., 2001).

NAS Sunnyvale (now the former NAS Moffett Field) was commissioned as one of two NASs in the early 1930s to port the two U.S. Naval Airships (dirigibles). The NASs were developed through the efforts of Admiral William A. Moffett to provide security for the lengthy expanse of the U.S. coastlines via air reconnaissance. Hangar 1 at NAS Sunnyvale was built in 1932 to house the airship *U.S.S. Macon*. The construction of Hangar 1 preceded the construction of the remainder of the base, which began in 1933. The hangar was the first building constructed at the station and was central to the overall function and purpose of NAS Sunnyvale. Hangar 1 is located perpendicular to the main axis of the station plan and provided the visual focus for the 1933 NAS Sunnyvale master plan (Navy, 1994).

Hangar 1 is a structure that was designed to hold fully inflated airships. Along with its counterpart in Akron, Ohio, Hangar 1 remains one of the largest structures in the United States without internal support. The floor area is just over 8 acres. There are enormous curved "clam shell" doors on the ends of the building that pivot back when opened (Navy, 1994). These clam shell doors and the exterior metal skin are distinctive characteristics of a 1930s hangar type. The method of construction is also significant for its contribution to engineering because it involved an innovative building process, which needed to be developed specifically for the hangar because of its massive size and distinctive design (Page & Turnbull, Inc., 2001).

2.2 PREVIOUS INVESTIGATIONS AND REMOVAL ACTIONS

In 1991, NASA completed construction of a stormwater settling basin (settling basin) that is approximately 2000 feet northwest of Hangar 1, to limit sediment transport to Installation Restoration Site 25, which includes the Eastern Diked Marsh (EDM), Stormwater Retention Pond, and the MROSD property. This action also reduced contaminant migration. The stormwater settling basin is located at the upstream end of a series of catch basins that control stormwater runoff from the western side of Moffett. The location of the settling basin is shown on Figure 2-4. Several sampling and follow-up investigations have shown PCB contamination in sediments in the stormwater system leading to the settling basin. In general, PCBs were formerly used in equipment as insulating materials, and to a lesser extent, in building materials as fire retardants. PCBs are probable human carcinogens and ecological toxins that bioaccumulate in the environment. Because of the persistence and toxicity of PCBs in the environment, its manufacture was discontinued in the United States in 1977.

Because of the particular mixture of PCBs detected in sediments, Hangar 1 was suspected as a possible PCB source and was added to the Navy's IRP as Site 29. Actions were undertaken to control the PCB contamination found in the storm drain system.

2.2.1 Previous Investigations by SamplingMedia

Investigations into PCB locations, concentrations, and sources were conducted on a variety of media including the settling basin of the EDM, stormwater, building materials, storm sewer sediment, and air. The following paragraphs provide detail of these sampling results.

Settling Basin – Sediment

In 1997, during routine cleanout and sampling activities conducted by NASA, a relatively uncommon PCB, Aroclor-1268, was reported in sediment samples from the settling basin (Professional Analysis Incorporated [PAI], 2002). Analytical results showed concentrations of Aroclor-1268 in the sediment samples ranging from 0.05 milligram per kilogram (mg/kg) to 0.8 mg/kg (PAI, 2002) (Table 2-1). The USEPA Region 9 Industrial Soil Preliminary Remediation Goal (PRG) for an unspecified mixture of PCBs with high risk is 0.74 mg/kg. PCBs with high risk normally refer to Aroclor-1254. Aroclor-1268 is considered comparable to Aroclor-1254 due to a similar molecular structure. Accordingly, the Aroclor-1268 concentration of 0.8 mg/kg exceeded the associated Industrial Soil PRG level of 0.74 mg/kg. There was no obvious source to explain the presence of this PCB in the storm drain system.

Stormwater

In April 1999, Aroclor-1268 was reported in a stormwater sample collected from Manhole D-1 (1.1 micrograms per liter [μg/L]), which is located at the northwest corner of Bushnell Road and McCord Avenue (see Figure 2-4). In an attempt to identify the source of the Aroclor-1268, sediment samples were collected from 15 catch basins upstream of Manhole D-1 in June 1999. However, the analytical results indicated no detectable concentrations for any isomers of PCBs in sediment samples upstream of Manhole D-1 (NASA, 2003a,b).

As a result of the sediment sampling conducted in the summer of 1999, five additional sampling locations upstream of Manhole D-1 were added to the stormwater sampling program in October 1999, including Manholes 107 and 109 (see Figure 2-4). Aroclor-1268 was not detected in influent and effluent stormwater samples collected during the 1999 to 2000 storm year, but was reported in 2002 in samples from both at concentrations of 1.2 and 0.63 μg/L, respectively (NASA, 2003a,b) (see Table 2-1).

In March 2003, samples of stormwater runoff were collected directly from both the siding along the east side of Hangar 1 and from a rainwater downspout (DMJMH+N, 2003). Both samples were split, and Aroclor-1268 was reported in the runoff from the siding at 3.09 and 6.7 μg/L, and in the sample from the downspout below the laboratory detection limit and at 0.37 μg/L (see Table 2-1).

Building Structural Materials

Sampling to confirm the presence of PCBs in the exterior construction materials at Hangar 1 was undertaken in October 2002. Samples collected from the various surface materials of the structure, including the flat roof, roof sealant, window putty, and the coating on the exterior siding, were analyzed (Benchmark Environmental Engineering, 2003). Analytical results are presented in Table 2-1 and summarized below.

Siding

As shown in Table 2-1, the most significant levels of Aroclor-1260 and Aroclor-1268 were reported in samples collected in October 2002 from paint and interior layers of the siding. Concentrations of Aroclor-1260 and Aroclor-1268 were reported up to 5,500 and 188,000 mg/kg, respectively. Concentrations in samples from upper black walls ranged from 2 to 12 mg/kg and 5 to 119 mg/kg for Aroclor-1260 and 1268, respectively.

During the October 2002 sampling of the exterior Hangar 1 building materials (Benchmark Environmental Engineering, 2003), two paint chip samples were collected and analyzed for total lead. Two samples collected from the exterior doors were reported to have 101,160 mg/kg and 198,570 mg/kg of total lead.

Various Hangar 1 building materials, including siding, roofing, and other surface materials, were analyzed for asbestos in October 2002. Nearly half of these building material samples contained between 0.7 and 18 percent asbestos by weight (Benchmark Environmental Engineering, 2003). A sample of the hangar siding was analyzed in 2005. The analytical data are discussed in Section 2.3 and included in Appendix B.

The Hangar 1 siding materials are considered porous surfaces under the Toxic Substances Control Act (TSCA) because they consist of an inner core impregnated with PCBs as well as an outer metal surface coating with PCB-containing paint. Because of this determination, only certain decontamination methods may be used to remove the PCBs from siding materials.

Window Putty

Aroclor-1260 and Aroclor-1268 were also reported to be present in the window putty (from 1.7 to 77 mg/kg and from 4 to 409 mg/kg, respectively) (Benchmark Environmental Engineering, 2003). Because one of the window putty samples had abnormally high PCB concentrations, and because the ratio of Aroclor-1260 to Aroclor-1268 in the elevated window putty sample was close to the ratio of the PCBs reported in the siding, it was assumed that the elevated window putty concentration was due to inclusion of some siding material in the sample (NASA, 2003b). To confirm this possibility, five additional putty samples were collected. Aroclor-1260 was not detected in any of the five additional putty samples tested, and Aroclor-1268 was reported between 0.4 and 2.1 mg/kg (see Table 2-1).

Roofing Material and Roof Sealant

Samples of the flat roof and roof sealant located under the center walkway of the roof were collected and analyzed for PCBs in October 2002. The roof is constructed with a multi-ply asphalt built-up membrane coated with a water-based emulsion. Six samples were collected from the roof with each sample containing five layers. Each layer was separated and analyzed. The results indicated that Aroclor-1260 and Aroclor-1268 were present up to a maximum of 0.9 and 0.5 mg/kg, respectively. One sample of the roof sealant was collected. Aroclor-1260 was reported at 5.7 mg/kg, and Aroclor-1268 was reported at 4.4 mg/kg (see Table 2-1).

Structural Steel

Samples of the paint on the structural framework inside the hangar were collected in 2005 (Integrated Science Solutions, Inc. [ISSi], 2005) (see Table 2-1). Prior to collecting the sample, the area was cleaned. Then the paint was ground off using a sander to remove the required amount of paint for the sample. Analytical results indicated that the paint was lead-based and contained Aroclor-1260 and Aroclor-1268 at concentrations from 33 to 120 mg/kg and 32 to 94 mg/kg, respectively. Total PCBs were reportedly present at concentrations from 65 to 214 mg/kg. In addition, analytical results taken from the structural steel paint indicated lead levels as high as 200,000 mg/kg. In March 2003 dust samples were obtained from the interior of the hangar. The analytical results of the samples indicated PCB concentrations from below the detection limit to 320 mg/kg.

Because it was coated with PCB-containing paint, the structural steel surface is considered a porous surface under TSCA. Because of this determination, only certain decontamination methods may be used to remove the PCBs from the structural steel.

Concrete Floor Slab

Wipe samples of the concrete floor were collected in 2002 (83 samples) and 2003 (4 samples). Wipe sample results indicated PCB concentrations ranged from below the detection limit to 21.2 micrograms per 100 square centimeters (µg/100cm^2) and lead concentrations were below the detection limit. The PCB concentrations are above the USEPA cleanup level of 10 µg/100cm^2 (see Table 2-1).

Core samples were obtained from the floor in 2003. A core sample was analyzed for PCBs; Aroclor-1268 was reported at 0.0949 µg/kg and Aroclor-1260 was below the detection limit (see Table 2-1). Various depths of this sample were analyzed to determine if PCBs were penetrating the floor surface to any degree. The analysis indicated that PCBs were not penetrating the floor surface to any degree (DMJMH+N, 2003). The core samples were also analyzed for lead, and the results indicated that the concentration of lead (from any source) within the interior of the concrete floor slab ranges from 4.4 to 5.0 mg/kg (see Table 2-1). A Synthetic Precipitation

Leaching Procedure performed on this concrete indicated lead was below the detection limit (DMJMH+N, 2003).

Results indicate that the hangar-related PCB and lead contamination is limited to the surface of the floor slab (DMJMH+N, 2003) (see Table 2-1). Because PCBs present in dust do not migrate through concrete, as would liquid PCBs, subsurface contamination is not likely. There are no indications from the previous investigations, available historical records, or visible staining that liquid PCB spills occurred.

Stormwater Collection Trench Sediment

In March and July 2003, sediment that had been collected in the stormwater collection trench around the perimeter of Hangar 1 was tested for the presence of PCBs. Aroclor-1268 was reported in the March 2003 samples at concentrations from 65.5 to 72.4 mg/kg and in samples collected in July 2003 at concentrations from 2.2 to 540 mg/kg (see Table 2-1). Lead and zinc analyses were also conducted on perimeter collection trench sediment samples. Additionally, in February 2005 the Navy sampled sediment from the rain gutters on the hangar. The sample had Aroclor-1268 at 250 mg/kg, lead at 4,520 mg/kg, zinc at 3,380 mg/kg, and asbestos (as chrysotile) at 2 percent. Results are summarized in Table 2-1.

Air

Following the discovery of elevated levels of PCBs in the interior paint of Hangar 1, two separate investigations of the ambient air inside and outside the hangar were conducted. In October 2002, NASA sampled for PCBs and lead in air inside and outside the hangar. In November 2002, Harding Environmental Science and Engineering (ESE) sampled and analyzed for PCBs and lead in air inside and outside the hangar.

The NASA PCB sampling results indicated that Aroclor-1268 was not detected in ambient air outside of the hangar (NASA, 2003b). However, Aroclor-1268 was reported in the samples from inside the hangar at concentrations from 0.0888 to 0.1115 micrograms per cubic meter ($\mu g/m^3$). For the direct-contact exposure pathway of ambient air, the USEPA Region 9 PRG for PCBs is 0.0034 $\mu g/m^3$.

The Harding ESE PCB sampling results indicated that Aroclor-1268 was not detected in ambient air outside of the hangar (Harding ESE, 2002). This and other investigations indicated that Aroclor-1268 was inside the hangar at concentrations from 0.0292 to 0.1115 $\mu g/m^3$. All of the indoor air samples exceeded the PCB PRG.

The lead sampling results indicated that lead was present in ambient air outside of the hangar (Harding ESE, 2002) at concentrations from 0.0041 to 0.0093 $\mu g/m^3$. Lead was reported in the samples from inside the hangar at concentrations from below the detection limit to 0.0127 $\mu g/m^3$. The California Air Resources Board promulgated a California Ambient Air Quality Standard of

1.5 µg/m^3. All of the air samples analyzed for lead were below the California Ambient Air Quality Standard.

Additional Data Collected from the West-Side Aquifers Treatment System

The Navy operates the West-Side Aquifers Treatment System (WATS) at Moffett to treat groundwater impacted by solvents and petroleum products. The system is located approximately 100 feet west of Hangar 1. The WATS collects groundwater from seven extraction wells and two sumps in Hangar 1. The two sumps in Hangar 1, the Hangar 1 Sump, and Electric Vault #5 are connected to steam pipes under the hangar. Groundwater seeps into the steam pipes and flows to the sumps. When the sumps reach a designated water level, the water is automatically pumped out by sump pumps. The groundwater is pumped to WATS. In July 2003, the Navy sampled the influent from the extraction wells and the sumps and analyzed the samples for Aroclor-1268. Sample results indicated that for all the groundwater samples collected, concentrations of Aroclor-1268 were below the detection limit (Table 2-1).

Time-Critical Removal Action Conducted by NASA

In September 2003, NASA implemented an action to remove sediments contaminated with PCBs from the stormwater collection trench located around the perimeter of Hangar 1 and to remove potentially affected sediments present on paved surfaces immediately surrounding the structure. NASA's action involved cleaning out and characterizing sediment residue in the stormwater collection trench surrounding Hangar 1.

NASA notified the Water Board of the presence of Aroclor-1260 and Aroclor-1268 within the stormwater collection trench in a letter dated July 1, 2003 (NASA, 2003c).

2.2.2 Time-Critical Removal Action Conducted by the Navy

The Navy performed a TCRA as an interim removal action at Hangar 1 to limit the migration of PCBs from the exterior surfaces of the building materials into the storm drain system leading to Site 25.

In October 2003, the Navy TCRA included the following:

- The exterior surface of the hangar was cleaned by pressure washing to remove any grease, oil, and dirt that may have inhibited adhesion of the selected coating materials.
- The exterior corrugated siding was coated with an asphalt emulsion. The purpose of the coating was to isolate the siding contaminants until a final remedy is selected. The coating was not applied to the flat roof, window surfaces, walk-in doors, vehicle rollup doors, or exterior appurtenances, such as gutters and stormwater discharge piping.

- The area around the hangar was cleaned by pressure washing following coating of the structure to remove any contaminants that may have been present on surrounding paved surfaces.
- A permanent, 6-foot-high, chain-link security fence was installed to control access to the hangar.

A complete summary of the TCRA activities is provided in the TCRA Completion Report (Tetra Tech FW, Inc. [TtFW], 2004). Since the TCRA was completed, periodic visual inspections of the coating on the exterior siding are being conducted. In addition, in February 2005 as part of an ongoing effort to reduce contamination, the Navy cleaned out the rain gutters on Hangar 1 by collecting, sampling, and disposing of the contaminated sediments in the gutters. The results of samples collected from these sediments are included in Table 2-1.

2.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

The results from sampling and testing building materials confirmed that Hangar 1 was a source of the PCBs reported in the settling basin. Analytical results indicated that Aroclor-1260 and Aroclor-1268 were present at significantly elevated levels in the siding and were present at relatively low to nondetectable levels in the flat roof materials, roof sealant, and window putty. Excluding small items, such as the window putty, the hangar shell consists of the following primary components:

- **Flat Roof:** The roof is a five-ply built-up roof membrane coated with a water-based emulsion. The analytical results from testing bulk samples of the roof materials revealed low concentrations of Aroclor-1260 and Aroclor-1268 (maximum concentration of 0.9 and 0.5 mg/kg, respectively).
- **Siding:** The exterior and interior corrugated surface of the hangar consists of two types of materials. The first material is classified as v-beam siding, which was installed to a height of 132 feet above ground. Above the v-beam siding, a mansard siding was installed up to the flat roof transition. Both sidings are Robertson Protected Metal siding. As described by the manufacturer, the siding consists of multiple layers laminated symmetrically during manufacturing on an innermost sheet of steel. These layers applied to the sheet of steel are shown schematically in Figure 2-5 and described in detail in Appendix A, as summarized below:

  Layer 1: A specially annealed steel sheet protected from corrosion by the following four layers.

  Layer 2: An air-blown (pre-oxidized) petroleum asphalt layer ranging from 24 to 28 mils thick encases the sheet of steel. (A mil equals one one-thousandth of an inch or .0254 millimeter.) This layer is marginally pliable, but very dry. Particles disengage from the layer when prodded (as opposed to shattering).

  Layer 3: Asphalt-saturated asbestos felt (ranging from 24 to 28 mils thick) makes up Layer 3. This asphalt is slightly different from the Layer 2 asphalt in that it contains a fire retardant, which has high concentrations of PCBs. This

layer is marginally pliable, but also very dry. Particles disengage from the layer when prodded (as opposed to shattering).

Layer 4: A weatherproofing compounded bitumen (asphalt-based) (ranges from 12 to 20 mils thick), which was intended to keep moisture and oxygen away from the underlying asphalt and to lock in the bituminous binders and oils. This layer is dry and brittle, exhibiting a glass-like fracture when disturbed.

After Layers 2, 3, and 4 were applied to the sheet of steel, they were fused together in a heated press. After the coated sheet of steel cooled, it was corrugated.

Layer 5: Aluminum paint (estimated 4 mils thick) of an unknown resin base composes Layer 5.

Additional layers of paint, added over the years after the hangar was constructed, are the suspected sources of the lead present in the siding and in sediment samples. The final coating on the exterior of the hangar, an asphalt-based emulsion, was applied during the Navy's TCRA that was conducted in October 2003.

To further characterize the composition of the siding and the location of the PCBs, a small section of the siding was submitted to a laboratory for a detailed layer-by-layer analysis for contaminants. The sampling and analyses were completed in June 2005. The laboratory report, included in Appendix B, indicated the presence of four layers, including the metal sheet. The four layers, listed from innermost to outermost, and a summary of the results of the analyses, are included below:

Steel Sheet

- PCBs: Aroclor-1268 at 19 mg/kg (probably from adhered tar adhesive)
- Iron: >99 percent
- No evidence of galvanization
- No asbestos

Tar adhesive (could not be separated from fibrous mat, equivalent to manufacturer's description of Layer 2)

- PCBs: Aroclor-1268 at 36,000 mg/kg
- Tar pitch
- No asbestos

Fibrous mat (could not be separated from tar adhesive, equivalent to manufacturer's description of Layers 3 and 4)

- PCBs: Aroclor-1268 at 36,000 mg/kg
- Chrysotile asbestos: 80 percent by weight
- Cellulose (cotton): 5 percent by weight
- Horse hair: 5 percent by weight
- Tar pitch from tar layer

Silver paint outer layer (equivalent to manufacturer's description of Layer 5)

- PCBs: Aroclor-1268 at 6,600 mg/kg
- No asbestos

The above results suggest that the outer layer of the hangar is impacted with greater than 6,000 mg/kg of Aroclor-1268. Because the outer layers are potentially porous surfaces, it is possible that PCBs were present in the paint, or that the Aroclor-1268 migrated to the outer layer from the underlying PCB-containing, asphalt-rich layer.

In summary, two sets of results were presented for the siding material: the initial sampling results in Table 2-1 and the more recent sampling results presented above. The combined results of these investigations have shown that Aroclor-1268 is present in paint on the siding at concentrations greater than 6,000 mg/kg, and in interior layers of the Hangar 1 siding up to a maximum concentration of 188,000 mg/kg (18.8 percent by weight). Aroclor-1260 is present in interior layers of the siding up to a maximum concentration of 5,500 mg/kg. These high concentrations result in sediment and water concentrations in the stormwater collection system that exceeded the Industrial PRG levels of 0.74 mg/kg for PCBs in soil and 0.034 μg/L for PCBs in water.

Although PCBs are the COCs and the regulatory driver for this removal action, the Hangar 1 building materials also contain asbestos and lead, which are hazardous materials. Interior building components of the hangar include the following:

- **Structural Steel:** The lead-based paint used to coat the structural steel is showing evidence of deterioration, and the steel is showing signs of rust in some areas. The structural steel paint had Aroclor-1260 and Aroclor-1268 at concentrations up to 120 and 94 mg/kg, respectively. Total PCBs were reportedly present at concentrations from 65 to 214 mg/kg (ISSi, 2005).
- **Redwood Ceiling:** The redwood ceiling that makes up the upper portion of the interior face of the hangar was painted with a silver coating visually similar to the one used for the structural steel. There are no known sample results from the coating on the redwood ceiling; therefore, for this EE/CA, the paint on the redwood ceiling is assumed to be the same lead-based paint with PCBs as the structural steel.
- **Catwalk Planks:** There are seven levels of catwalks that run the length of the hangar on each side and two catwalks that run down the center of the hangar ceiling. The catwalks consist of wooden planks (possibly non-treated redwood) painted with a silver paint visually similar to the redwood ceiling and the structural steel. There are no known sample results from the coating on the catwalk planks; therefore, for this EE/CA, the paint on the redwood catwalk planks is assumed to be the same lead-based paint with PCBs as the structural steel.

Building materials containing asbestos and lead that are in good condition and not subject to disturbance may generally be left in place per USEPA and Department of Defense (DoD) policy.

However, in the course of addressing the PCB contamination at Hangar 1, it will be necessary to take into account health and safety issues associated with handling and working in the vicinity of materials containing asbestos and lead and to comply with requirements for proper management, abatement, or disposal of asbestos and lead as hazardous materials.

The following findings are based on the analytical results of the building materials, sediment, and related Hangar 1 sampling:

- The siding and other building materials on Hangar 1 have high concentrations of PCBs that have adversely affected the sediment and surface water concentrations in the nearby stormwater collection system.
- The structural steel paint has high concentrations of PCBs that may have also contributed in the migration of PCBs.
- The Navy, regulatory agencies, and NASA have agreed that these findings warrant an additional response designed to control continued release of COCs from Hangar 1 to the environment.

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