

THE BOEING COMPANY
7755 East Marginal Way South
Seattle
King County
Washington

HAER WA-189
HAER WA-189

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD
THE BOEING COMPANY

HAER No. WA-189

Location: 7755 East Marginal Way South
Seattle, Washington 98108

Within an area bounded by East Marginal Way South on the east, the Duwamish Waterway on the west, 16th Avenue South on the north, and the Jorgensen property on the south.

Quad: Seattle South
UTM: Zone 10, 5264114 N / 551953 E

Dates of Construction: 1936–1941

Original Designers: The Austin Company (Engineers and Builders)

Original and Present Owner: The Boeing Company

Original Uses: Airplane assembly (2-40 and 2-41)
Warehouse storage, offices, and partial assembly (2-31 and 2-44)

Present Use: Facilities storage (2-40) / Vacant (2-41)
Offices, Shops and Storage (2-31) / Vacant (2-44)

Significance: Boeing Plant 2 assembly buildings 2-40 and 2-41, and the two associated warehouses, 2-31 and 2-44, are significant for their direct association with the World War II defense industry, specifically production of B-17 aircraft. The plant serves as an intact example of industrial building design and construction by The Austin Company.

Project Information:

This HAER document has been prepared at the request of the property owner, The Boeing Company. The report provides historical and architectural information about Buildings 2-31, 2-40, 2-41 and 2-44 at the Plant 2 facility located south of Seattle.

Historians, Drafters:

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Report Date: June 30, 2010

PART I. HISTORICAL INFORMATION

THE BOEING COMPANY IN SEATTLE

The history of The Boeing Company can be traced back to 1916, when William Edward Boeing (1881–1956) began building floatplanes in a small boathouse on the east side of Lake Union in Seattle. Boeing was born in Detroit, and attended Yale University. He moved to Seattle in 1908 after making money in timber around Grays Harbor, Washington. Boeing was fascinated by aviation, and in 1915 he and George Conrad Westervelt began building a seaplane. Westervelt was a Navy engineer who had studied aeronautics at MIT. William Boeing completed the plane on his own when Westervelt was transferred to the East Coast, and in 1916 he established the Pacific Aero Products Company. The following year, he reorganized the firm as the Boeing Airplane Company. During World War II the company was known as the Boeing Aircraft Company.

The company's first manufacturing facility was located on the west side of the Duwamish, south of the Seattle city limits. The former Heath Shipyards site, which William Boeing had purchased in 1910, served as a location for some fabrication, as well as drafting and office space. In 1918, a tarpaper shed was replaced with a more substantial structure. It became known as Plant 1 following the establishment of Plant 2 in 1936 (Hansen, n.p.).

During World War I, the Navy ordered 50 seaplane trainers from Boeing, and by May 1918 the company had 337 employees (Boeing Company, *A Brief History*, p. 7). Planes were tested on a grassy airstrip known as the Meadows, on the Duwamish Valley floor. This airstrip eventually was improved and acquired by King County in 1928.

The 1920s was a decade of expansion in airplane manufacturing and related industries throughout the nation. Boeing developed and manufactured fighter planes for the military, as well as a mail plane that won an airmail contract with the U.S. Post Office. The airmail service was inaugurated in 1927 and provided limited passenger service in a two-seat cabin. The first dedicated passenger transport began in 1928 with Boeing's 12-passenger Model 80 biplane, which a year later was upgraded to an 18-passenger model. By the end of the decade, airplane manufacturers began developing new monoplanes—the beginning of contemporary commercial aviation (Boeing Company, *A Brief History*, pp. 14–17).

The Army Air Corps ordered the first 13 B-17 bombers from Boeing in 1936, and Plant 1 was inadequate to keep the production on schedule (*Year by Year*, p. 37). In a step that signaled the commencement of what would be a massive World War II expansion, Boeing purchased 28 acres on the east side of the Duwamish Waterway and built the first phase of Plant 2.

CONSTRUCTION AND EXPANSION OF THE PLANT 2 BUILDINGS

For a graphical depiction of the construction and expansion of the buildings, see the drawing on the first page of the Part V., the Supplemental Graphics Section.

In March of 1936, Boeing purchased the first 28 acres of the new Plant 2 site. It was well-situated near the King County airport, across the Duwamish Waterway and south from Boeing Plant 1. At that time the King County Airport (Boeing Field) was being enlarged and improved with Works Progress Administration funds. Plans called for immediate construction of a "large and modern assembly plant [to]

be completed before the end of the year, with additions...to be made as business justifies" (Boeing press release, March 14, 1936). Site grading began in April and construction began in May, with scheduled completion within five months. The facility was necessitated by the Army Air Corps' order of 13 Y1B-17 (also known as 299) bombers from Boeing.

The earliest portion of the assembly plant measured 200' wide by 300' deep, with an unobstructed floor area and a height of 53'. The building had giant rolling doors along the primary northeast façade, in an opening 198' wide by 35' high. Six hundred tons of structural steel were used in the building's construction. This first phase of the project cost approximately \$250,000. Parts were trucked or barged from Plant 1 and assembled at the new Plant 2 site. A railroad spur to the site was laid parallel to East Marginal Way, and a dock served Plant 2 on the Duwamish Waterway.

Between March and October of 1937, the assembly building was more than doubled in size by construction of an addition immediately northwest of the 1936 portion. The addition consisted of two bays each measuring 125' wide by 300' deep, for a total addition of 250' by 300'. The overall building then measured 450' wide by 300' deep. All of this construction comprised a portion of what is known as Building 2-40. "From the start, the Boeing facility expansions, in common with other aircraft manufacturing plants, were the results of production demands far in excess of original quantities requested by the Government" (Air Materiel Command Headquarters Report, p. 24).

In 1940, the British government provided assistance to further expand Plant 2 for production of Douglas DB-7 bombers. This \$2 million addition was built to meet the production demands of a \$23 million order for the Allies. Approximately 600,000 square feet of floor space were added, and the existing building was extended southwest to the property line at the border of the Duwamish Waterway. This phase expanded Building 2-40 and provided the first portion of Building 2-41. Construction began in June 1940 and a dedication dance was held on October 12, 1940. A warehouse to the northwest—now known as Building 2-31—was constructed as well. It was immediately adjacent and internally connected to the assembly area. The first story of an engineering building (no longer extant) was added under this contract.

Meanwhile, further expansion was already being necessitated by B-17 production demands. Under an Emergency Plant Facilities (EPF) contract, the U.S. government funded the purchase of additional land and plant expansion. (Later, in 1943, Boeing bought out the government share of Plant 2 for more than \$7.7 million [*Seattle Times*, July 19, 1943].)

Just three days after the dedication of the previous project, a construction contract was signed for a subsequent Plant 2 addition. Buildings 2-40 and 2-41 were expanded to the southeast, and the one million square-foot project also included a four-story engineering and production department building, as well as a three-story office building. (The engineering and office buildings are no longer extant). Building 2-44, a warehouse southeast of the assembly area, was constructed under this contract and completed prior to the final 2-40 and 2-41 expansion. This addition was carried out in 1940 and 1941. A newspaper article from the period noted that:

Immense as Plant No. 2 will be, the production arrangement is simple. The manufacturing area will be flanked by warehouse area. Raw materials and purchased parts will be routed into the plant as manufacturing work progresses. Subassembly work will be done in second-floor areas above the primary shop areas (*Seattle Times*, October 16, 1940).

A 6,000-car employee parking lot, located across from Plant 2 on East Marginal Way, occupied land leased to Boeing by King County. The lot was sized to provide empty sections for workers coming on shift before those in the preceding shift had departed. Police and State Patrol were needed to direct the large volume of traffic during shift changes.

According to 1946 analysis of construction progress, “[t]he several consecutive expansions at Boeing, Seattle, were efficiently planned and the actual expansions accomplished in commendable time, in comparison with similar West Coast expansions,” (Air Materiel Command, p. 24). At each phase, buildings were occupied before their completion.

Beginning in 1942, a camouflage project was undertaken to disguise the appearance of Plant 2 from above, to stymie potential air attacks on this strategically important facility. The camouflage project was delegated to the Seattle Army Corps of Engineers. Two men are credited with the design of the camouflage for the Boeing plant. William Bain Sr., a prominent Seattle architect, who served as the Camouflage Director for the State of Washington Office of Civil Defense beginning in 1942, is credited with the overall camouflage project. Its design is attributed to John Detlie, a designer with training in architecture and engineering, who worked as an art director at MGM studios in Hollywood from 1935 to 1942. Detlie had been approached by Army personnel before the bombing of Pearl Harbor to discuss possibilities for camouflaging large plants on the West Coast. In response, he began designing and building models of camouflaged factories.

In May of 1942 Detlie received orders to report to Seattle to head the camouflage efforts for Plant 2. The resulting design converted the rooftop of Plant 2 into a complete, mock suburban neighborhood, nicknamed ‘Wonderland’. The sawtooth roof of the plant was covered with wire netting, burlap or canvas, and finished with small-scale trees and shrubs, houses, garages, and a gas station. Windows, skylights and clerestories throughout the plant were painted out for blackout purposes, and exterior walls were painted in a camouflage pattern. Although the threat of air attack faded and camouflage became unnecessary, removal of the rooftop work was not done until late June 1946.

THE AUSTIN COMPANY, ORIGINAL DESIGNER AND CONTRACTOR

The Austin Company designed and constructed Boeing's Plant 2 buildings. Founded in 1878 in Cleveland by Samuel Austin, the company began as a carpentry, building, and contracting firm. Austin had his own shop and eventually his own mill and built residences, commercial buildings, and factory buildings. Many of these were also designed by Austin. Samuel's son Wilbert "W.J." received a degree in mechanical engineering from what is now Case Institute of Technology and in 1901 joined his father in business. The company was incorporated in 1904 as Samuel Austin & Son Company.

The “Austin Method” became the company's hallmark. Under this method, the company provided full services by one firm—design, engineering, and construction. In 1908, the Samuel Austin & Son Company began a designing and constructing a series of factories for various electric lamp manufacturers. In 1911, the firm designed and built a campus research facility and a lamp manufacturing plant for the National Electric Lamp Association, both in Cleveland. Extensive work for the Association led W.J. Austin to the concept of standardization in design and construction. The company name changed to The Austin Company in 1916. Austin established sales offices in industrial centers—the first engineering and construction company to do so—eventually resulting in a network of offices around the country. The Seattle-area branch, which is attributed with the original design and construction of Plant 2, opened in 1926.

During World War I, The Austin Company's volume of work increased nearly 35 percent (Greif, p. 60), as it undertook national railroad projects and several major military installations. The company's most extraordinary project of the time was the Curtiss Aeroplane & Motor Corporation plant in Buffalo in 1918. The largest factory building in the world, at more than 600,000 square feet, it was completed in 90 working days and covered an area of approximately 28 acres under one roof. This plant continued to serve as an aircraft production plant throughout World War II, more than 25 years later.

The Austin Company continued to develop new areas of standardization to provide facilities for different industries. Particularly, W.J. Austin's love of aviation and his contacts with the country's aircraft manufacturers resulted in his innovation in wide-span hangar doors and The Austin Company's eventual leadership in design and construction of air transport facilities.

With extensive experience in standardization, aviation, and industry, The Austin Company was responsible for Boeing's development in the Puget Sound area from 1936—when the initial construction at Plant 2 was undertaken—into the 1960s. During World War II the company's work also included ship-building facilities, factories, special Naval facilities, and bomber assembly plants in the Southwest.

After the war, The Austin Company added specialty practices for television studios. In 1984, National Gypsum bought The Austin Company. Austin's management bought the company back in 1997, and in 2006 Austin became part of the Kajima Family of Companies.

From an architectural perspective, the Boeing Plant 2 buildings provide a clear contrast with many earlier industrial facilities. Constructed in the run-up to and during World War II, they are much more straightforward and functional in their exterior appearance. Rather than masonry cladding, the façades of Buildings 2-40 and 2-41 feature corrugated and plain metal panels, stripped of extraneous veneer and decorative details. In particular the highly visible Buildings 2-40 and 2-41 served as expressions of the power of production rather than an iconic image of industry.

Original interior spaces within the Plant 2 are clear spans interrupted only by necessary structure. Here, too, the Boeing Plant 2 was created as a space with maximum flexibility, capable of supporting varied manufacturing in a multi-line process rather than a single assembly line.

This flexibility proved its worth by allowing Boeing to change production processes with greater efficiency by using trenches below the concrete floor slab of the assembly floor, which ran along grid lines in both directions, for insertion and remodeling of rails and utility distribution systems responsive to changing means and methods of production.

THE SURROUNDING NEIGHBORHOODS AND THE DUWAMISH RIVER

The physical context surrounding Boeing's Plant 2 has changed considerably from its early 20th century conditions. This is due in large part to the early history of the area and the modifications made to the Duwamish River's natural flow, which once wound north through the Green River Valley (present-day Kent and Auburn areas) to the headland at what is the present Duwamish Waterway. The Duwamish is Seattle's only river and is part of a collection of rivers that includes the White, the Green, and the Puyallup Rivers. These run through the broad, L-shaped valley south of Seattle in southern King County and northern Pierce County.

The Duwamish was straightened and dredged as part of the early efforts by the City of Seattle to create infrastructure for industrial development. It presently runs through the flat bottomland that makes up much of the area from Tukwila to Harbor Island, passing along the west side of Plant 2, the west side of Seattle's Georgetown neighborhood, and the east side of the South Park neighborhood. South Park and Georgetown were annexed to Seattle in 1907 and 1910 respectively.

Plant 2 borders the Georgetown neighborhood, which is located to the east of East Marginal Way. Georgetown emerged in the late 19th and early 20th centuries, and the area is characterized by a mix of industry and residential development. In addition to the undulating course of the river, a number of rail lines once ran through Georgetown to serve local industries. Seattle's economy through the early part of the 20th century remained focused on import/export activities and resource-extraction based industries rather than manufacturing. While a strong ship-building industry developed during the run-up to World War I, this business sector remained stagnant through much of the 1920s and 1930s. Thus there are few historic industrial facilities comparable to Boeing Plant 2 in the area.

Boeing Field / King County International Airport is located south of Georgetown and east of East Marginal Way South. It was originally cleared as farmland and developed as the Meadows Race Track in 1902 with a 10,000-seat wood-framed grandstand and nearby stables for 1,000 horses. The track, which was placed over flat river bottomland, began to be used as an airfield with the first airplane flight demonstration in Seattle in March 1910. The Meadows served as an informal airstrip for testing and demonstrating flights through the 1920s, during which time the Boeing Company began building airplanes for use by the Army and Navy. The airport opened in 1928 and scheduled air service began in 1929. After the opening of Boeing's Plant 2 and through World War II, the airfield was used to test the company's B-17 bombers.

The nearby neighborhoods of Georgetown and South Park both result from a historic pattern of residential and industrial development. The typical buildings that dominate these areas are small one- and two-story wood-frame dwellings on small lots (typically 30' to 50' by 100'), small-scale wood-frame boarding houses, and apartment buildings. Retail stores, cafes, and taverns are located in older buildings in the commercial centers of both neighborhoods near Airport Way South and 13th Avenue South in Georgetown, and South Cloverdale Street and 14th Avenue South in South Park. In addition there is a library, community recreation center, and elementary school in South Park. The combined residential population of these two neighborhoods in 2000 was approximately 4,990.

PLANT 2'S WORLD WAR II WORKERS

The massive growth of the aircraft industry during World War II is conveyed by employment and production numbers. Between 1939 and late 1943, the number of aircraft workers in the United States grew exponentially—from 48,638 to more than 2 million (Lentz, p. 13). This facilitated the growth in aircraft production, from 6,019 planes in 1940 to a peak of 96,318 planes in 1944. The total aircraft production for the years 1940–1946 was 304,887 (Stoff, p. 175).

There were other aspects of wartime aircraft production, beyond the advent of mass production of military aircraft, which had lasting implications. These include the large-scale admission into the workforce of women and the emerging role of minority workers in the industry and organized labor.

The history of Boeing's Plant 2 celebrates the role that women played in production during World War II. However, the Boeing Aircraft Company had hired women in production roles as early 1916 when

seamstresses began sewing fabric for the company's first airplane. In 1917 the company's Drafting Department hired its first female engineer. By 1918 these women and other female employees made up almost 25% of the company's work force. Their numbers rose during World War II, to approximately 15% in 1942.

By 1928, with 800 employees, Boeing was one of the largest aircraft manufacturers in the country. By 1936, it had over 1,000 workers when production began at Plant 2. As military aircraft were ordered at an increasing rate and many men left for war, labor shortages loomed. Women, minorities, very young men, and retirees were hired to fill the need. In December 1940, Boeing had 8,427 Seattle employees; by the end of the war the number reached 46,000 (*Year by Year*, p. 46). In January 1943, there were 14,876 women employed at Boeing's Seattle and Renton plants, out of 34,087 total employees (Boeing "Payroll Headcount: Highest Peaks of Employment," cited in Myers, p. 40).

Boeing's wartime employment of female workers reflected the role of women in defense industries throughout the country. Working mothers made up more than 40% of the nation's female workforce in 1940, and their number grew to nearly 46% by 1944. In Seattle alone, the employment of women increased by 55 percent between April 1940 and January 1943. By May of 1943, Boeing employed nearly 14,500 women. (Bernier, 1999, p. 68 – 79). At the height of production, between 1942 and 1944, women made up 46% of Boeing's workforce. (Anderson, p. 77).

Most of the women who came to work in Plant 2 were unskilled in the manufacturing process, with only 3,062 of those working in 1943 having semi-skilled positions and only 109 with skilled ones. Most of the women workers performed simplified tasks as part of an overall assembly line. In response to training needs, local public schools offered publicly funded training in aircraft trades, pre-flight, and map and blueprint reading, with specific programs cited as "Free Education for Boeing Employees." The Boeing Company also provided in-house classes and ongoing training.

Organized labor, in an effort to secure employment for male union members after the war, viewed women as temporary workers. The Aero Mechanics Local 751, Seattle's largest union prior to the war, fought for higher wages and more breaks for Boeing workers and equal (union scale) pay for equal work, along with calls for rent and price controls, and government-sponsored housing. While the union eventually supported wartime employment of women and African-Americans it did not welcome either as permanent employees. Local 751 briefly allowed African-Americans to become members in 1940, but under pressure it quickly changed this policy. Up to 1,600 African-Americans worked at Boeing at peak levels in 1943, but throughout the war era they were charged dues, but given only union work permits. Without seniority and other benefits of membership, more Blacks found work in local shipyards than in aircraft factories. It was not until the post-war period, in 1948, that the union ended this discrimination. Taylor, p. 164-166).

The presence of women working on the factory floors of Plant 2 alongside men initially raised difficult social conditions, and some differences remained inherent in the workplace throughout the war. Publications and company records indicate the efforts undertaken by Boeing to train the new defense-industry employees, and its actions to address women's issues such as child-care and transportation needs. At Plant 2 meals were served in a cafeteria, and women were provided with separate locker rooms and security gates. Women employees were closely monitored, and as the company studied their performance it redesigned some production processes, such as the cockpit assembly, to utilize their smaller size and ability to complete detailed tasks.

Promotion of women workers occurred locally and at a national level. While most women were drawn to work in defense industries, government agencies and media at all levels promoted the concept of women as non-traditional factory workers as their patriotic and civic duty. The song, "Rosie the Riveter" was produced in 1942 as part of the federal effort to sell war bonds, and in May 1943 the *Saturday Evening Post* published an image of "Rosie" on its cover, using a portrait of a young telephone operator by painter Norman Rockwell. The iconic figure became a part of popular culture during the war, and has continued to serve since then as a proud symbol of female workers.

PART II. ARCHITECTURAL DESCRIPTION

THE SETTING

Buildings 2-31, 2-40, 2-41, and 2-44 make up the World War II era production facilities at The Boeing Company's Plant 2 in south Seattle. The approximately 110-acre property that comprises Plant 2 is bounded by East Marginal Way South on the east, the Duwamish Waterway on the west, South Webster Street on the north, and the Jorgensen property on the south. The buildings are southeast of the 16th Avenue South Bridge (also known as the 14th Avenue South Bridge and the South Park Bridge), which bisects the current Plant 2 property. The facility is located in the industrial corridor of south Seattle, on the east bank of the Duwamish Waterway and across Marginal Way from Boeing Field / King County Airport. The original Plant 1 buildings, which are the subject of this report, were located to the east of 16th Avenue South, the street that led from East Marginal Way to the east side of the bridge.

Nearby blocks of East Marginal Way also contain expansive and low-scale industrial sites. The Georgetown neighborhood is located north of Plant 2 and Boeing Field, and west across the Duwamish Waterway is the South Park neighborhood, with West Seattle beyond. Beacon Hill is farther east/northeast, beyond Boeing Field and Interstate 5. Seattle's commercial downtown is approximately five miles to the north.

Historic photographs show that the property that became Boeing's Plant 2 consisted largely of fields before development of the facility, which allowed for great expansion over time. The siting of the buildings on this property provided a strategic location in relation to water, rail, and vehicular access and in close proximity to the King County Airport.

The area surrounding Plant 2 has several transportation grids in addition to East Marginal Way South, resulting from the development of nearby South Michigan Street, Highway 99, and I-5. Heavy traffic traverses the Georgetown neighborhood along Airport Way South and on the major arterials that lead from it to East Marginal Way. East Marginal Way, the six-lane road that runs in front of Plant 2, serves as an urban freeway, providing access for commercial as well as private vehicles throughout the south Seattle industrial areas. Neighborhood streets from the east typically lead to and terminate at East Marginal Way. At the west end of 8th Avenue South, however, there is the recently-developed City of Seattle Gateway Park.

Near the intersection of South Michigan Street and East Marginal Way the Duwamish River is crossed by the 1st Avenue South Bridge, which was constructed in 1956 and 1998 and rebuilt in ca. 2001. 14th Avenue South, which passes through the present Boeing Plant 2, leads to the commercial center of the South Park neighborhood on the west side of the river. This historic double-leaf bascule bridge, which dates from 1929–1931, was closed in late June 2010 and is scheduled for replacement in the future.

SITE FEATURES

According to King County Tax Assessor's records, the tax parcel on which the subject buildings are located is 28.65 acres. Other buildings on the same parcel date from 1940 to 1953 and were built primarily for offices and additional warehouse space on additional property. The site is relatively flat.

The subject buildings are identified as 2-31, 2-40, 2-41, and 2-44. The primary assembly buildings, 2-40 and 2-41, do not stand as two distinct structures. Built in separate phases, they make up a single large structure with 2-40 being northeast of 2-41. The two abutting warehouse structures located to the northwest (2-31) and southeast (2-44), are internally connected to Buildings 2-40 and 2-41. A tunnel system, situated below the first floor, links all four buildings. The tunnel system provides continuous access for plant personnel, along with restrooms, locker rooms and some storage and service spaces.

Buildings 2-31 and 2-40 are abutted by, and internally connected to a newer structure, Building 2-25, an office facility, is situated northwest of 2-31. Building 2-44 is abutted by Building 249, a tall clear-span structure, on the southeast. A large asphalt-paved parking lot is located immediately northeast of Buildings 2-40 and 2-44 in the approximate 250' setback between the building and the roadbed of East Marginal Way. The Duwamish Waterway is located to the southwest of Building 2-31, 2-41, and 2-44.

ASSEMBLY BUILDINGS 2-40 AND 2-41

The buildings known as 2-40 and 2-41 form one vast structure, with an overall rectangular footprint of approximately 754' by approximately 1000'. (This area corresponds to column lines A to Q, northwest to southeast, by column lines 1 to 26, northeast to southwest.) The primary facade faces northeast, where it is set back approximately 250' from East Marginal Way South. The portion designated 2-40 is the northeastern (or "front") portion of the building, extending approximately 550' from column line 1 to column line 12. It is also known as the Assembly Building or Final Assembly Building. 2-41 is the southwestern (or "back") portion, extending approximately 450' from column line 12 to column line 26. This is also identified as the Primary Building or Basic Primary Building.

Constructed in four phases between 1936 and 1941, the structure is composed a steel frame on concrete footings, with a 6"-thick concrete slab-on-grade foundation, and piers. The tunnel system, which extends below all four of the Plant 2 war era buildings, is constructed of concrete.

The structure of Building 2-40 is made up by steel trusses, and riveted steel columns, with support a sawtooth roof with northeast-facing windows. The overall building height varies from approximately 42' to 53', with the tallest portion along the southeast. Most of 2-40 is a tall, single story volume, with a 50'-wide mezzanine running between column lines 11 and 12. An L-shaped second story is located also within 2-41, leaving the western corner as a taller single-story space. Where the building extends over the Duwamish Waterway on the southwest side, a 5"-thick structural concrete slab is used between column lines 25 and 26. Original structural drawings note the slab was set on 12x16 creosoted wood beams on creosoted wood pilings, approximately 10' on-center. A timber bulkhead runs northwest to southeast, below the southwest side of the building.

The exterior façades are characterized by industrial steel sash ribbon windows, metal cladding, and seven giant overhead doors along the primary northeast façade. Cladding was noted on original drawings as "ferroclad." As subsequent additions were made, some windows and ferroclad panels from existing exterior walls were salvaged and reused on the new exterior walls. Metal cladding presently in place is a combination of flat panels and corrugated panels, all of it painted a buff beige color. The original drawings note composition roofing; presently there appears to be a combination of composition roofing and asphalt roofing.

Typical window strips measure approximately 3'-6" and 5'-2" in height; these are continuous and contain various divided-light glazing patterns—two, three, or four lights tall. Windows along the northeast face of

each sawtooth are also steel sash windows set continuously, typically 7'-9" or 8'-7" tall. Each of these 30-light (6 across by 5 high) fixed windows contains an operable 8-light awning section at the top center portion. Numerous doors, of various sizes and types, provide access and egress around the building. The seven overhead doors on the northeast façade range in size from 94' to 100' wide. These oversized doors also contain strip windows, person doors, and several smaller vehicle doors within them.

The assembly buildings was designed to provide as much open floor area as possible, uninterrupted by partitioned offices, restrooms, or other divided spaces. Building 2-40 consists of a single tall story, measuring approximately 36' from floor to underside of roof trusses. An estimated 37,500-square-foot mezzanine runs along the full width of the southwest end, between column lines 11 and 12. At the main floor level below the mezzanine, the space is divided into numerous smaller offices and rooms. A concrete wall with large rolling fire doors along column line 12 indicates the transition between Building 2-40 and Building 2-41. Most of 2-41 has two floors; only the west corner of the building—from column lines 22 to 26 and from column lines A to D—is a tall single-story space.

"The plant was laid out to be under one roof with no dividing walls [between 2-40 and 2-41]. After it was built the fire underwriters required that it be divided by a fire wall in the middle [along column line 12] on account of the large amount of insurable values within the bldg." This division reportedly modified the original ventilation and lighting design, and a later blackout requirement also affected the ventilation plan (*Boeing News Bureau*, July 26, 1943, p. 5).

The interior space is characterized by its large volume, which is largely unobstructed but for the riveted steel columns; fully exposed structure, including massive steel roof trusses; concrete floor slabs at the first floor and maple flooring at the mezzanine (2-40) and second floor (2-41); ample natural light from continuous strip windows along the walls and the sawtooth roof; and restrooms contained in sections that are suspended from the structure above the production floor. These restrooms are accessed by metal stairs. Additional restrooms are situated below the first floor, accessed by stairs. Single crane rails and craneways and large mechanical equipment elements are also distinguishing features of the interior.

The cast-in-place concrete fire separation wall at column line 12 between 2-40 and 2-41 contains a series of large openings with sliding fire doors as well as conventionally-sized openings. A large concrete-enclosed room is located at both the north and east corners of Building 2-41. These two spaces have large metal fire doors and fire shutters and appear to have had large exhaust ductwork originally. One sign reads, "Central Fab. Conveyor Spray Painting," indicating that the space appears to have been used as a paint spray area. There are no other notations on drawings or earlier documentation.

The interior face of the northeast and southwest perimeter walls is unfinished, with the structure exposed and the exterior cladding elements visible. On the northwest and southeast sides, Buildings 2-40 and 2-41 flow into the neighboring buildings without any wall separation.

Beneath the building concrete tunnels, approximately 10' to 15' wide and 10' high, provided access and egress for personnel without interrupting work on the floor. A period article notes: "Beneath the factory floor at Plant No. 2 will be 3,000 lineal feet of concrete access tunnels, providing entrance and exit for workers. Large washrooms and locker rooms will be along the access corridors on the basement level" (*Seattle Times*, October 16, 1940). Narrower utility tunnels are reached from the larger access tunnels, along with a few storage and service spaces. There are also utility trenches accessed from openings (covered with metal plates) in the production floor of 2-40 and 2-41.

CONSTRUCTION CHANGES TO BUILDINGS 2-40 AND 2-41

The original construction campaigns spanned 1936–1941, with the buildings constructed in phases as described earlier in this report. Buildings 2-40 and 2-41 are essentially unmodified from their original design and embody architectural integrity, although some various alterations have been made over time.

Permit records were not available for review. The following description of changes is based primarily on visual observation and a review of more contemporary drawings.

- The earliest portion of the building had massive sliding doors on the primary northeast façade. These doors were replaced early on by vertical lift doors, which remain in place today. These overhead doors have had subsequent alterations made to them—two rubber overhead doors have been inserted within the large metal overhead doors, some of the windows within the doors have been replaced with metal panels, and some of the windows in the doors appear to date from the later 1940s or 1950s.
- The "Boeing" sign, visible in early photographs, was removed from the primary northeast façade. Historic photos indicate this occurred during WWII, apparently for the camouflage project.
- The typical ferroclad original cladding panels on the northeast façade have been replaced or covered by vertical metal panels. The date of this change is unknown.
- Some non-original doors have been inserted or have replaced original doors.
- Minimal areas of glazing have been replaced with Plexiglas or metal panels.
- Non-original ducts, vents, or exhaust lines are visible.
- Non-original partitions were inserted to create office area below the mezzanine in 2-40.
- Some original interior openings in the fire wall at column line 12 have been infilled with concrete masonry units.
- On the second floor of Building 2-41, partitioned office space was created. Finishes in this area include gypsum wallboard, carpet, and acoustical drop ceiling.
- Some newer mechanical / manufacturing equipment has been installed.

Both buildings suffer from some deferred maintenance, particularly 2-41. Areas of water infiltration are visible; the evidence of greatest damage is at the southwest edge of the roof where a section of wood decking is extensively deteriorated. Bird infiltration is also evident. Some areas along the southwest part of 2-41 are cordoned off to prevent access, due to safety concerns.

For the most part, original windows are extant and intact. There are some broken window panes and minimal replacement of original glass with Plexiglas. Some exterior window surfaces are painted, presumably a remnant from World War II blackout requirements, while others are clear.

Second-floor office areas in Building 2-41, which were previously altered with contemporary office finishes, have been vacant since the 1990s. Maple flooring at the second floor in 2-41 is undergoing abatement of a substance related to former production work that was done in that area. Building 2-40 is presently used for facilities and fleet storage and a portion is leased out for historic aircraft restoration. This portion appears to be better-maintained than 2-41, which is vacant.

Building systems—including electrical, fire protection, HVAC, plumbing, and related systems—are aging, and Boeing Company personnel have noted that in many cases these systems are not operational. Piping breaks and resulting failures in the underground fire lines have caused extensive flooding in the tunnel areas and this reportedly continues to be a problem. The power distribution system was last upgraded in

1962. Wood pilings in the Duwamish Waterway, under the southwest edge of the building, show evidence of deterioration, although some repairs were made in the 1980s.

BUILDING 2-31 (NORTH WAREHOUSE, 1940)

Two structures on either side of the assembly buildings 2-40 and 2-41 are cited as warehouses in original drawings and planning documents. Building 2-31 is a steel and concrete frame warehouse that abutted the northwest perimeter of 2-40 and 2-41. Similar to Building 2-44, it is characterized by its lower scale than the assembly buildings and by its flat roof monitors with clerestory glazing. Because of the constraints of the site, 2-31 is not rectangular, but rather it tapers to the southwest of column 9.

2-31 contains a continuous, straight 20'-wide transit aisle that runs between column lines A and WJ, from the paved setback in front of the assembly complex to the back of the Boeing property. A second, perpendicular 20' wide transit aisle ("Burma Lane") is set between column lines 10 and 11, and extends to the southeast through 2-31 into building 2-41 and from there through 2-44 to 2-59. This aisle was once part of Plant 2's rail shuttle system, although the rails have since been removed.

2-31 has overall dimensions of approximately 664' by 224'. It has no primary facade facing toward East Marginal Way due to the construction of Building 2-25, a multi-story office facility, which abuts its northeast perimeter wall. Portions of the secondary west facade are aligned with the roadbed of 16th Avenue South, while the narrow, 22'-wide back facade faces southwest toward the Duwamish River.

The design concept for 2-31 is similar to the earlier assembly buildings as a large open space, punctuated by columns and illuminated by clerestories in two flat-roof monitors. The building structure is made up by both concrete columns with conical caps and steel columns, set on concrete footings, with a 6"-thick concrete slab-on-grade foundation, and foundation piers. The columns support steel roof trusses, set at 48' on center, which define five longitudinal bays. Above these there are long clerestory windows running longitudinally along the outsides of the roof monitor columns WA and WC, and WE and WF. Original floor plan indicates warehouse functions within 2-31, along with accessory restrooms and a switch room. As with the other buildings that made up Plant 2 it contained stairwells that led to the tunnel system and restrooms below grade.

Changes to 2-31 include the addition of several flat roof carport like structures along its west facade, a loading dock near the northwest corner that continues along the back of Building 2-25, and a wood frame stair near the southwest corner that bridges over 2-31 with a raised walkway. The walkway leads to the second floor office area in Building 2-41.

Offices, classrooms and conference rooms have been inserted into the front portion of the building on the first and second floor. These spaces feature gypsum wallboard walls, suspended acoustic-tile clad ceilings, and contemporary lighting systems in contrast to the unfinished original construction. An enclosed shop is situated to the northeast of the transit aisle and column line 11, between column lines WJ and WF, and a parts room is located in the triangular-shaped end space, southwest of the same drive aisle.

BUILDING 2-44 (SOUTH WAREHOUSE, 1941)

Examination of the original plans by The Austin Company, and historic information from records and photographs indicates that 2-44, the "South Warehouse", was used for production of small parts as well as

storage and office functions. The structure of 2-44 is made up by steel wide-flange columns, and flat trusses with perimeter walls on the four exposed facades clad with 8" of brick masonry. Steel columns and trusses are welded and bolted. The columns set along the northeast and southwest perimeter walls are enclosed in concrete to form pilasters.

Building 2-44 is approximately 231' wide, with a single 31'-wide bay between column lines Q and R and four 50' bays that correspond to column lines R, T, U and V. The building is 1000' in depth, which is consistent with the adjacent assembly buildings. There are a total of 26 bays: 16 bays of 50' run between column lines 1 to 12 and 22 to 26 (including northeast and southeast outer walls that add 1'-1" at each end of the structural grid), and 10 bays of 25' from 12 to 22. A continuous, 31' wide transit aisle ("Burma Road"), runs straight through 2-44, between column lines 24 and 25, linking it with 2-41 and Building 2-48. 2-48 is a tall steel-framed canopy of approximately 67' by 147', which serves as the south terminal of the transit aisle.

Another abutting structure, Building 2-49, is located along the back of the southeast façade. Known as 2-49, it was as a Jig Erection Building in 1953. Abutting both 2-49 and 2-44 there is small gable roofed, enclosed structure, No. 2-51, the 1954 "Box Storage and Shoring Shed."

The 200' wide primary facade of Building 2-44 faces northeast. Set back situated approximately 250' from East Marginal Way South, it joins with the primary facade of Building 2-40, but it is distinguished by its smaller scale, height, and roof monitors. This facade is finished with flat metal panels. The secondary facades, which faces southeast toward a large paved parking area and southwest along the Duwamish River, are clad with brick masonry.

In contrast to the neighboring assembly building, 2-44 is characterized by its lower scale and two flat-roof monitors. The long sides of the roof monitors are clad primarily with glazing and "Transite" panels, made of a fire-resistant composite material, while the monitor ends are finished with 26 gage steel over 2x6 T&G framing. Some areas of the roof monitors are patched with corrugated metal panels. Windows in the facades are composed in strips, typically 3'-5" and 4'-10" in height. Notes on the original drawings indicate that some of the windows were recycled glass. Obscure glass was installed at the first floor level windows.

Interiors partitions were originally constructed with vertical T&G boards, framed modular 3-ply panels, plaster, and wire mesh, with wire mesh used also for sliding panels and gates. Large, "Burvett" counterbalance fire doors, clad on two sides with steel panels, were set into the wall between 2-44 and 2-40 and 2-41. Plaster was used for the partitions that enclosed a row of offices, corridor and women's restroom, which were situated along the front (northeast) perimeter of the building, while wire mesh enclosed a nearby, 75' by 68' "Acct & Inst." classroom space. With exception of these enclosed rooms the interior of 2-44 was largely open, although there were specific areas cited on the floor plans as "Storage Area" for materials and parts, and another for "Maintenance." 2-44 contained some equipment that suggests its use in assembling some aircraft parts. These include spaces for propellers, engines in the front half, between column lines 3 and 7, a large Jig Shop in the center. Pits—recesses in the floor slab—were cited on original drawings for a planar pit, a resaw pit, veneer press pit, and several additional unidentified pits. This equipment was powered by electrical cables fed by conduits along the columns and ceiling areas. Below the first floor there were restrooms, transformer rooms and service spaces off underground tunnels.

Interior changes in 2-44 include the later installation of large overhead cranes carrying electrical distribution cables, and several unidentified rooms. The offices along the front have been replaced by

other office and conference rooms and a paint-finishing area characterized by cast floor supports and ducting. There appears to be more pits in the floor slab than shown on the original 1940 drawings, which suggests some of the changes made to the building over time. In the back section, southwest of column line L there are stairs leading up to non-original second floor office areas. Construction dates for these non-original spaces have not been confirmed. Some of these offices have been removed, but the areas identified by remnants of acoustic ceiling tiles and floor framing.

PART III. PRODUCTION PROCESS AND OPERATIONS AND PROCESS

THE B-17 BOMBER

The Boeing B-17 bombers were used during World War II primarily on long-range missions in Europe flying out of bases in England. The aircrafts were designed and built for speed, range and defense capabilities, and thus they flew frequently in formations without fighter escorts. Boeing began to design and build its first long-range heavy bombers in Seattle in 1934. Early models included the XB-15 and the 299, a four-engine prototype for the B-17, which took its first flight in July 1935. By early 1937, when the U.S. Army Corps received delivery of the first 13 aircraft, they were designated as Model Y1B-17.

Improvements in Boeing's design of the B-17 were made throughout its ten-year period of production, particularly during the war in response to battle experience. Named the "Flying Fortress" by a local reporter, the B-17 was known also as the "Flying Fort" because of its weight and defense capacity. The aircraft had a length of 74'-4", a height of 19'-1" and a wingspan of 103'-9", and carried four 1,200 horsepower engines and propeller blades nearly 12' in diameter. 13 Browning machine guns were fitted into dorsal, ventral, nose and tail turrets, in addition to side, waist and lower dorsal positions. The bomber featured a closed cockpit, a navigator's position, and a bombsight in the glazed nose. It held bomb racks and a catwalk in a bomb bay, and considerable radio equipment in a radio room.

Weighing approximately 36,000 pounds the B-17 could carry a total of up to 65,500 pounds, including a typical bomb load of 8,000 pounds (or more with special external racks). It could climb to 35,600 feet, and had a maximum speed of 287 mph, and a range of 2,000 with a typical 6,000 pound bomb load. A typical B-17 crew was made up of ten airmen, including a pilot, co-pilot, navigator, bombardier, flight engineer, radio operator, two waist gunners, tail gunner, and ball turret gunner.

Between 1935 and 1945, 12,732 of the B-17 bombers were produced. Production was greatest with the final model, the B-17G, with a total production of 8,680. An estimated 4,735 B-17s were lost in combat during the war. Soon afterwards the B-17s were replaced by newer aircraft. Current estimates of the remaining aircraft put their number at fewer than 100.

THE MANUFACTURING PROCESS

Aircraft production at Boeing's Plant 2 began in 1936 with approximately 1,000 workers. At that time large parts and materials were brought by barges up the Duwamish River to the rear doors of the facility. The plant grew to play a pivotal role in aircraft manufacture during World War II, reaching a peak production in June 1944 when sixteen B-17s rolled off the production line in a 24-hour period (*Year by Year*, p. 39). The world record for a single month of production had been broken by Boeing in March 1944, when 362 B-17s were produced and delivered (*Year by Year*, p. 54).

Cooperation among various aircraft manufacturers enabled a coordinated nationwide war effort, "widely viewed as one of the greatest industrial triumphs of all time" (Lentz, p. 12). The Allied victory is largely attributed by historians to American air power, and many cite the specific role of the B-17 bombers in this effort.

The Boeing Company is credited with creating a flexible and highly efficient manufacturing process utilizing a multi-line system. A period newspaper article describes the system:

Installation of an assembly-line production system in building the latest type of Flying Fortresses for the Army was announced today by the Boeing Aircraft Company. The new system, patterned after the mass production methods used in automobile plants, will be used in fulfilling the Army's order for thirty-nine of the Fortresses... The system is in line with a War Department plan to have all manufacturers of military equipment gear their plants to highest possible speed. Under the mass-production method, virtually all the 175,000 square feet of floor space in the company's No. 2 plant in East Marginal Way has been turned over to the new assembly line for speedy production of the twenty-two-ton bombers, known as B-17B ...

When the Flying Fortress production line is operating at full speed, the bombers will emerge ready for flight in virtually a steady stream... Boeing officials declared this is the first time an assembly line system has been used on planes as large as the bombers... Under the new system, special production lines of wings and sub-assemblies lead up to the main assembly line, where the planes progress successively through eight stages of construction... As the Flying Fortresses progress along the line, parts are fed to them by the plant's elaborate overhead crane system and specialized crews of men perform specific operations on each plane as it passes through their zone. (*Seattle Times*, May 31, 1939.)

Various sized hoists, and heavy crane ways between beam and column lines carried partially assembled parts above the floor levels of the Plant 2 buildings. Eventually the parts were brought to the open-span assembly areas in Buildings 2-40 and 2-41. In lower-ceiling areas of the plants there were air intake supply and exhaust ducts, and flexible electrical power distribution drops from the ceilings served the factory equipment on the floor levels below. Manufacturing processes were carried out also on second floor spaces along with engineering, with steel stairs connecting the two levels for efficient access. Additional steel stairs accessed toilet facilities at upper mezzanine levels, while concrete stairs led to those along the tunnel system below the factory floor.

Distinct production process plans have not been discovered for the Boeing Plant 2, but historic photographs and diagrams describe the fabrication of B-17s within Plant 2 during the early 1940s. There were three assembly lines, each sized to accommodate multiple planes. Portions of the fuselage, nosing wing and tail sections, cockpit interiors and engines were assembled in the back portions of the plant. As the aircraft was brought toward to the front area in 2-40 the assembled fuselage would be carried forward, and tail and wing sections and engines added. Once the planes were finished they moved through the 21'-6" doors in the northeast façade of 2-40 to the paved area in front of Plant 2, and from there across East Marginal Way to Boeing Field.

Company records indicate that many parts were manufactured offsite in six separate factories in Washington state. Production materials were stored in one of four large warehouses that the company leased in Seattle and delivered to the warehouses of Plant 2.

The multi-line system instituted by Boeing has been recognized as a critical component in the high productivity at Plant 2, particularly when compared to similar wartime production of planes by former motor company plants in the Midwest, such as Willow Run. Other Boeing assembly plants, built in the 1940s in Renton and Wichita, were designed to follow the multi-line concept. This process proved its

flexibility when Plant 2 was reconfigured to produce B-29s in 1944. This conversion reduced the B-17 production to a single assembly line that ran along the southeast side of 2-40 and 2-41.

While B-17s were built in Seattle, B-29s were built initially in Boeing's Wichita plant. In April 1944, portions of the Seattle Plant 2 were also converted to B-29 production, and its operations were coordinated closely with Boeing's Renton Plant southwest of Seattle. Fabrication, structural work, installation, and sub-assembly took place at Plant 2, and final assembly was completed at the Renton plant. (*Year by Year*, p. 54.) The first of the B-29s emerged from the assembly lines in June 1943, and the first B-29 mission took place on June 5, 1944.

None of the original or later equipment and machinery used for aircraft production or assembly remains within Plant 2, although there are some parts stored in Building 2-31. Recessed floor slabs and plates in Building 2-44 recall the presence of jigs and other machinery that required greater clearance than allowed by the floor-to-ceiling heights, ventilation, or maintenance and operations access from below.

During World War II, Boeing and other manufacturers throughout the county built aircrafts developed by one another in an effort to maintain maximum production. The Lockheed Aircraft Corporation and the Douglas Aircraft Company built B-29s, and the Bell and Glenn L. Martin Aircraft Companies built Boeing's B-17s. Between 1936 and 1944, Boeing produced Douglas DB-7B attack bombers, Waco-designed gliders, and Stearman Aircraft Company Kaydet trainers in its American factories. At the same time Boeing Aircraft of Canada built amphibian aircraft designed by Consolidated Aircraft of San Diego and British-designed Blackburn Shark torpedo aircraft.

PLANT 2 IN THE POST WAR ERA

Drastic changes occurred in local industries immediately after World War II. Military orders largely ceased and Boeing closed down many of its production facilities. An estimated 70,000 employees in the Seattle area were laid-off. After the war the company continued to use Plant 2, however, for aircraft production, including assembly of B-50 and B-52 bombers. Boeing's Model 307 Stratoliner and Model 377 Stratocruiser airliners, and its initial four 737s, which were later built in the Renton plant, also came off the assembly lines of the Seattle plant.

Beginning the late 1950s, Boeing developed guided missiles, which went into mass production, including the off-site intercontinental ballistic missile system, the Minuteman program. It expanded jet aircraft production for private aviation, initiated space exploration and mass transit programs, and advanced new technologies in digital computers. The company went on to become a leading producer of commercial passenger planes, and later manufactured manned and unmanned space vehicles such as the Space Shuttle and Apollo lunar vehicle.

By 1968, Boeing employment in the Puget Sound area reached a peak of 101,000 workers, including many employed in its Everett plant. This 98.3 assembly plant was designed for production of the world's largest jet airliner, the 747. By 1968 construction of the Everett facility completed. Boeing continued to use its Renton plant and expanded its production facilities outside of Washington state, but its use of Plant 2 for aircraft production ended. Areas of the assembly buildings and warehouses were gradually converted to office and storage use, along with production of parts. For much of the last decade portions of Buildings 2-40 and 2-41 have been donated for use by the Museum of Flight for storage of older airplanes, including a B-17 and B-29 bombers, which are undergoing restoration, and a Lockheed Super Constellation airliner.

PART IV. SOURCES OF INFORMATION

RESEARCH

Research for this report was undertaken in April through July 2009, with additional research in May and June 2010. Research included examination of available drawing records; property tax records; historic maps, photos, company publications, newspaper articles, and internal reports; and site visits to measure the buildings and look at and document remaining original design features, subsequent changes, and current conditions. The primary source of information was the Boeing Company. Historic maps, photos, and company publications came from the Boeing Historical Archives. Original design drawings by The Austin Company and later construction drawings came from digital files in the company's Plant 2 Engineering Department.

Other sources of information came from the following repositories:

- Digital collections of the University of Washington Libraries Special Collections and Museum of History and Industry
- Period newspaper clippings and other publications from the Seattle Public Library's special collections, available at the Central Library's Seattle Room
- King County Tax Assessor's Property Record Cards from the Puget Sound Regional Archives, located at Bellevue Community College.

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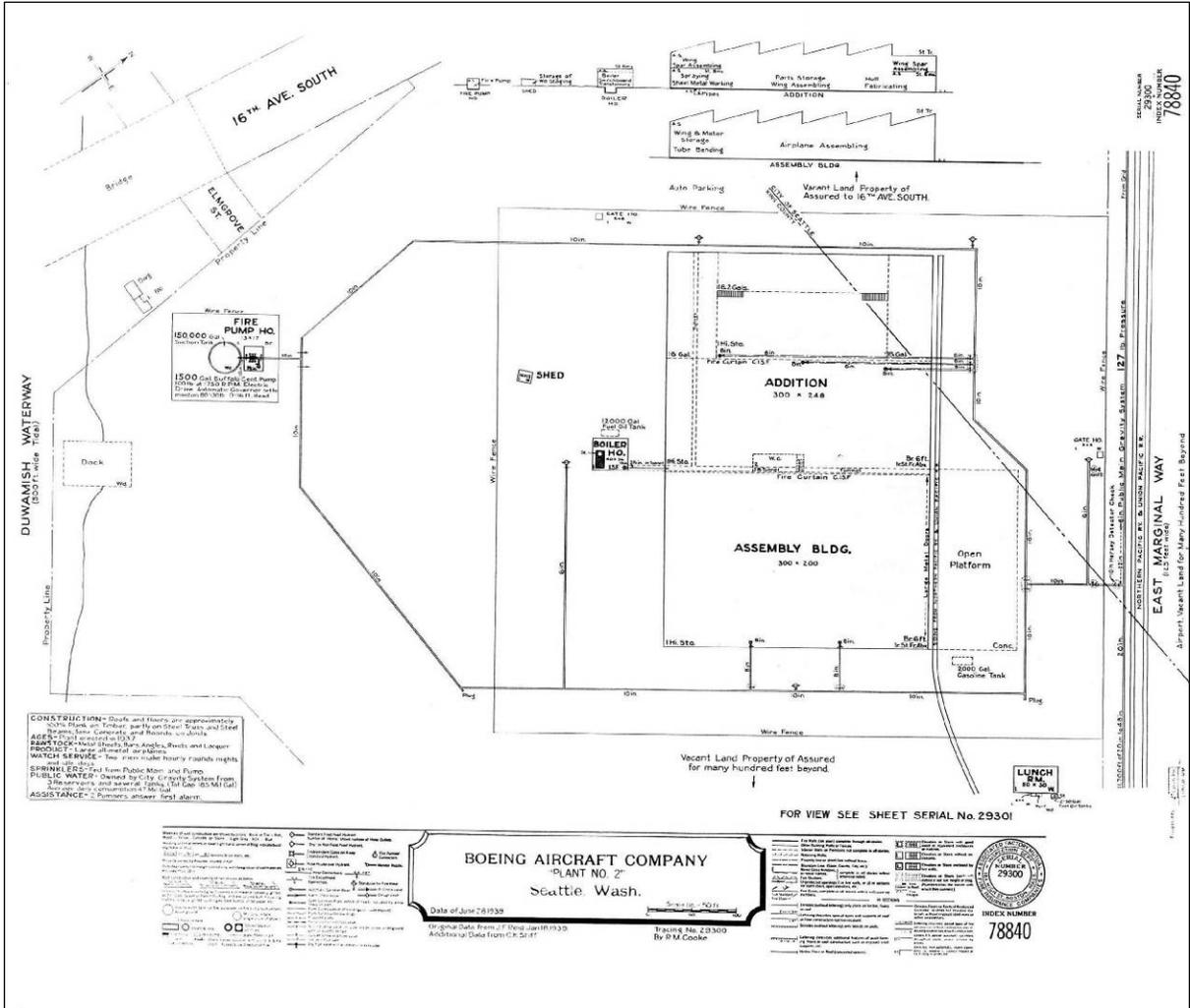
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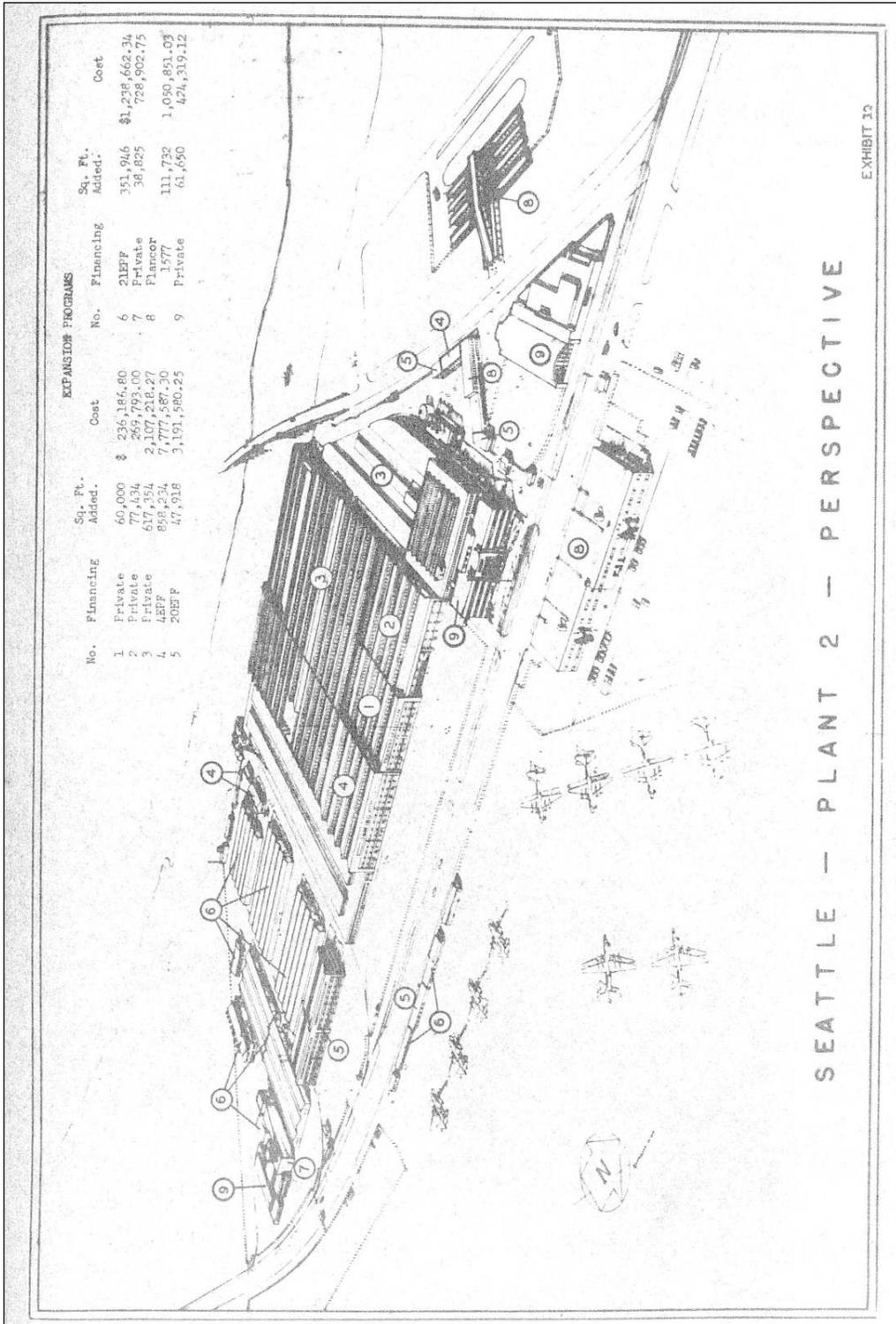
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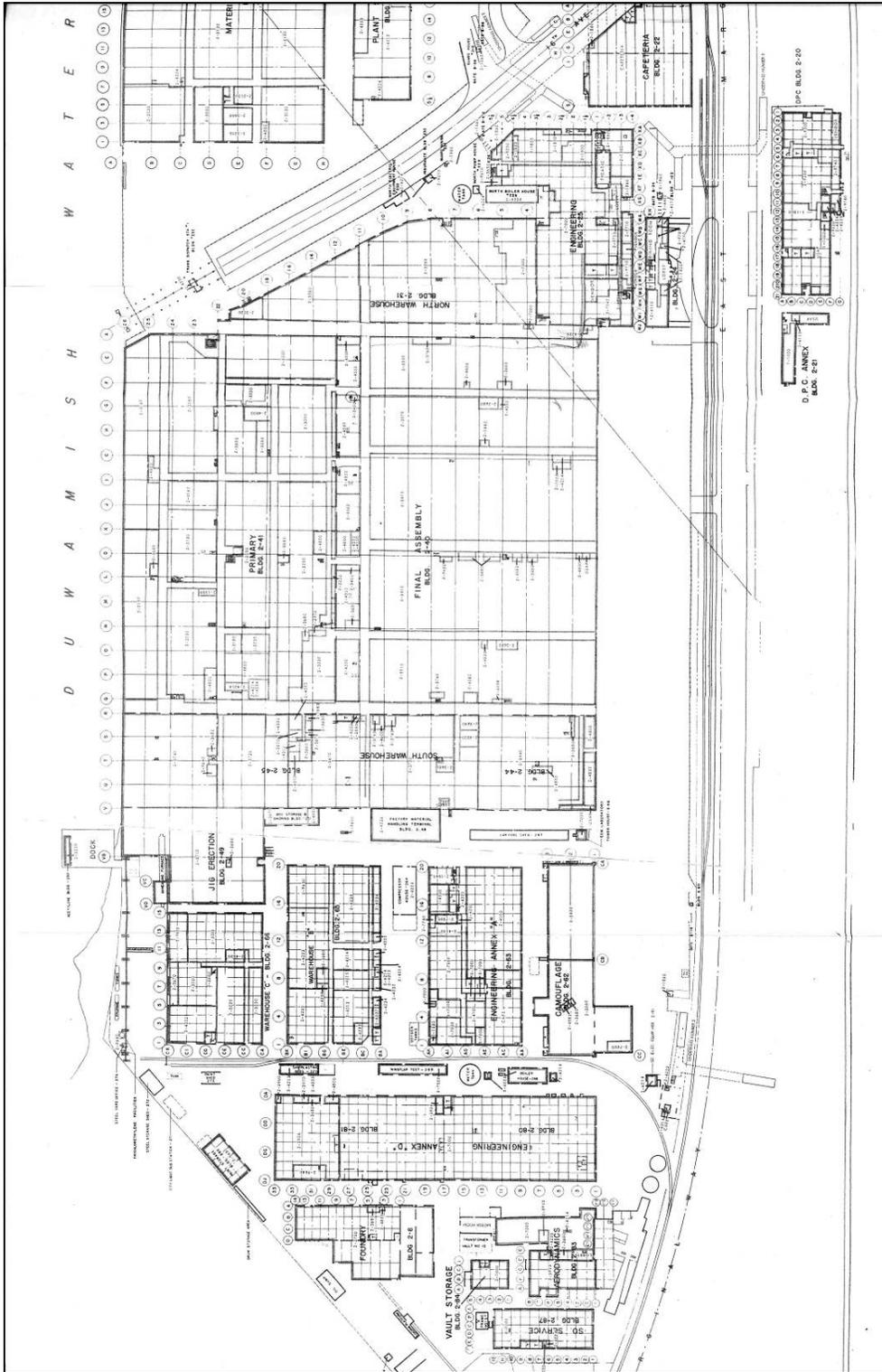
PART V. SUPPLEMENTAL GRAPHICS



Site plan showing Plant 2 in 1939. (Boeing Historical Archives.)



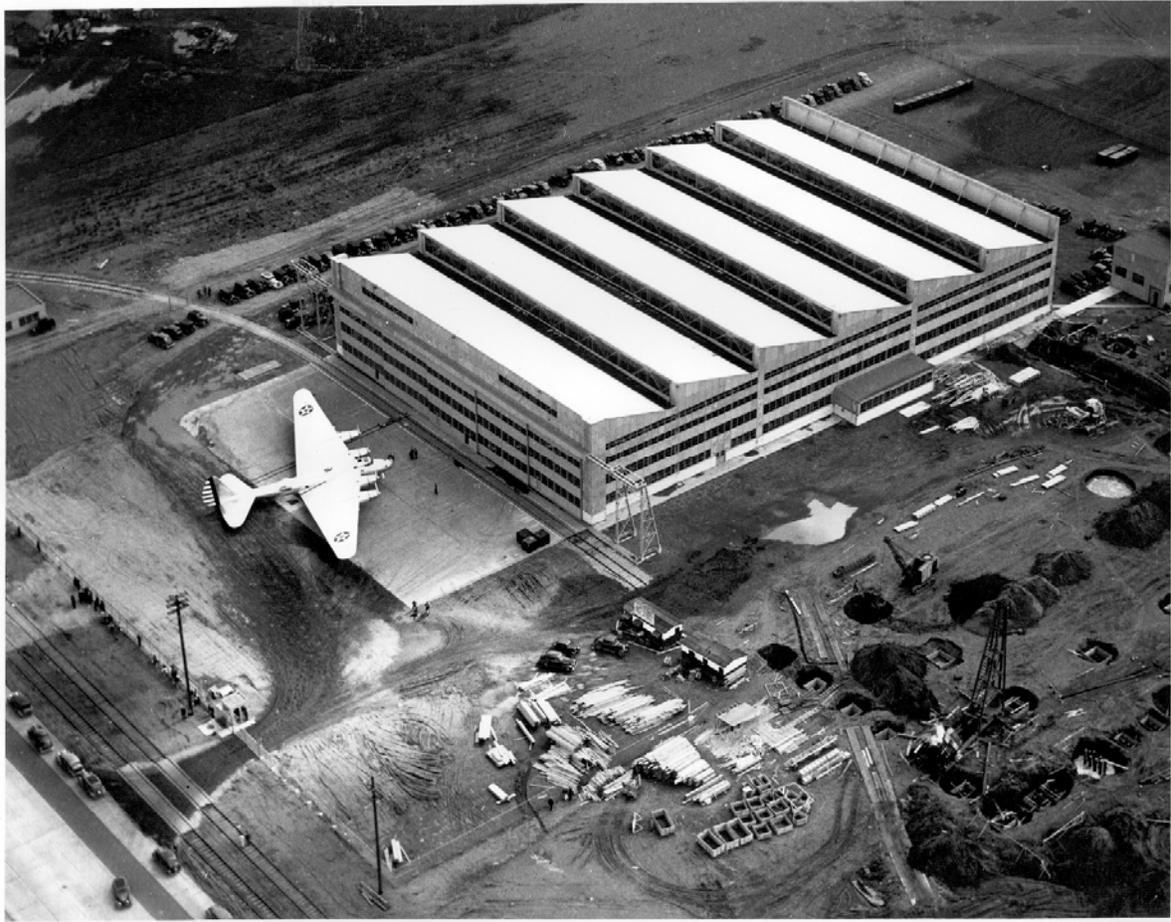
Perspective view of Plant 2, from a 1946 report by Air Materiel Command Headquarters. (Boeing Historical Archives.)



Site plan showing Plant 2 in 1956. (Boeing Historical Archives.)



The first portion of Building 2-40, view looking south in 1936. (Boeing Historical Archives, 2B1389.)



Aerial view showing the initial portion of 2-40, in 1936. (Boeing Historical Archives, P45685.)



View looking west, showing the expanded Building 2-40 in September 1939. (Boeing Historical Archives, P40039.)



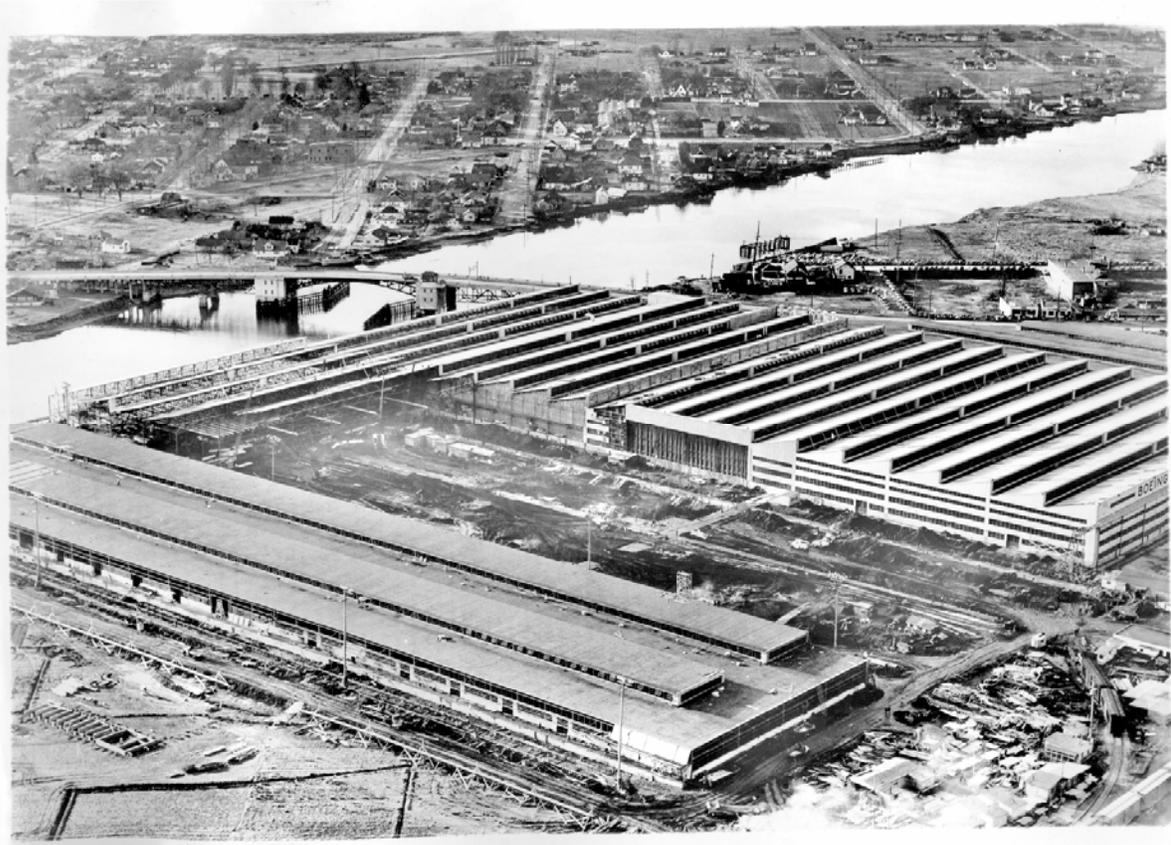
This August 1940 photo is overlaid with marking to show the expansion of Plant 2, including the first portions of the assembly buildings, 2-40 and 2-41, and the North Warehouse 2-31. The area noted for further expansion refers to the later phase of 2-40 and 2-41. Some of the farmland in the background was used for construction of the South Warehouse, Building 2-44. (Boeing Historical Archives, 12939B.)



An aerial view dating from September 11, 1940 shows the assembly buildings, 2-40 and 2-41, warehouse 2-31 and the adjacent office facility, Building 2-25. Farmland to the southeast was used for later expansion of Buildings 2-40 and 241, and 2-44. (Boeing Historical Archives, P419.)



A December 4, 1940 view shows expansion of 2-40 and 2-41 under construction. (Boeing Historical Archives, Austin20B.)



An aerial view looking west in January 1941 shows the final phase of the 2-40 and 2-41 expansion, and warehouse 2-44 in the foreground. (Boeing Historical Archives, 15518B.)



View looking northwest at the edge of the Duwamish River, construction of warehouse 2-44, and the final expansion of the assembly buildings, 2-40 and 2-41. This view is looking northwest. (Boeing Historical Archives, P535.)



A view looking south across a parking lot toward the buildings in 1941. (Boeing Historical Archives, P982.)



A March 1941 aerial photo, view looking east at the completed Plant 2 with Assembly Buildings 2-40 and 2-41 along with adjacent structures 2-31 (the North Warehouse, left) and 2-44 (the South Warehouse, right). (Boeing Historical Archives, P643.)



Similar aerial view and the photograph on the prior page, shows the camouflage treatment on the roof of Plant 2, which was installed in 1942 and removed in 1946. (Boeing Historical Archives, X-1228.)



1942 interior view looking west into the northeast end of Building 2-40 and the final assembly of B17s. The wide vertical lift doors are visible in the upper foreground, partially raised. (Boeing Historical Archives, P1978.)



Interior view looking across Building 2-40 in 1942. This view shows the northeastern portion of the vast assembly space between column lines D and Q. (Boeing Historical Archives, P1810.)



Interior view of a second floor area showing details of the steel trusses, ductwork and electrical power drops from the ceiling that served machinery for small parts manufacturing, and a steel stair leading to an upper mezzanine. (Boeing Archives P11705.)



A view looking north from the Duwamish Waterway, July 10, 1943. The southwest façade of Building 2-41 is visible, and the 16th Avenue South Bridge is in the background. (Boeing Historical Archives, 38917B.)



A shift change, August 1943. A small portion of the northwest façade of Building 2-41 is visible in the upper left corner of the photo. The concrete structure at the upper right is the support for 16th Avenue South Bridge. View looking south, with a portion of 2-31 visible in the background. Note the separate exit route for women workers. (Boeing Historical Archives, P3404.)



Plant 2 in the post-war era. Aerial view from 1954 looking south at the complex, with 16th Avenue South to the left and the Duwamish River in the background. (Boeing Historical Archives, A68747.)



A view looking southwest at the partially raised doors and interior space of Building 2-40, October 1945. (Boeing Historical Archives, HS5060.)