

U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK NO. 1,
PUMPWELL, BY-PASS VALVE & SALTWATER PUMPHOUSE
(Dry Dock No. 1, Pumpwell, By-Pass Valve & Saltwater Chambers)
(U.S. Naval Base, Pearl Harbor, Naval Shipyard, Facilities Nos. S17,
S17A & S786)
North end of Fifth Street, between Dry Dock No. 1 & Facility GD2
Pearl Harbor
Honolulu County
Hawaii

HABS HI-511
HI-511

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HI-511

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN BUILDINGS SURVEY
PACIFIC GREAT BASIN SUPPORT OFFICE
National Park Service
U.S. Department of the Interior
1111 Jackson Street
Oakland, CA 94607

HISTORIC AMERICAN BUILDINGS SURVEY

U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK, BY-PASS NO.1 PUMPWELL VALVE & SALTWATER CHAMBERS *Pumphouse*

(U.S. Naval Base, Pearl Harbor, Naval Shipyard)
(Facility Nos. S17, S17A, & S786)

HABS
HI-511
HABS No. HI-511

(Page 1)

Location: Near the North End of Fifth Street
Between Facilities S779 (Dry Dock No.1) and GD2
Pearl Harbor Naval Base
City and County of Honolulu, Hawaii

This building is at UTM coordinates 04.608000.2361510 and is within the boundaries of the Pearl Harbor, Naval Shipyard as defined in the location section of the overview report HI-483.

Significance:

Facilities S17, S17A, and S786 are located within the Pearl Harbor National Historic Landmark. Facility S17 was constructed in 1919 as the pumpwell for the first dry dock (Facility S779(HAER HI-65) at the Shipyard. Completed in 1942, adjacent Facility S17A is associated with the major expansion of dry dock facilities during World War II when Dry Dock No.2 (Facility S780 ~~HAER HI-65A~~) and No.3 (Facility S781 ~~HAER HI-65B~~) were assembled. The two facilities are of a distinctive type and period of construction with the construction history of Facility S17A and the bombproof addition to the roof of Facility S17 tied in response to the December 7, 1941 attack on Pearl Harbor. Facility S786, originally named the Saltwater Pumphouse, was completed after World War II in 1950. These three facilities are part of a grouping of facilities that includes Dry Docks No.1, 2, and 3, Facility 170 (pumpwell – Dry Dock No.2 HABS HI-507), and Facility 1229 (pumpwell – Dry Dock No.3). The entire dry dock system is a fundamental engineering component of the Naval Shipyard and its main function of ship repair.

*Dry Dock No. 2 is HAER HI-66
Dry Dock No. 3 is HAER HI-67*

Description:

Facility S17 is a multi-story, concrete frame industrial structure. This pumpwell abuts the east wall of Facility S17A and the west wall of Dry Dock No.1. The majority of the building is subterranean descending 57'-6" below ground level with only a portion of the top level located above ground. It has a rectangular floor plan and measures 96'-6" x 29'-6". The foundation is a concrete wall below grade approximately 3' thick.

The original roof was a thin reinforced concrete roof with three pairs of removable panels and panels of built-in ceiling lights. It was supported by reinforced concrete roof beams. The roof was bombproofed in 1942 by adding 3'-0"-thick concrete over the middle of the structure and 5'-0"-thick concrete at the north and south ends. This modification came in response to the December 7th bombing of Pearl Harbor. New concrete walls were added at the north and south

**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 2)**

pumphouse

ends of the building to help support the new roof. These walls also added more size to the above ground structure as well as enclosing and protecting the original building. The bombproofing was an attempt to help defend against possible recurring attacks. The eaves, which overhang all sides of the building, were an additional protective measure. The steel caged ladder at the south end of the building is used to access the roof. A steel pipe railing encompasses the perimeter of the concrete roof.

The original entry at the south end of the east wall of the building was accessible via a short concrete stair with steel railing that descended from street level down to 9-light steel double doors at the first sub floor. This entrance was fully enclosed with concrete walls and a door was added here at street level. This change was also installed in 1942 at the same time as the bombproofing. Enclosing the entry was another means of added protection. A door is also located at the north end of the east wall and serves as a way out from the emergency exit. Through this door one can also access Facility S786. Typically the original windows were 12-light metal sash pivot window units. Each light measured 10" x 12" and had wire glass. Most of these windows are still intact although many have been either painted over or removed and replaced with solid panels.

The first level is an open floor plan with four main de-watering pump motors and a motor control switchboard. There are two adjacent metal stairs at the north end of the room one that descends to an intermediate level between the first and second floors and the other which ascends to a narrow emergency exit. There are two drainage pumps and two discharge valves in this space. Metal lockers, a slop sink and private room with a toilet, shower, and steel sliding door that operates on a metal track are also located here. In the ceiling there are three pairs of removable steel panels. Through the use of a crane, these panels are removed on the exterior and the motors or miscellaneous equipment can be lifted out of the pumpwell for necessary repairs and overhauls. Large steel floor grates cover openings in the concrete floor. Like the ceiling panels these grates are removable to allow accessibility for repairs to the equipment on the floors below. Air ventilation ducts are at ceiling height.

At the intermediate level there is an open wood stair with wood handrails that goes down to the second level. This floor and the third level below it was created by installing steel grided platforms or catwalks and metal pipe rails. The catwalks, nearly centered between the east and west walls, span the length of the building and are supported by riveted steel beams and four equally spaced transverse concrete beams that flare at the east and west wall junction. These beams provide additional stability and support to the pumpwell structure. The four main pump shafts run from the pump motors to the pumps at the bottom floor of the pumpwell. At this level the shafts

**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS** *pump house*
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 3)

are enclosed with metal framed expanded metal mesh. For each pump there is a suction gate valve operator (four total valve operators) these are to the east of each pump shaft. Two caged metal ladders descend to the pump floor and four of them ascend to the thrust bearings located just beneath the pump motor floor. All the ladders are adjacent to the east and west of the catwalk. There is also a caged ladder at the north and south wall that provide access to all levels of Facility S17. The shafts for the drainage pumps and discharge valves along with four motorized valve operators are at the north end. An oil tank and two oil pumps are also on this floor.

The third level below is practically the same as the second level above. However here the large transverse concrete beams are actually walls that go to the floor of the pumpwell creating designated structural bays for each main pump and the drainage pumps and discharge valves at the north end. The discharge valve operators for pumps 1-3 are on steel service platforms to the east of the catwalk. The discharge valve operator for pump no. 4 is located above at the second level.

The four main pumps at the bottom floor are centrifugal pumps with double valve protection from the discharge valve and butterfly check valve. This double valve protection safeguards the pumpwell from flooding. A double 90° elbow pipe connects the underside of each main pump to the suction chamber and the by-pass valve chamber (Facility S17A). The suction valves are connected to this pipe and regulate the passage of water from the suction chamber to the main pumps. At the north end of the floor are the two 85 horsepower drainage pumps, which are used to pump out all the seepage from the dry dock walls as well as the discharge water of the ships when they are docked. Each pump has the capacity to discharge up to 4,875 GPM. Next to the drainage pumps is a 4,500-gallon capacity sewage tank. Sewage from the toilet, sinks, and shower in the pumpwell collects in the tank and goes through a suction gate valve to the sewage pump where it is then discharged to the harbor. The sewage pump is a motor driven centrifugal pump with a capacity of 300 GPM.

Facility S17A – This facility is a By-Pass Valve Chamber that abuts the west wall of Facility S17 and the south wall of Facility S786. The actual chamber which is the majority of the construction of this building descends 57'-6" below ground level. The minor portion of this building located above ground level is a single-story lean-to structure. It has a steel pipe frame and is enclosed with corrugated metal panels. The roof is a shed roof framed with steel pipes and sheathed with corrugated metal panels that extend to form overhanging eaves. There is a rectangular opening under the eaves that spans the length of the building. It is screened with expanded metal mesh providing ventilation, light, and visibility to the exterior. The entry door to the above ground structure is at the southwest corner of the building. It is

**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS ^{pump house}
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 4)**

a makeshift metal door with corrugated panels and expanded metal mesh near the top rail. There is no door at the opening between Facility S17A and S786.

The part of Facility S17A that is above ground shelters four steel access panels that are bolted and sealed in the concrete floor. These panels are removable when the by-pass valve operators/controllers, located 13'-0" below ground level on the by-pass valve operator floor, need to be removed and repaired. The interior of the structure is also lined with shelving and miscellaneous items. Fluorescent lights suspend from the roof framing.

An additional makeshift lean-to structure extends from the south wall of Facility S17A and abuts the west wall of Facility S17. It is a metal structure with riveted panels and a metal shed roof. It has a hinged door with a metal panel over an expanded metal mesh screen. This lean-to encloses a metal pipe rail and a concrete stair that descends to the by-pass operator valve floor. At the base of the stair is a hinged steel door with an opening in the concrete wall above. The space is a narrow rectangular plan with concrete walls, floor, and ceiling and four by-pass valve operators spaced at equal intervals. Each operator is riveted to two steel channels and a steel access panel in the concrete floor beneath it. Like the access panels at ground level, these floor panels are removable for repairs to the by-pass valve and other machinery in the by-pass valve chamber. A manhole cover in the floor at the center of the west wall seals a caged steel stepladder that allows personnel to access the lower chamber. From each operator runs a steel stem down to the rising stem valve and the by-pass valve at the floor of the valve chamber. Supporting each stem are three guide bearing holders and three stem guide brackets that are riveted to the concrete wall. A 72" culvert at the south end of the valve chamber floor connects it to Dry Dock No.2 and 3. Through a series of flanges, valves and pipes each by-pass valve is also connected to the pumps in the adjacent pumpwell (Facility S17) and the suction chamber.

Facility S786 – This facility is a single-story structure attached at the northwest side of Facility S17. It is rectangular in plan measuring 42'-8" x 20'-10". It has a shed roof with a ridge height of 16'-0" and an eave height of 11'-3". The roof is constructed of a pipe frame covered with corrugated metal panels riveted together and overhanging eaves. The foundation is slab-on-grade concrete with a 6"-high concrete curb at the north and west walls. The floor is gently sloped from north to south and the curb almost disappears at the south wall as it approaches the ground level. The structural frame of the building is metal; the east wall is concrete and shared with Facility S17. The primary exterior materials are corrugated metal panels. There is a rectangular opening under the eaves that spans the length of the building. It is screened with expanded metal mesh providing

**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS ^{pumphouse}
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 5)**

ventilation, light and visibility to the exterior. All the doors are flush metal. Fluorescent lights suspend from the roof framing and a large duct in the center of the space projects through the roof. Some additional interior elements include lockers, shelving, table and chairs, desk, sink, washing machine, etc.

Historical Context:

Facility S17 (pumpwell) and its main function of draining Dry Dock No.1 make it a fundamental component of the drydocking operation. It was constructed simultaneously with Dry Dock No.1 in 1919 after a ten-year battle with funding, design and construction problems. On February 17, 1913 during what was the initial construction of the first dry dock, a final attempt was made to dewater the cofferdam. The attempt failed as the dry dock "rumbled, exploded and caved-in as a result of underground hydrostatic forces" (Nakahara, 1981). It was a disastrous day in Navy history. Many Hawaiians proclaimed it was "the wrath of the Shark Goddess (Kaahupahau) because in Hawaiian legend the site of Dry Dock No.1 was once dedicated as her temple" (Nakahara 1981). The legend states that, "sorrow would come to anyone profaning her province, the Pearl River Basin". Construction began again in 1914, an offering was made and a blessing was performed on the site. More than five years later on August 21, 1919 Dry Dock No.1 was completed and commissioned.

When original construction began in 1909 the specifications called for a dry dock that was 589 feet in length. At that time it was ample space for the fleet's largest ships. However within a short time the larger class of ships, the *New York* and *Texas*, required a dry dock at least 800 feet long. The contract was revised and a larger Dry Dock No.1 measuring 1001'-0" x 138'-0" was completed. The contractor for Dry Dock No.1, Facility S17, and S17A was the San Francisco Bridge Company (later named the Pacific Bridge Company).

Dry Dock No.1 is the oldest of the Pearl Harbor Naval Shipyard's four dry docks. As the first one constructed, its engineering and manner of operation was revolutionary. With advancements in technology Dry Dock Nos.2-4 are progressively more advanced in design and process. However the general concept and process of drydocking is universal to all four facilities. A fundamental element of the docking system is the pumpwell. In general terms the pumpwell (Facility S17) and dry dock system for Dry Dock No.1, works as follows: water enters through the influent tunnel and passes through the three sluice gates in the west dry dock wall that are operated at street level to fill the dry dock. The flood valves in the caisson can also be opened if need be to help flood the dock. When the dry dock is filled the caisson is (under controlled movement) moved away from the dry dock to allow the ship to move in and dock. Once the ship is carefully positioned, the caisson is returned to its original location to enclose the dry dock. Simultaneously the dock is de-watered as the ship is

**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS** ^{pump house}
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 6)

precisely positioned over wood support blocks on the dock floor. To de-water the dock, water enters through sump intake valves in the dock floor and proceeds to the suction chamber just beneath the dock floor. It is then pumped to the discharge tunnel and out to the harbor below sea level. Each of the four main pumps is driven by a 550 HP motor and is capable of pumping 66,000 gallons per minute (GPM). The pumps' combined capacity of 264,000 gallons per minute technically de-waters the dock in approximately two hours twenty minutes.

During the Japanese attack on Pearl Harbor on December 7, 1941, Facility S17 was operational as the pumping system for dry dock no. 1. On the morning of the attack the destroyers *USS Cassin* and *USS Downes* were berthed side by side in dry dock no. 1 along with the battleship *USS Pennsylvania*. Dry dock no. 1 was a prime target for the attacking bombers that day as they attempted to destroy the cassettes. Facility S17 was unscathed as a bomb struck the east side of dry dock no. 1, blowing out about 40' lineal feet of the upper portion of the dock wall to a depth of about 6'. The *Pennsylvania* was struck with shrapnel and a single bomb which penetrated her deck at the starboard side, facing the northwest side of the dry dock. Shrapnel pierced the fuel tanks of the two destroyers and a bomb which landed between them ignited a fire in the dry dock. This is when the crew of Facility S17 went into action and began operating the pumps, flooding the dry dock in an attempt to extinguish the raging fire. The rising water in the dry dock lifted the *Cassin* off her keel blocks and also had the unintended consequence of floating the burning fuel higher which began to ignite torpedo warheads and ammunition on the destroyers. The crew in Facility S17 reversed the pumping and de-watered dry dock no.1. The destroyers were abandoned and the *Cassin* slumped to her side and fell against the *Downes*. The fire was extinguished later that day and the *Cassin* and *Downes* with hulls bent out of shape, were listed as complete losses but later were re-built.

After more than eighty years of service the majority of Facility S17 remains in tact. The patents for the pump motors date back to 1900 and were developed by the General Electric Company of Schenectady, New York. All pumping equipment was built and installed by Alberger Pump and Condenser Company of New York in 1918. The control board at the first floor below grade, and many of the valves and suction valves have been changed out. New flooring has also been installed on the first level.

According to the Navy Database the completion date of Facility S17A (By-Pass Valve Chamber) is 1942. It is uncertain what the actual date of construction is but in a conversation with Dry Dock No.1 engineer, Paul Borges, he theorized that Facility S17A was probably completed in 1919 at the same time as Dry Dock No.1 and the pumpwell. It is believed that the subterranean concrete chamber was already

**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS ^{pumphouse}
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 7)**

completed in 1942. The portion of the building that may have been under construction at that time was the single-story lean-to structure and the 6'-0" diameter culvert that connected the by-pass chamber (Facility S17A) to Facility 170 (pumpwell – Dry Dock No.2). Modifications were also made to Facility S17 around this time as a result of the December 7th attack. The building was bombproofed by adding multiple feet of concrete to the roof that also cantilevers over the original building. In addition the entry stair and doors were fully enclosed with concrete to help secure the building.

In normal drainage situations the by-pass valve chamber (Facility S17A) is not utilized. However when pumps and pump motors in Dry Dock No.1 fail the by-pass valves can be opened to allow the water to pass through the chamber and 6'-0" diameter culvert to the suction chamber at the Dry Dock No.2 pumpwell where it can be pumped out to the ocean. The same process can be reciprocated from Dry Dock No.2 pumpwells to Dry Dock No.1.

Facility S786 was originally constructed as a fire protection facility for Dry Dock No.2 in 1950. It is currently used as Shop 99 for minor repairs and maintenance of pumphouse equipment as well as an office and locker room.

For additional information on Facilities S17, S17A, and S786 see HABS No.HI-65 on Dry Dock No.1 (Facility S-779).

For an overview of the Naval Shipyard See HABS No. HI-483.

Sources:

Borges, Paul.

Interview by Ann Yoklavich, July 9, 1998. Photo copies of historic photos for Facility S17.

National Archives & Records Administration II, RG 71 CA.

Box 157, Folder "Pumpwell-Dry Dock No. 1," Box 158, Folder "Dry Dock No. 1 – July 1919."

NAVFAC PAC: Plan Files. Drawings for Facility S17, S17A, S786.

Pacific Bridge Company

Contract NOy-5049, for Construction of Dry Dock and Power Plant, Moorings and Additional Facilities, at the Navy Yard at Pearl Harbor, T.H. Prepared for the Navy Department, Bureau of Yards and Docks. 1944. Report is on Microfilm at Pacific Division Naval Facilities Engineering Library.

Pearl Harbor Naval Shipyard.

Property Record Card for Facility 786. May 22, 1952.

U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS ^{pump house}
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 8)

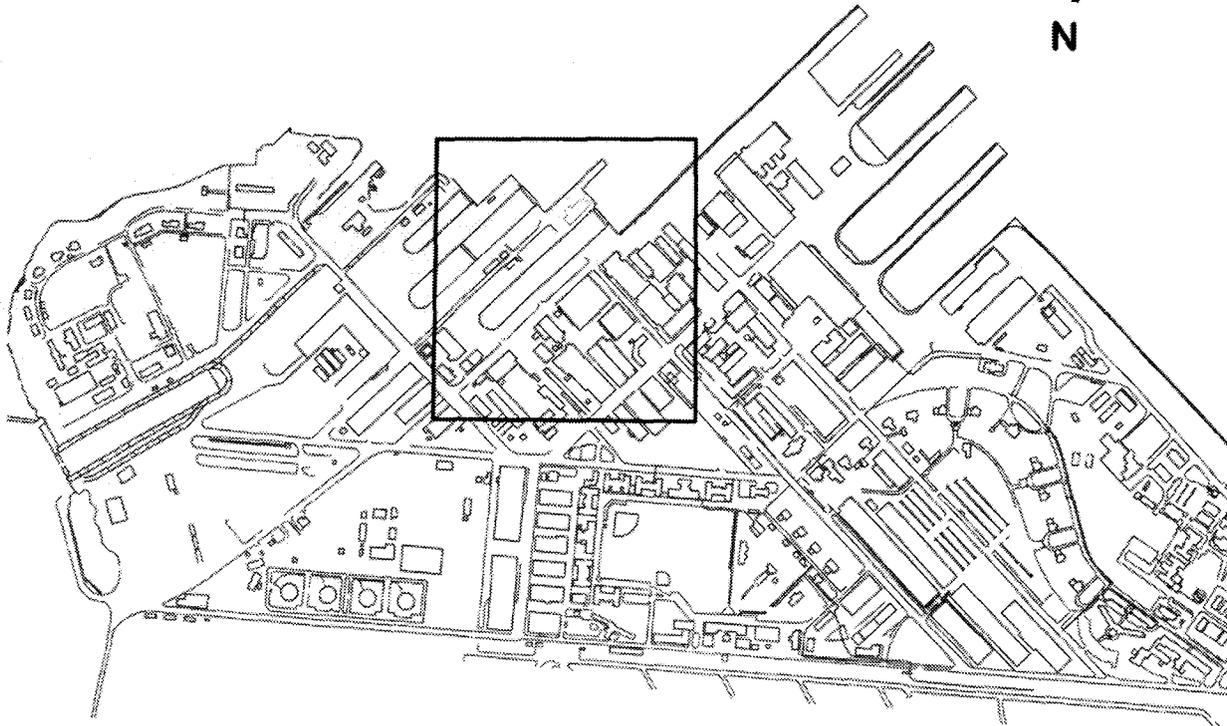
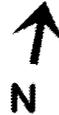
Project Information:

Photo documentation and recordation of this facility by the Navy has been done in anticipation of future alterations or potential demolition of the structure. Photo documentation of historic facilities by the Navy assists in expediting planned undertakings by having the documentation prepared prior to taking actions. Also, photo documentation assists the Navy in gaining more information about its historic facilities to assist in making proactive management decisions. This project is being supervised by Jeffrey Dodge A.I.A., Historical Architect NAVFAC Hawaii. The photographic documentation was undertaken by David Franzen, photographer. Joanmarie N. Orłowski, Architectural Historian, of Mason Architects, Inc. prepared the written documentation. The field work and research was conducted for this report between July 2001 and December 2001.

U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS *pumphouse*
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 9)

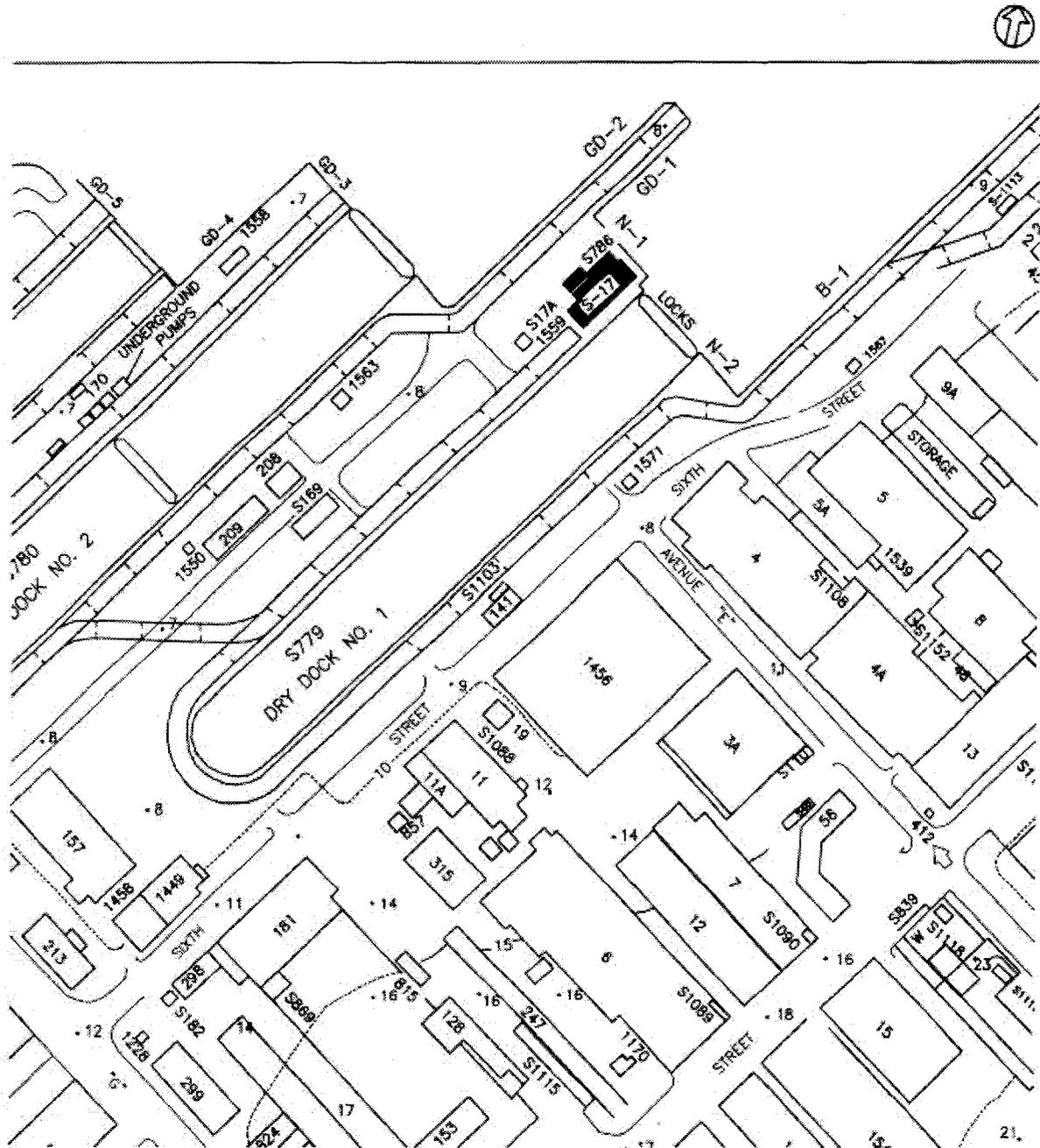
Shipyard Map

SEE ENLARGED MAP



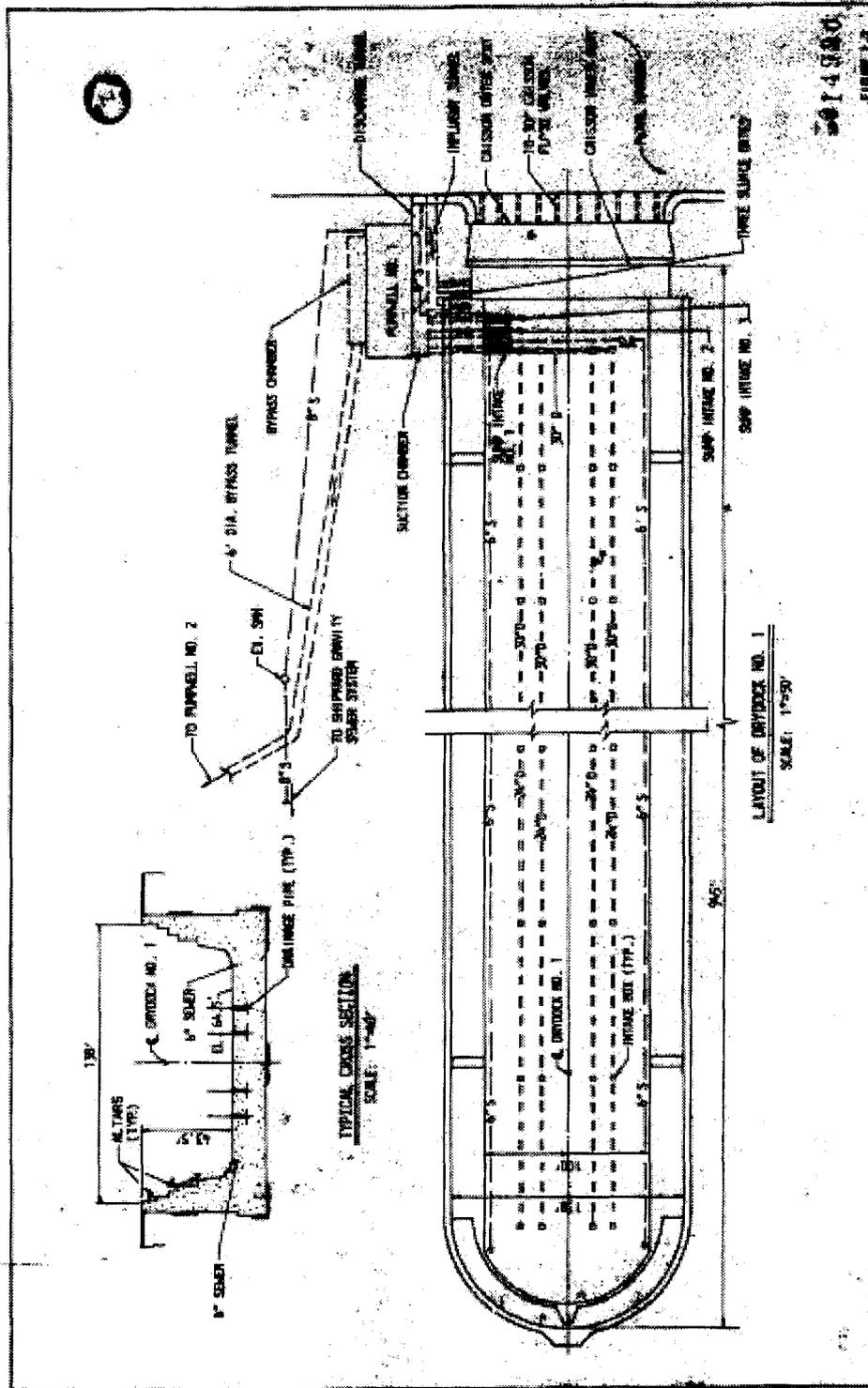
U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS *pumphouse*
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 10)

Enlarged Area Map (reduced, not to scale)



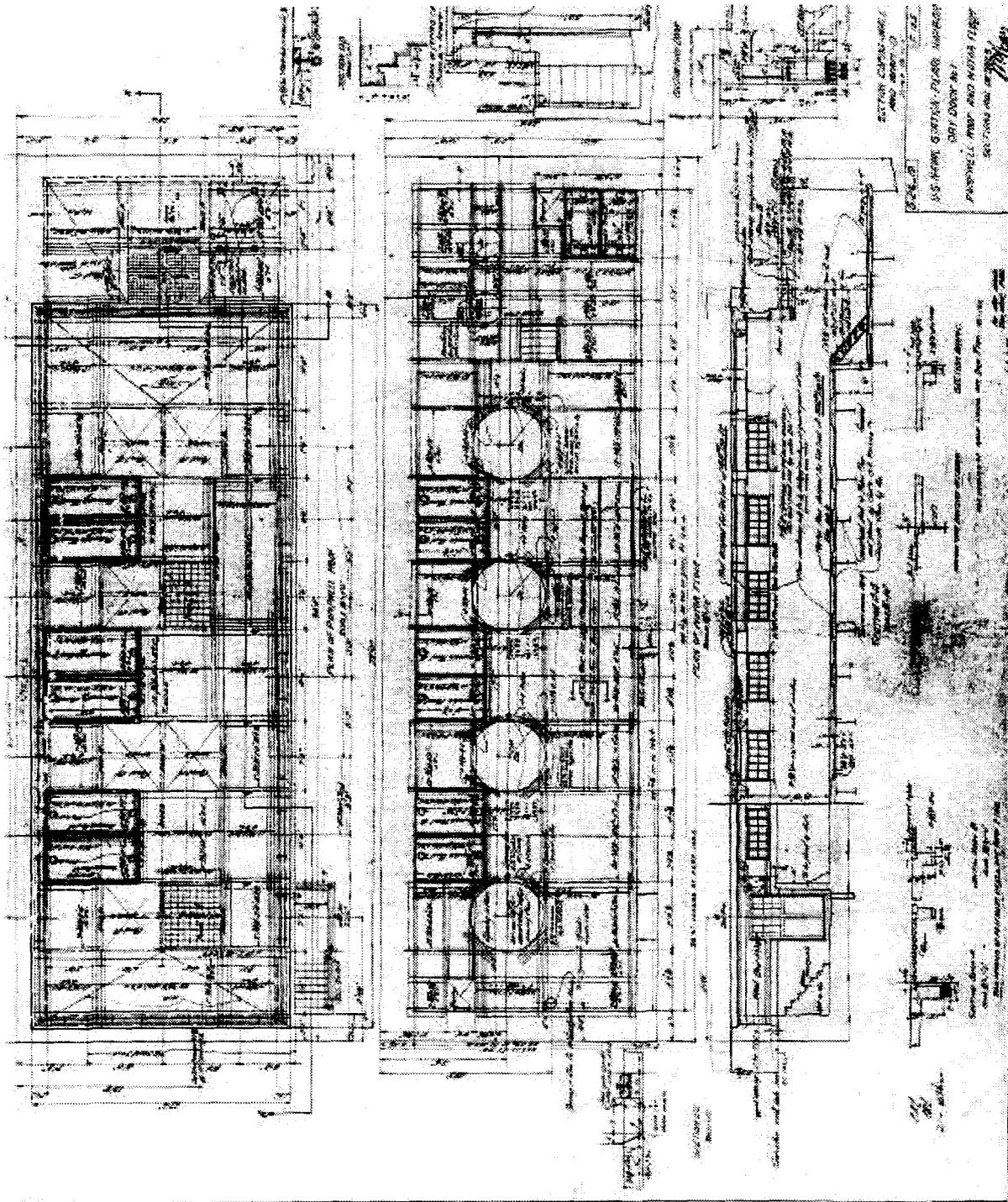
**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
 BY-PASS NO. 1 PUMPWELL VALVE &
 SALTWATER CHAMBERS** *pumphouse*
 (Facility Nos. S17, S17A, & S786)
 HABS No. HI-511 (Page 11)

Layout of Dry Dock No.1 (Drawing No. 14920, Fig. I-2, undated) (reduced, not to scale)



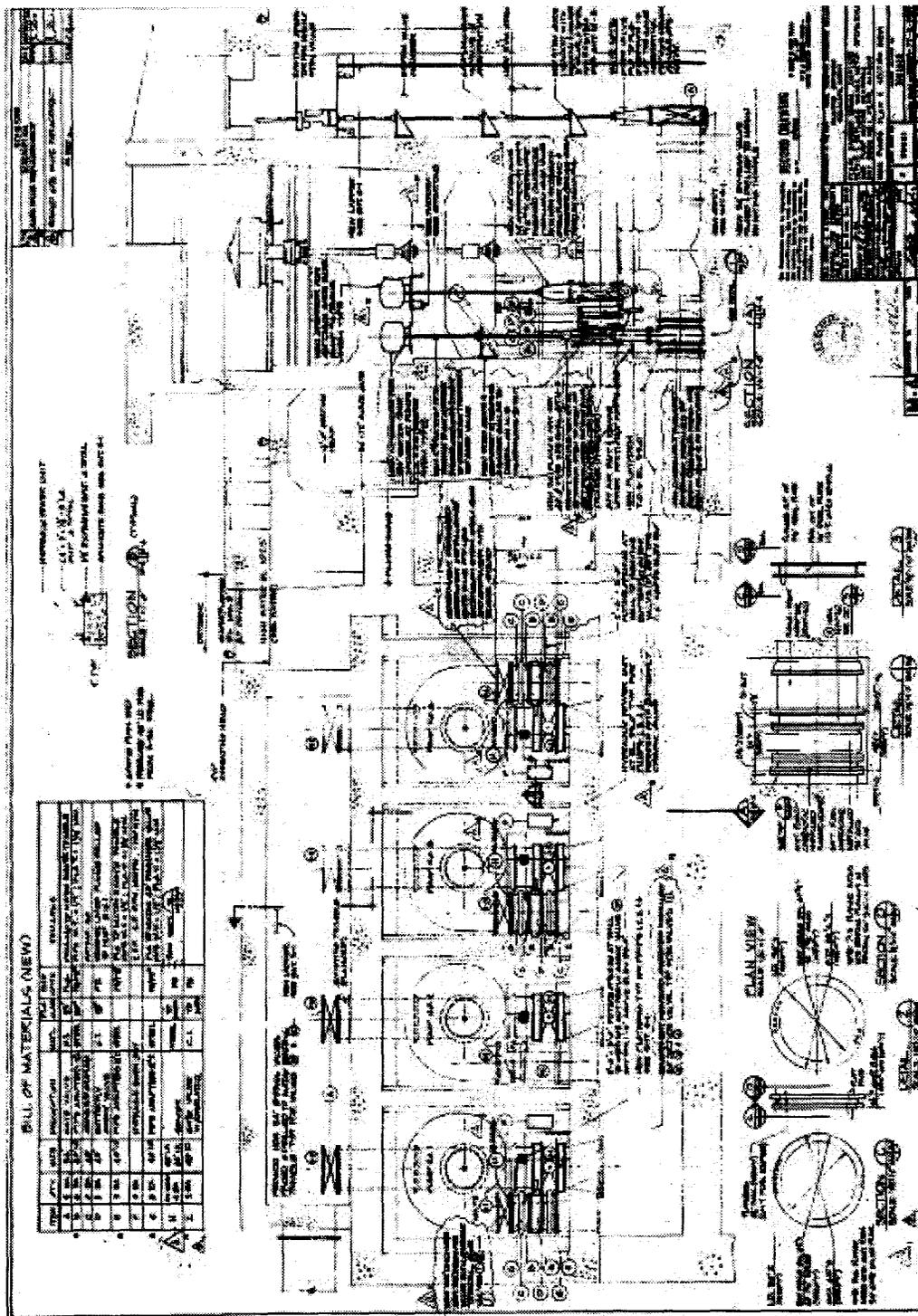
U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
BY-PASS NO. 1 PUMPWELL VALVE &
SALTWATER CHAMBERS *pumphouse*
(Facility Nos. S17, S17A, & S786)
HABS No. HI-511 (Page 12)

Facility S17 - Pumpwell Roof and Motor Floor - Sections and Details
(Drawing No. F-125, dated 5/26/1919) (reduced, not to scale)



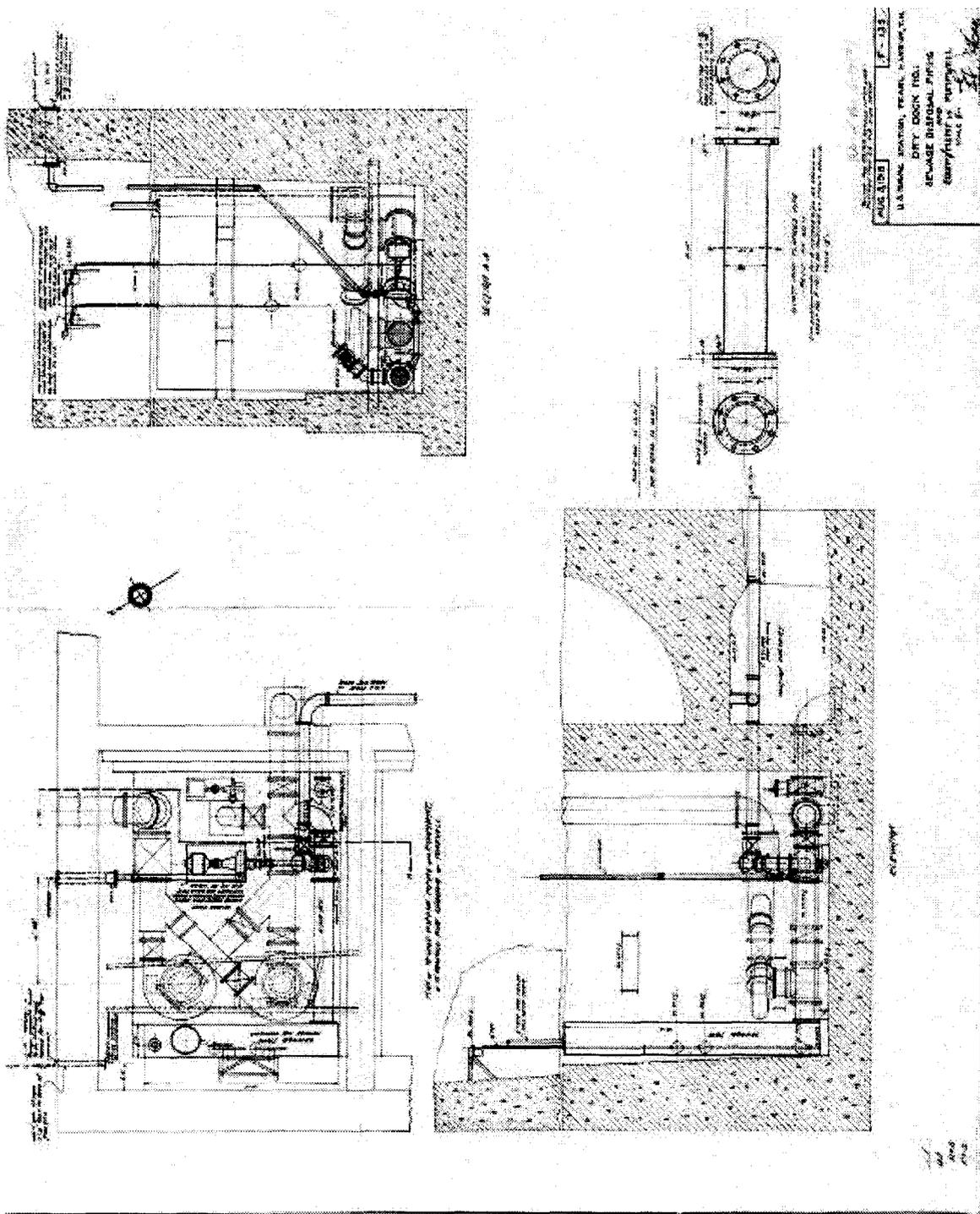
**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
 BY-PASS NO. 1 PUMPWELL VALVE &
 SALTWATER CHAMBERS ^{pumphouse}
 (Facility Nos. S17, S17A, & S786)
 HABS No. HI-511 (Page 16)**

New Main Pumps Plan and Section (Drawing No. 7021839, dated 9/9/1983) (reduced, not to scale)



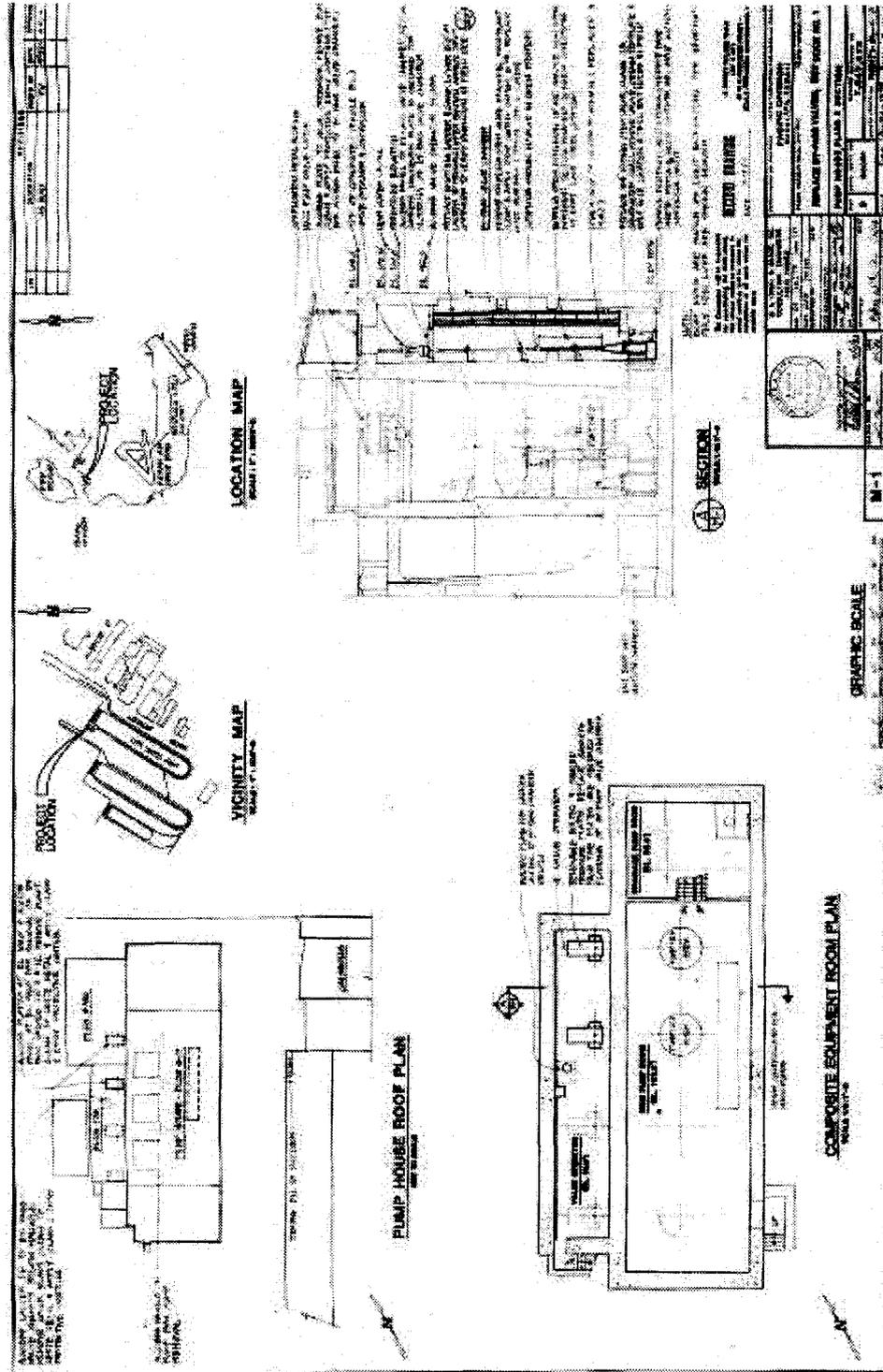
**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
 BY-PASS NO. 1 PUMPWELL VALVE &
 SALTWATER CHAMBERS ^{pump house}
 (Facility Nos. S17, S17A, & S786)
 HABS No. HI-511 (Page 17)**

**Sewage Disposal Piping and Equipment In Pumpwell (Drawing No. F-135, dated 8/5/1918)
 (reduced, not to scale)**



**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
 BY-PASS NO. 1 PUMPWELL VALVE &
 SALTWATER CHAMBERS ^{pumphouse}
 (Facility Nos. S17, S17A, & S786)
 HABS No. HI-511 (Page 18)**

Replace By-Pass Valves, Dry Dock No.1 – Pump House Plans and Section (Drawing No. 7047673, dated 1/26/1984) (reduced, not to scale)



**U.S. NAVAL BASE, PEARL HARBOR, DRY DOCK,
 BY-PASS NO. 1 PUMPWELL VALVE &
 SALTWATER CHAMBERS *pumpchase*
 (Facility Nos. S17, S17A, & S786)
 HABS No. HI-511 (Page 19)**

Replace By-Pass Valves, Dry Dock No.1 – Mechanical Plans and Details (Drawing No. 7047674, dated 1/26/1984) (reduced, not to scale)

