

**FIELD REPORT:
2014 USS *HOUSTON* (CA-30) DIVEX**

Prepared By



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I. EXECUTIVE SUMMARY

During 9-13 June 2014, a joint Dive Exercise (DIVEX) of the U.S. Navy (USN) and the Indonesian Navy (IND) was undertaken on the site now confirmed to be the wreck of USS *Houston* (CA-30) as part of Cooperation Afloat Readiness and Training Indonesia (CARAT) 2014. The wreck is located in Banten Bay within the territorial waters of Indonesia. Data recovered during the operation is consistent with the identification of the wrecked vessel as USS *Houston* and also indicates systematic and ongoing unauthorized disturbance of the site, which serves as a maritime war grave and is known to carry ordnance and unknown quantities of oil.

Background

USS *Houston*, a heavy cruiser measuring 600 ft (c.183 m) in length, was launched in 1929 and sunk in combat by Japanese forces during the Battle of Sunda Strait on 1 March 1942. The 2014 DIVEX aimed to verify the identity of the site and ascertain the ship's state of preservation in response to reported activities of unauthorized disturbance in the vicinity. During the DIVEX, a wreath-laying ceremony, presided over by the U.S. Deputy Chief of Mission to Indonesia, Ms. Kristen Bauer, commemorated the loss of life associated with the vessel's sinking, among the most costly in U.S. Navy history (645 sailors and Marines). Captain Albert H. Rooks, USN, killed in action, posthumously received the Medal of Honor for extraordinary heroism, while USS *Houston* was awarded two battle stars, as well as the Presidential Unit Citation.

Summary of Operations

The U.S. Pacific Fleet, U.S. 7th Fleet, U.S. Task Force 73/Commander Logistics Group Western Pacific, USNS *Safeguard* (T-ARS 50), Mobile Diving and Salvage Unit (MDSU) 1 Company 1-5, the Naval History and Heritage Command

(NHHHC), the U.S. Embassy in Indonesia, and the Indonesian Navy served as the primary DIVEX sponsors. USNS *Safeguard* departed Jakarta and arrived in the vicinity of the target in Banten Bay on 10 June, together with KRI *Sultan Thaha Syaifuddin* (STS-376). Side-scan operations successfully located the target and diving operations ensued. Over the course of 14 U.S. Navy dives and several dives performed by Indonesian Navy personnel during 5 excursions from 10 to 12 June, both ends of the wrecked vessel were marked with buoys, and the exposed port side and deck were documented by video recording. USNS *Safeguard* departed the site on 13 June. Captain James Driver, CWO2 Jason Shafer, and MDV William Phillips, along with MDSU-1 Company 1-5 and the crew of USNS *Safeguard* enabled mission accomplishment. Captain Ario Sasoneko, the crew of STS-376, and the Indonesian dive team ensured the effective execution of the DIVEX.

Summary of Findings

Data recovered during the cursory DIVEX was compared with available geospatial records, ship's plans, historical and archival information, eyewitness accounts, and expected identifiable features and battle damage. Whereas the duration of the DIVEX did not support a comprehensive site assessment, data recovered is consistent with the identification of the wrecked vessel as USS *Houston*. Furthermore, the DIVEX revealed and documented conclusive evidence of systematic unauthorized disturbance of the site. Evidence also suggests ongoing unauthorized recovery of presumed unexploded ordnance from the vessel, raising public safety and security concerns. Moreover, active seepage of oil from the hull was evident. Continued unauthorized disturbance of the site may exacerbate either or both of these considerations, as well as potentially impact any human remains present within or adjacent to the hull.

II. HISTORICAL ACCOUNT OF USS *HOUSTON*

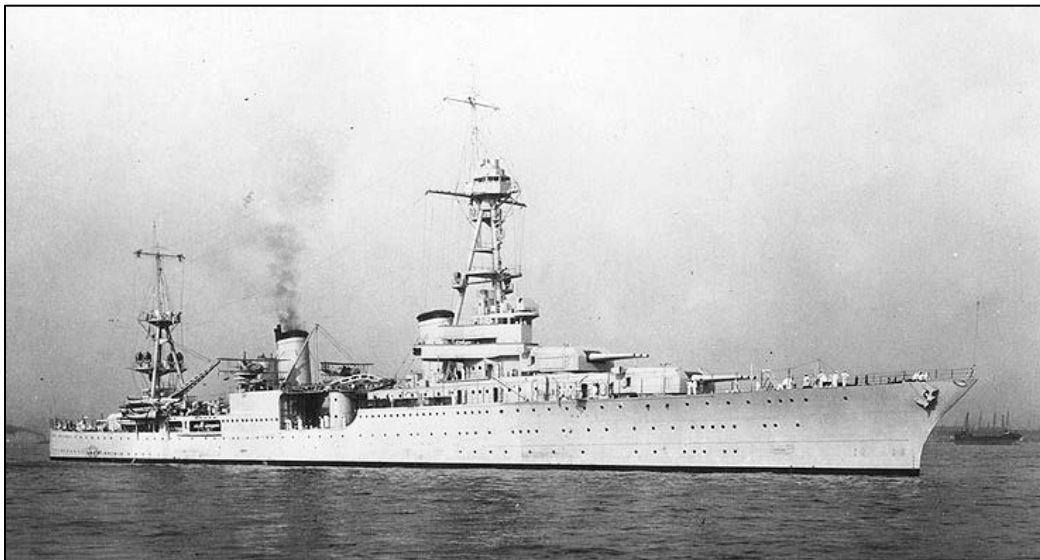


Figure 1. USS *Houston* during the 1930s. (NHHC photo NH53588)

Vessel History

On 7 September 1927, the second U.S. Navy ship to carry the name of the city of Houston, TX, was launched by Newport News Shipbuilding and Dry Dock Co., in Newport News, VA. Sponsored by Miss Elizabeth Holcombe, daughter of the mayor of Houston at the time, the 9,050-ton *Northampton*-class heavy cruiser was first commissioned as CL-30 on 17 June 1930 with Captain J. B. Gay as commanding officer. The vessel's designation changed to CA-30 on 1 July 1931 (DON 2014a).

USS *Houston* traversed much of the world during the interwar period. After spending some time in the Atlantic and Gulf of Mexico, she joined the fleet at Hampton Roads. With the outbreak of war between Japan and China in 1932, *Houston* moved on to Shanghai to protect American citizens and interests in the region. The following year she joined the Scouting Force in San Francisco in which she participated in Fleet Problems and maneuvers in the Pacific. During this time, *Houston* celebrated the opening of the Golden Gate Bridge in San Francisco on 28 May 1937. For

brief periods, in 1938 and 1939, *Houston* became the flagship of both the U.S. Fleet and the Hawaiian Detachment. President Franklin D. Roosevelt claimed *Houston* as his favorite ship, and she made several special cruises carrying the President on a number of occasions in 1934, 1935, 1938, and 1939 (DON 2014a; Hornfischer 2006:14-19).

As the fear of war began to spread around the world, *Houston* departed for the Philippine Islands on 3 November 1940 and arrived at Manila on 19 November. There she became the flagship of Admiral Hart, Commander of the Asiatic Fleet, and was readied for battle. *Houston* was undergoing some repairs at Cavite Naval Yard on 27 November 1941 in the Philippine Islands when her captain, Albert H. Rooks, received a Navy Department warning about an impending Japanese attack on the Asiatic Fleet (Winslow 1984:37). In response, *Houston* set about anti-submarine patrols in the area (Winslow 1984:38). On 8 December, the crew learned of the attack on Pearl Harbor, Hawaii, and *Houston* set out with fleet units for Darwin, Australia (DON 1943:5). She traveled by

way of Balikpapan and Surabaya and arrived on 28 December 1941. After completing patrol duty she joined the multinational ABDA (American-British-Dutch-Australian) naval force at Surabaya in January 1942.

Finding herself in the midst of war, *Houston* saw her first battle against the Japanese at the Battle of Makassar Strait on 4 February 1942. During this engagement, Rear Admiral Karel Doorman of the Royal Netherlands Navy led the Dutch and American forces to the Bali Sea where *Houston* battled bravely. After evading serious damage for over two hours (Baldwin 1946:5-7), *Houston* was the target of an enemy bomb that put turret 3 out of commission, killing nearly 50 crewmembers and injuring 20 (DON 1943:28). *Houston* subsequently sought refuge at Tjilatjap to work on repairs and to tend to wounded sailors (Hornfischer 2006:12).

Houston departed Tjilatjap for Darwin, Australia, on 10 February to escort a convoy delivering reinforcement troops to Dutch Timor (Holbrook 1981:51). *Houston*, said to be “twisting in and out of that convoy like a mother hen protecting her chicks” (Schultz 1985:126), successfully defended herself and the rest of the convoy when Japanese aircraft attacked in two waves on 15 and 16 February, shooting down 7 of the second wave’s 44 planes (DON 1943:37; Holbrook 1981:53).

As the major Japanese invasion force approached Java, *Houston* was ordered to rejoin Rear Admiral Doorman’s strike force as soon as possible. At sunset on 26 February the fleet of the Combined Striking Force, consisting of 5 cruisers (USS *Houston*, HMAS *Perth*, HNMS *De Ruyter*, HMS *Exeter*, and HNMS *Java*) and 9 destroyers, set sail to engage the enemy (Hornfischer 2006:69). Morning light the next day, 27 February, brought Japanese air raids and by that afternoon the Allied ships met the Japanese support force under Rear Admiral Takeo Takagi consisting of 4 cruisers and 13 destroyers. The resulting encounter became known as the Battle of the Java Sea. While

Doorman’s advance had caught the Japanese off guard, the lack of air support, challenges in communication, and fatigue hindered the Combined Striking Force (van Oosten 1976:42). As the battle got underway, cruisers of both fleets opened fire. *Houston* struck a Japanese cruiser and temporarily slowed it down, but was hit twice in return. The first shell passed through *Houston* without exploding, but the second exploded on the port side, rupturing an oil tank (DON 1945b:2).

By 5:10 pm, *Exeter* was hit and severely damaged (DON 1943:64), while amidst frantic maneuvering Dutch destroyer *Kortenaer* took a torpedo meant for *Houston* and was sunk (Schultz 1985:142); British destroyer HMS *Electra* was lost shortly thereafter. Doorman broke off contact and headed north in an attempt to attack the Japanese transports but was unable to determine their location (DON 1943:70). The American destroyers, low on fuel and out of torpedoes, were sent back to Surabaya. At 9:25 pm British destroyer HMS *Jupiter* was sunk, either by mine or internal explosion; another destroyer, HMS *Encounter*, was detached to pick up survivors from *Kortenaer*, leaving the remaining four cruisers without destroyer protection (DON 1943:74-75).

Later that same night, around 11:00, the cruisers again sighted the Japanese surface group, and the opposing units opened fire. The Japanese launched a devastating torpedo attack 30 minutes later. Twelve of these torpedoes found their targets in *De Ruyter* and *Java*, exploding and sinking them, and carrying their captains and Rear Admiral Doorman down with the ships. Prior to sinking, Doorman managed to radio an order for the cruisers *Perth* and *Houston* to retire to Batavia (Jakarta) (Thomas 1968:212-3). The Battle of the Java Sea marked the largest surface naval engagement since the Battle of Jutland in World War I (Weinberg 2005:320).



Figure 2. "Sunda Strait – USS Houston" by John Hamilton. Oil Painting on wood, c. 1970. (Navy Art Collection, NHHC, #80-142-N).

The Battle of Sunda Strait

The following day, 28 February, the only two remaining Allied cruisers, *Perth* and *Houston*, departed from the port of Tanjung Priok, Batavia (Jakarta), with orders to report to Tjilatjap via Sunda Strait (DON 1945b:3). The cruisers were to make their way out to the Java Sea, regroup, and then continue the resistance against the Japanese (DON 1943:77). En route to Sunda Strait, *Perth* and *Houston* unexpectedly encountered the Japanese invasion force anchored vulnerably in Banten Bay (van Oosten 1976:60). As the cruisers approached the bay they swiftly evaded nine torpedoes launched by the destroyer *Fubuki* (Thomas 1968:218). The cruisers returned fire, hitting four transports, one of which sank, leading the other three to beach themselves to avoid the same fate. Prospects were grim as Sunda Strait, the cruisers' means of retreat, was blocked by a Japanese destroyer squadron, and Japanese large cruisers *Mogami* and *Mikutna* closed in from the north. *Perth* was first to come under fire at 11:36 pm and just after midnight she went up in flames and sank,

leaving *Houston* alone to face overwhelming odds (DON 2014a).

Houston battled bravely as the last remaining challenger to the enemy forces, holding the paradoxical advantage over the enemy fleet of being able to consider all other vessels targets; this advantage was lost when a hit on *Houston's* forecandle started a fire that singled her out (DON 1945b:5). Shortly after midnight on 1 March, the aft engine room was hit on the port side, presumably by a torpedo (DON 1945b:6). Despite losing headway due to the torpedo hit, the vessel carried on the fight, guns blazing in all directions. Fires erupting near turrets 1 and 2 helped the enemy get their range and bearing on her, and a second torpedo hit soon followed (DON 1945b:8, 12). Due to the overwhelming volume of fire and the sheer rapidity with which hits were being scored on *Houston*, it was impossible in many instances to determine whether a shell, torpedo, or bomb hit had occurred (DON 1945b:8). Just prior to the order to abandon ship, another torpedo hit the starboard side abreast the foremast, while severe shelling and machine gunning of the ship was taking place from both the port and

starboard side at close range (DON 1945b:9, 13). A final torpedo struck the forward engine room from the port side (DON 1945b:13). At 12:30 am, Captain Rooks, who posthumously received the Medal of Honor for his extraordinary heroism that night, was killed by shrapnel from an exploding shell (DON 2014a). A few minutes later, with her ensign still flying, *Houston* sank into the waters of Banten Bay taking 645 crew members with her. The number of enemy ships sunk and the extent of damage to others is unknown because of the darkness and the smoke that enveloped the engagement; later reports suggested that *Houston* sank seven ships, including cruisers, destroyers, and a seaplane carrier (DON 1945b:14). In questioning by the Japanese after capture, *Houston* officers were accused of lying when they stated that only two Allied ships were present during the battle; it was the firm belief of all the American officers that the Japanese had shot at several of their own ships (DON 1945b:5, 14).

The 367 *Houston* crew members who survived the sinking had to jump overboard and face what seemed to be an endless swim in relentless currents, dodging machine gun fire in hopes of reaching shore. Some were fortunate enough to find makeshift rafts to stay afloat. On one such raft *Houston's* chaplain, Commander George S. Rentz, prayed with the other men to calm them down. He tried repeatedly to give up his life jacket and his place on the raft to other men (Hornfischer 2006:156). Ultimately, he was able to hand off his life jacket to a young Seaman First Class Walter L. Beeson, sealing his own fate. Commander Rentz received a posthumous Navy Cross, and was the only Navy chaplain during World War II to receive such an award (Schultz 1985:204).

The Japanese took the 367 *Houston* survivors as prisoners to the town of Serang, where they were subjected to crowded living conditions, regular beatings, and starvation (Grob 2013). The prisoners were then moved to Batavia and placed in the "Bicycle Camp," named for the Tenth Battalion Bicycle Force of the

Netherlands East Indies Army it had previously housed (Hornfischer 2006:187). Conditions at the camp, though still challenging, were less deplorable than in Serang (Schultz 1985:228). From there, the men of *Houston* were dispersed to various camps around Asia, most of them heading to Singapore, forced into rusty freighters for days on end where they could hardly move and were given very little to eat; many suffered from dysentery on this journey (Hornfischer 2006:224-227). Upon arrival at Changi Camp the men were transported to Burma where they became slave laborers on the Burma-Thai Railway (Winslow 1984:180). This project became known to the prisoners as the "Death Railway," claiming 12,399 Allied POW lives, including 77 from *Houston*, and nearly 100,000 native Asian lives during its construction (Hornfischer 2006:340-341; DON 1945b:15). When the war ended, after having spent three and a half years in captivity, the *Houston* prisoners were rescued by American OSS operatives and other Allied forces. The men were brought to Calcutta, India, and the Philippines before returning to the United States (DON 1945c). Of the 376 *Houston* survivors (including 9 who had been evacuated from the ship prior to her sinking), 299 sailors and Marines survived captivity and were able to return home.

It was not until after the war had ended, and *Houston's* survivors were liberated from prison camps, that the full story of her courageous fight was told. Almost 9 months passed after *Houston's* sinking before the world first heard of its fate. When news of the ship's sinking reached the citizens of Houston they raised money to build the light cruiser USS *Houston* (CL-81), as well as the light aircraft carrier USS *San Jacinto* (CVL-30). On Memorial Day 1942, one thousand men known as the "Houston Volunteers" were sworn in to the Navy to symbolically replace *Houston's* crew, who were all presumed dead at that time, in an effort to carry on their legacy (Life Magazine 1942).

In addition to two battle stars, *Houston* was awarded the Presidential Unit Citation (DON 2014a).

Site Discovery and Recent Site Visits

Identifying the location of the wreck of *Houston* was the objective of repeated efforts in the late 1960s, and the quest continued into the early 1970s. Earlier reports suggested the potential salvaging of the vessel by the Japanese, while in 1966 President Johnson was reportedly presented with a bell from *Houston* by Philippine President Ferdinand Marcos. In June 1973, the Naval Historical Center (later the Naval History and Heritage Command) was informed that an Indonesian SCUBA diving club sanctioned by the

Government of Indonesia Department of Communications recovered the ship's bell from *Houston* and offered it to the U.S. Naval Attaché, indicating the first confirmed identification of the site's location. The bell was presented to U.S. Ambassador Francis Galbraith on 24 August 1973, along with a 30 caliber machine gun, a telescope, and other small items (DON N.D.). Since that time, the sites of both USS *Houston* and HMAS *Perth* have been repeatedly visited by divers and also remain common fishing grounds. The 2014 DIVEX prompted the first formal site assessment by the U.S. Navy of the remains of the vessel, producing baseline data that addressed the identity and state of preservation of the wreck.

III. GEOGRAPHICAL AND ENVIRONMENTAL PARAMETERS



Figure 3. Map indicating the general location of the loss of USS *Houston* off Java, Indonesia. (Google Maps)

The wreck site of *Houston* lies in the vicinity of the Sunda Strait within Banten Bay, adjacent to Pulau Panjang Island in the northwest tip of Java, Indonesia. The Java Sea is controlled by the monsoon climate, therefore the surface current of the Sunda Strait changes from east-southeast during the northwest monsoon (November to March) to west-northwest during the southeast monsoon (May to September) (Wyrtki 1961: 119). The wind-controlled current drives the water from the Java Sea to the Indian Ocean via the Sunda Strait (Sofian 2007). Water from the Java Sea running through the Sunda

Strait is relatively high in temperature and low in salinity due to river runoff from Sumatra and Java (Gingele et al 2002). Wind blows with an intensity of approximately 3 Beaufort from November to February and can reach 4 Beaufort at other times of the year (Durand & Petit 1995). The waters of Sunda Strait can be rough and squalls are frequent during the northwest monsoon (DON 1934).

Sunda Strait connects the Indian Ocean and Java Sea between the islands of Java and Sumatra and is 20 to 65 miles (32-100 km) wide

(Hoitink and Hoekstra 2005). The Java Sea has a mean depth of about 150 ft (c. 46 m), but its depth decreases to about 65 ft (c. 20 m) at its southwestern portion where it meets the mouths of Banten Bay and Sunda Strait (Hoitink and Hoekstra 2005). In the vicinity of the USS *Houston* site, approximately 1 mile from Pulau Panjang Island, depths range from about 95 ft (c. 29 m) to about 125 ft (c. 38 m). The combination of relatively shallow waters and strong currents cause the underwater visibility to be low. The sediment is composed of a mixture of clay and silt, forming a muddy layer that further decreases visibility when disturbed (Hoitink and Hoekstra 2005).

While daily variations in sea surface temperature can be high, annual variation tends to remain rather stable, with warm temperatures observed throughout the year (Wyrтки 1961). Sea surface temperatures in the region correlate closely with air temperatures and average between 26° C and 30° C (DON 2014b). Java has a rainy season and a dry season; precipitation levels are highest in January (average ~12.6 in), while the lowest average precipitation levels occur between the months of July and September (~3.2 in) (Aldrian & Sustano 2003).

IV. 2014 DIVE EXERCISE

During 9-13 June 2014, a joint Dive Exercise of the U.S. Navy and the Indonesian Navy was undertaken on the site believed to be the wreck of USS *Houston*, as part of Cooperation Afloat Readiness and Training Indonesia 2014. The overall objective of the mission was to enhance regional capabilities and cooperation, promote understanding, and improve interoperability and readiness of participating forces.

The exercise was based off of USNS *Safeguard* (T-ARS 50) and supported by KRI *Sultan Thaha*

Syaifuddin (STS-376). MDSU-1 Company 1-5 provided a Navy diver complement, who were joined by their Indonesian counterparts and served as the foundation of the operation. The primary author of this report served in the role of chief archaeologist responsible for setting and refining objectives, coordinating the applied methodology, overseeing the delivery of data products, and interpreting findings.

NHHC DIVEX Research Objectives

Within the framework of the CARAT14 DIVEX, the overarching objectives on behalf of the NHHC from a site-management perspective were to undertake a site assessment of the wreck in order to confirm the vessel's identity as USS *Houston* and establish a record of its state of preservation. Concerns over the latter stemmed from reported disturbance of the site resulting from unauthorized activities. Complementary and supplementary objectives included:

1. Establishing a secure set of GPS coordinates for the bow and stern of the vessel.
2. Documenting the site and assessing its current condition, including ascertaining the extent and orientation of the vessel and its associated debris field.
3. Assessing the site for environmental hazards (e.g., oil), public safety hazards (e.g., ordnance), or visible evidence of human remains.
4. Identifying and documenting evidence of any unauthorized disturbance.
5. Identifying and documenting evidence of original battle-related damage.

Condensed DIVEX Operations Log

Exercise logistics afforded the team three days on site and provided for an ambitious schedule of operations. Fortunately, delays resulting from weather or technical difficulties were minimal, whereas both the adaptability of the officers and crew of USNS *Safeguard*, as well as

MDSU-1 Company 1-5, enabled the operation to maximize its data-gathering potential. A condensed DIVEX operations log follows, while a more comprehensive operations log appears as Appendix A.

Table 1. Condensed version of the DIVEX operations log accounting for core activities undertaken during each day of the survey.

| Date | Activities |
|--------------------|---|
| 9 JUNE 2014 | <i>Safeguard</i> moored at Jakarta International Container Terminal 2. Briefs with Force Protection, CAPT Stacpoole (NAVAT), IND Diver Unit/Frogmen, and CWO2 Shafer / MDV Phillips. Kompas interview and meeting with MC3 Senyk to coordinate data management. |
| 10 JUNE 2014 | Arrived in Banten Bay. Side-scan sonar operations initiated. Conducted seven passes over Waypoint 1 with no target located. Passes over Waypoint 2 resulted in the location of a positive target and additional passes revealed a large metal hull. Visual confirmation of the target by divers followed. Initiated the placement of extremity buoys, positioning one by western extremity and one close to midships. Length of site determined by side-scan sonar ensonification. <i>Safeguard</i> moored overnight by eastern buoy. |
| 11 JUNE 2014 | Repositioned <i>Safeguard</i> due to moor shifting overnight. Poor visibility and strong currents disturbed morning surface-supplied diving operations. Reverted operations to SCUBA with intent of installing a buoy on eastern extremity and investigating western extremity to establish whether it represents the bow or stern. US/Indonesian VIP delegation arrived and wreath-laying ceremony was held. USN Remotely Operated Vehicle (ROV) operations initiated near eastern extremity. Diving investigations ensued and established that the stern is located adjacent to western extremity and bow adjacent to eastern extremity. Evidence of disturbance documented. ROV became entangled, causing the fiber-optic cable to malfunction. ROV operations ceased and vehicle was recovered. |
| 12 JUNE 2014 | USN divers explored from midships buoy to bow along exposed port side of hull during the first dive of the day. IND divers subsequently explored interface between deck and seafloor along entire length of vessel. Second USN dive explored from midships buoy to stern. Diving interrupted in late morning due to strong current. Several afternoon dives proceeded toward bow from midships buoy, then stern from midships buoy, sweeping the deck of the vessel to its extremities. Weather prevented planned evening dives from materializing. |
| 13 JUNE 2014 | Breakdown operations began and buoys removed from site. Hotwash brief from USN and IND teams occurred and CARAT 14 concluding ceremony held. DIVEX concluded. <i>Safeguard</i> removed its moor and was scheduled to proceed to its next mission. |

Data Recovered During DIVEX

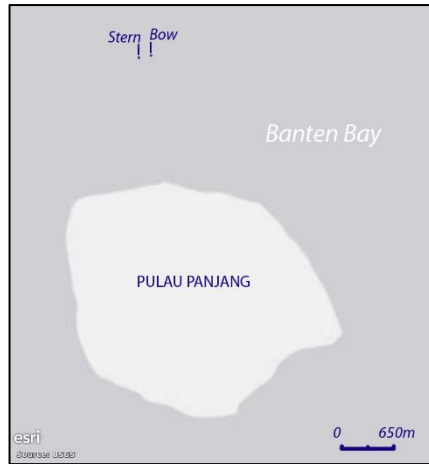


Figure 4. GPS coordinates of extremity buoys for precise location and orientation.

The operation resulted in a total of 14 dives conducted by MDSU-1 Company 1-5, along with several dives conducted by the Indonesian Navy team during the course of 5 dive excursions. Given the observed depths of 90-120 ft (c. 27.5-36.5 m), dives were limited to 15 minutes in order to conform to standard dive safety practices. Additionally, as a result of the periodic current (up to 1.7 knots) and compromised visibility on site, not all dives permitted for the systematic and provenience-based assessment of site features. Furthermore, early dives did not yet benefit from the subsequent placement of buoys on the extremities and midships of the site, therefore compromising the accuracy of positioning of observed features.

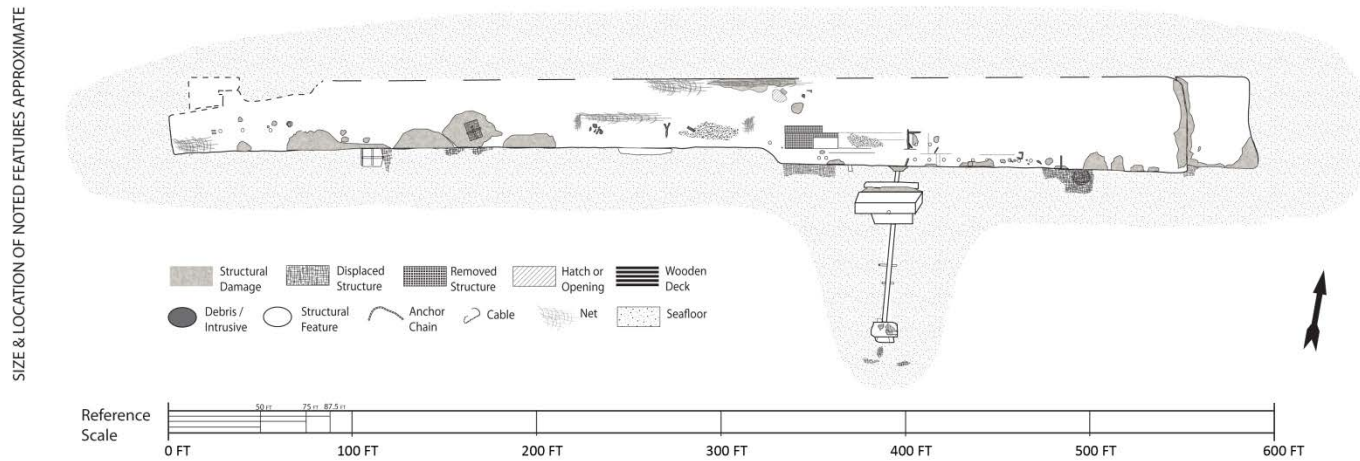
In addition to diver reports, 15 of the 19 dives were also documented utilizing GoPro handheld video recorders producing 59 GB of data which was the primary record subsequently analyzed in the course of developing this site report. Furthermore, Remotely Operated Vehicle footage (150 MB), concentrating on a single component in the vicinity of the bow, and moderate quality side-scan sonar data collected over the length of the hull (275 MB) enhanced the interpretation of the site and its identification. Finally, GPS coordinates obtained

over the buoys affixed near the extremities of the site provided for a precise location and orientation, as seen in Figure 4. A subsequent high-resolution remote sensing survey of the site utilizing a multi-beam echo sounder and/or high frequency side-scan sonar would be of significant value in confirming the assessment presented below and developing a reliable overview of the site that would facilitate long-term site management.

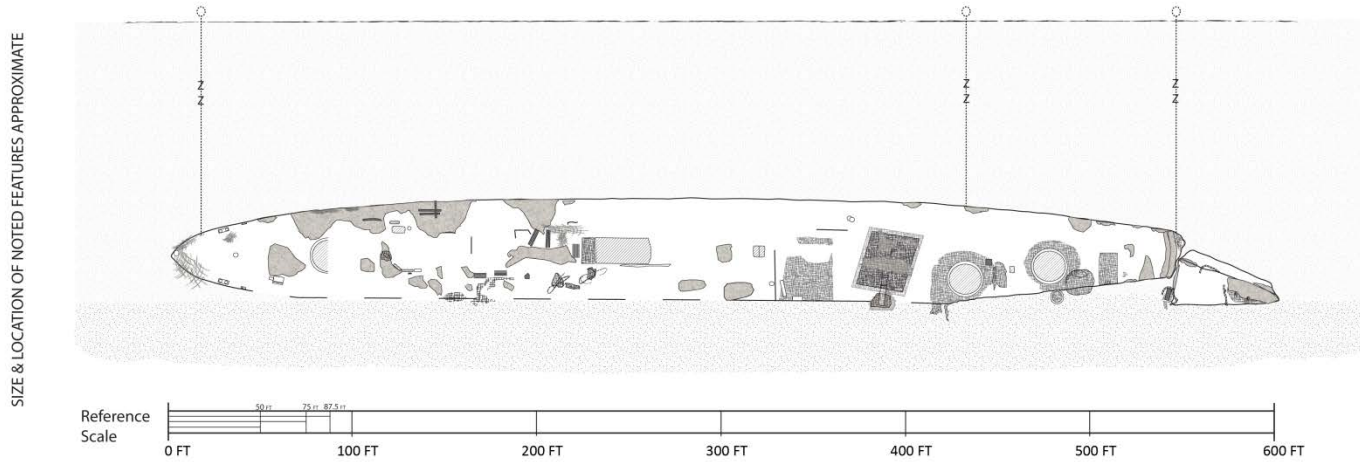
The data collected during the DIVEX indicated that the hull's starboard side is lying on the seafloor, with the deck positioned perpendicular to the seafloor facing towards shore and the entire port side exposed. A notable break appears near the bow, approximately 40 ft (c. 12 m) aft of the damaged tip. Battle damage, damage associated with the wrecking event, and subsequent disturbance of the site appear to have severely disfigured the vessel. Fishing nets, strewn throughout the hull and particularly prominent in the vicinity of the stern and along amidships, obscure many of the vessel's features. Figure 5 presents a comprehensive site plan based on features observed during review of video recordings and concurrent assessment of all other project-derived data such as diver logs and side-scan sonar records.

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(A) TOP VIEW



(B) PROFILE VIEW



LEGEND



Figure 5. Site plan identifying features and site damage observed during data analysis phase. (A) represents a bird's eye view of the port exposed side of the vessel, while (B) represents a profile view of the hull as it rests on the seafloor.

V. WRECKED VESSEL IDENTIFICATION

Pursuant to a thorough review of available data, confirmation of the identity of the wrecked vessel as USS *Houston* followed multiple lines of evidence.

Location of USS *Houston* and its Relation to HMAS *Perth*

According to historical accounts and eyewitness statements, USS *Houston* and HMAS *Perth* were traversing Banten Bay heading west toward Sunda Strait when the battle erupted. HMAS *Perth* sank first, and according to most eyewitness reports, further to the north than *Houston*, which was reported as sinking closer to shore, following Captain Rooks's decision to turn in to the battle and away from Sunda Strait (DON 1945b:7, Winslow 1971:17). Current nautical charts issued by the United Kingdom Hydrographic Office (2014) report two wrecks in the vicinity of Banten Bay, the southernmost of which, closer to shore, corresponds to the DIVEX target. The bow of the wrecked vessel faces east, away from Sunda Strait, correlating with Captain Rooks's actions.

Overall Vessel Dimensions

Side-scan sonar data estimates the overall length of the target extending between 570 ft (c. 174 m) and 610 ft (c. 186 m), corresponding with the overall length of USS *Houston* (600 ft / c. 183 m). GPS coordinates taken from buoys affixed adjacent to the extremities of the vessel indicate the buoys were positioned approximately 510 ft (c. 155.5 m) apart. This also corresponds with the overall length of *Houston*, as the stern buoy was positioned approximately 30 ft (c. 9 m) from the bitter end, and the bow buoy was placed on the extremity of the main hull and did not encompass the last 40 ft (c. 12 m) of the broken bow. Error in GPS accuracy and in the tautness of the buoy lines can feasibly account for the remaining 20 ft (c. 6 m) discrepancy.

Identifiable Features

The original construction plans for USS *Houston*, preserved in the National Archives (DON 1929), were located and provided a basis for comparison of site features identified in the video recordings. Some of the most prominent areas of the ship, such as the bow rake, stacks, masts, and gun turrets, were significantly damaged and/or dislocated during the battle and the ensuing wrecking event. Furthermore, marine growth and an expansive array of various grades of fishing nets blanket the site and conceal many of the finer identifying features. Complicating the assessment was the fact that the DIVEX timetable did not permit for the establishment of any form of reference grid that would allow for the precise positioning of identifying features.

Nevertheless, a number of observations favor the identification of the vessel as *Houston*, the most prominent of which include the tripod foremast, now consisting of the centerline leg and foretop fire control station (Fig. 7(A)); the associated port leg stump (Fig. 7(B)); a hatchway between turrets 1 and 2 (Fig. 7(C)); a dual hatchway amidships beneath the airplane catapults (Fig. 7(D)); a hatchway to port of the aft mast (Fig. 7(E)); the vessel's three observed gun turret barbets (Fig. 7(F), (G), (H)); the positioning of cleats, bitts, and chocks in the stern (Fig. 7(I), (J), (K)); a series of portholes along the exposed port side of the vessel (Fig. 7(L)); the identification of hexagonal tile flooring in the vicinity of the aft mast washroom (Fig. 7(M)); and a void in the vicinity of the aft stack and boiler uptakes. No observed features were inconsistent with the identification of the vessel as USS *Houston*; however, the significant damage observed on site may have concealed such markers.

FIELD REPORT: USS *HOUSTON* (CA-30) DIVEX 2014

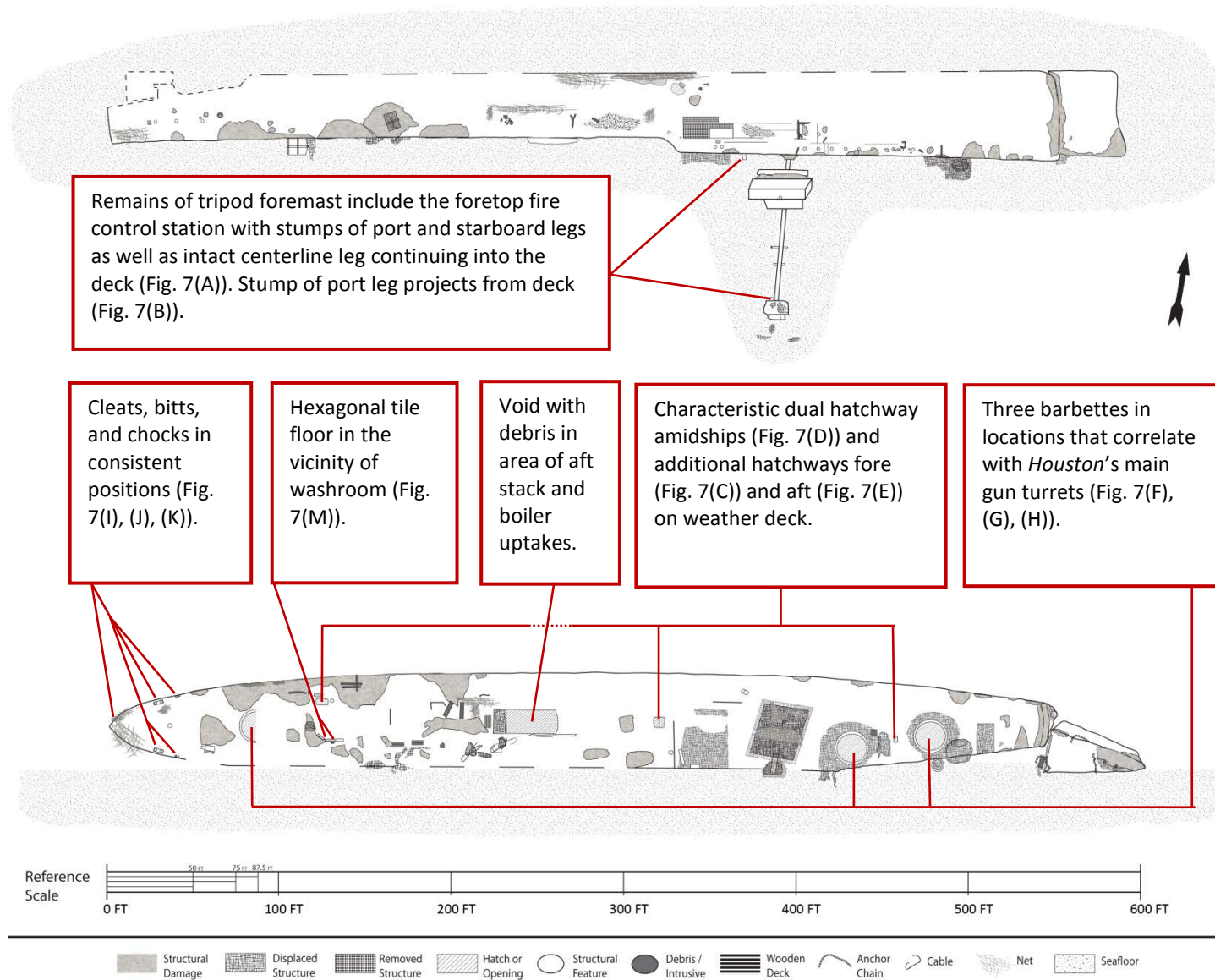


Figure 6. Identifying features observed on the site of USS *Houston* that assisted in the confirmation of the wreck's identity.

FIELD REPORT: USS HOUSTON (CA-30) DIVEX 2014



Fig. 7 (A)



Fig. 7 (B)



Fig. 7 (C)

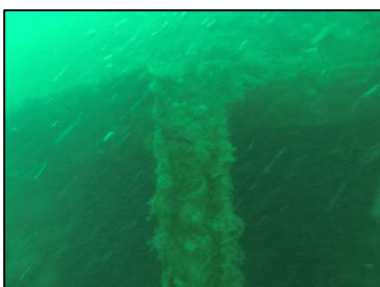


Fig. 7 (D)



Fig. 7 (E)



Fig. 7 (F)



Fig. 7 (G)

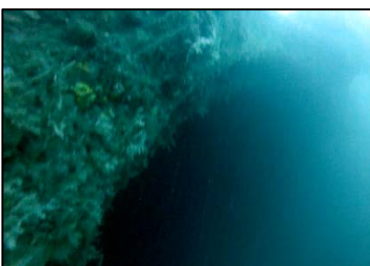


Fig. 7 (H)



Fig. 7 (I)



Fig. 7 (J)



Fig. 7 (K)



Fig. 7 (L)



Fig. 7 (M)

Figure 7. Screen shots from video recordings of identifiable features: (A) foretop fire control station with two stumps and the centerline leg; (B) port foremast stump; (C) forward hatch; (D) midships hatch; (E) stern hatch; (F) turret 1 casing; (G) turret 2 casing; (H) turret 3 casing; (I) stern bit; (J) stern chock; (K) stern double cleats; (L) sample porthole; and (M) hexagonal tile in washroom near base of mainmast.

Evidence of Battle Damage

The wrecked vessel shows evidence of battle damage in the form of areas of deformed hull, as well as penetrations of the hull and decks that exhibit both inward-facing and outward-facing impacts. Additionally, the vessel clearly suffered damage as a consequence of its wrecking event, which resulted in all three main gun turrets, the foremast, associated superstructure, and both stacks being displaced. Neither the mainmast nor the ship's one remaining scout observation seaplane was located during the dives; these may have come to rest on the seafloor beyond the line of sight of the divers, or they may have been removed subsequent to the vessel's sinking.

There is particular evidence of battle damage that corresponds directly with the action report filed in 1945 by former gunnery officer Arthur Maher (DON 1945b), the senior survivor of USS *Houston*, which also correlates with eyewitness accounts presented elsewhere (e.g. Holbrook 1981:83-102). Table 2 is an excerpt from Maher's action report recounting the shell and torpedo hits *Houston* sustained. Figure 8 illustrates the impact areas superimposed on both the original ship drawings as well as on the site plan of the wreck site, indicating a series of correlations with the action report. Figure 9 provides images of hull impacts identified during the DIVEX and believed to represent battled damage.

Among the most obvious correlations are the shell hits received near the forecastle (Table 2/Fig. 8 A, S) & (Fig. 9(A)(B)), a wardroom compartment (Table 2/Fig. 8 O/Fig. 9(B)), the sick bay (Table 2/Fig. 8 F/Fig. 9(C), (D)), the life jacket locker (Table 2/Fig. 8 H/Fig. 9(C), (D)), the

area of the main wardroom (Fig. 8 DON 1945b:7/Fig. 9(E), (F)), and near the stern (Table 2/Fig. 8 G, R). Additionally, what appear to be two torpedo hits are visible on the wreck in the vicinity of reported torpedo hits (Table 2/Fig. 8 U/Fig. 9(G), (H)). Finally, damage observed on site may also be the result of earlier engagements, such as the Battle of the Java Sea (e.g. Fig. 8 **/Fig. 9(B)).

It is worth noting that the team only had access to the exposed port side of the vessel during the available exercise timeframe, and that the correlation of hits received on the starboard side of the vessel could not be assessed. Nevertheless, there is a particularly strong correlation between the reported damage received and the discernable damage on the observed portions of the site that remain relatively intact on the seafloor. This correlation both supports the identification of the wreck as USS *Houston*, and also serves as a testament to the thoroughness and professionalism exemplified by the action report (DON 1945b), filed almost four years after the event.

At the same time, the elevated degree of association between reported hits and battle-related damage observed on site raises some concern over expanses of significant hull deformation that cannot be readily explained. This is particular the case near the aft port side of the hull where four adjacent but distinct areas appear impacted. Damage to this section of the hull cannot be reasonably dismissed as related to the wrecking event, as is the case with the broken bow extremity, and raises the prospect of notable unauthorized recovery of portions of the hull.

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Table 2. Excerpt from the 1945 after action report accounting for shell and torpedo hits received by USS Houston during the Battle of Sunda Strait.

| DESIGNATION | APPROX. TIME | LOCATION | DAMAGE RESULTING FROM | DAMAGE RESULTING |
|-------------|--------------------------|---|------------------------|---|
| A | 2330 | Forecastle Deck Frames 0-8. | Shells | Paint Locker Set Afire |
| B | 2340 | Main Deck Frame 70 | Shell | |
| C | 2400 | After Engine Room C-2 | Torpedo from Port | Undetermined Major rupture of steam lines. Damage to blkd. at Frame 90. |
| D | 0000 | Vicinity a-417-A | Torpedo | Undetermined |
| E | 0020 | Turret II | Shell | Powder Fire in Turret and Powder Circle |
| F | 0020 | Sick Bay A-209-L | Shell | Fire |
| G | 0020 | Brig Frame 132 Port | Shell | Fire |
| H | 0020 | Life Jacket Locker, Fr. 33 Stbd. | Shell | Fire |
| I | 0020 | Upper Deck Vicinity Frame 20 Stbd. | Shell Salvo | |
| J | 0020 | Magazine A-416-M | Shells or Torpedo | Fire |
| K | 0022 | Magazine A-415-M | Shells or Torpedo | Fire |
| L | 0023 | Magazine A-410-M | Shells or Torpedo | Fire |
| M | | Navigating Bridge | Shell | General Derangement |
| N | | Foremast AA Machine Gun Platform | Shrapnel | |
| O | | Wardroom Cmpt. A-103-L | Shells | |
| P | | 2nd Deck Frame 55 Crpt. B-202-L | Shells | Fire |
| Q | | Main Deck Frame 78 | Shell | |
| R | | Frame 137 Main Deck | Shell | |
| S | | Forecastle Port-Side, Fr. 0-23. | Shells (Approx. 15) | General Damage to Wardroom & Warrant Country, Extent undetermined. |
| T | Just Prior Abandon Ship. | Vicinity A-A23-A | (Shallow run?) Torpedo | Undetermined |
| U | During "Abandon Ship" | Fwd. Engine Room | Torpedo from Port | Not determined |
| V | During "Abandon Ship" | Communication Platform, Fr. 52, Starboard | Salvo | Hit #1, 1.1" gun |

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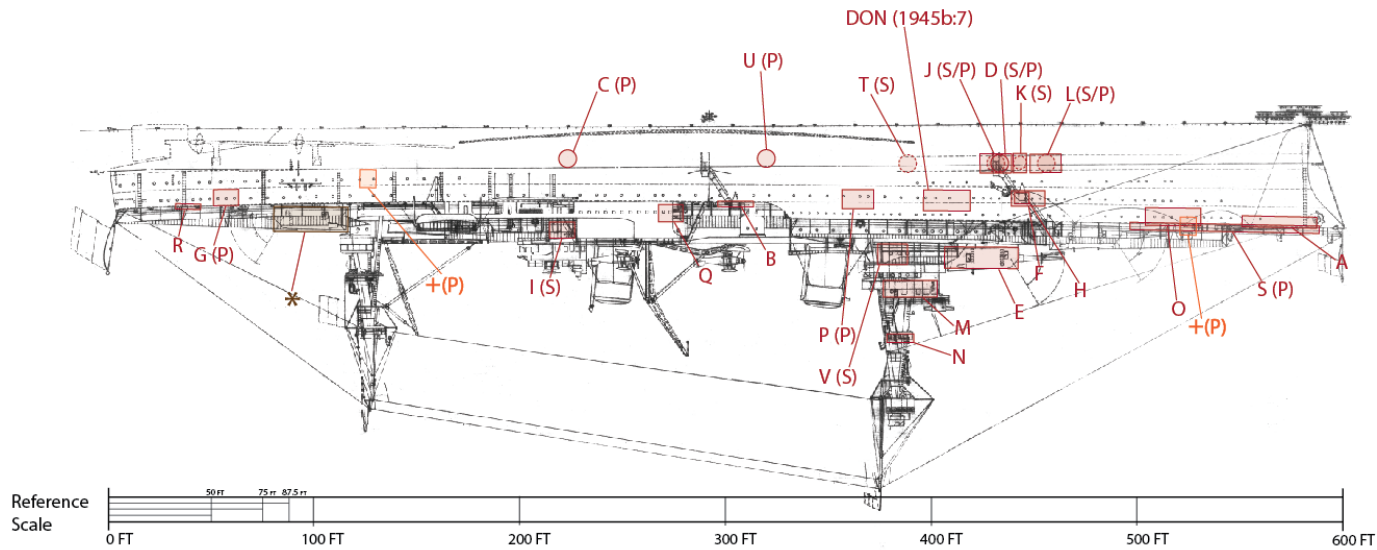


Figure 8. Approximate areas of shell or torpedo hits received by USS Houston superimposed on original ship drawings (above) and superimposed on the top view site plan (below). Hits sustained during previous engagements are indicated by symbols (*: Battle of the Flores Sea; +: Battle of the Java Sea). Damage sustained during the Battle of Sunda Strait is indicated by letters, which correspond to Table 2. Letters in parentheses indicate the side of the vessel receiving the strike, when known (P: port; S: starboard).

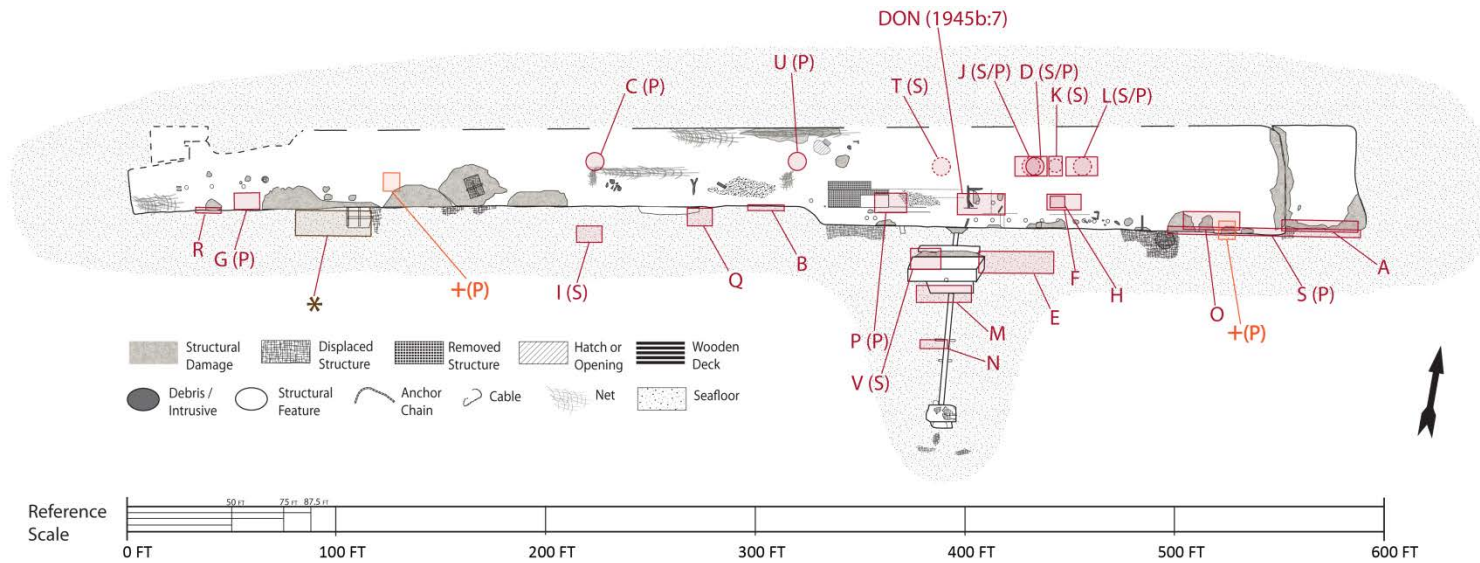




Fig. 9 (A)



Fig. 9 (B)



Fig. 9 (C)



Fig. 9 (D)



Fig. 9 (E)



Fig. 9 (F)

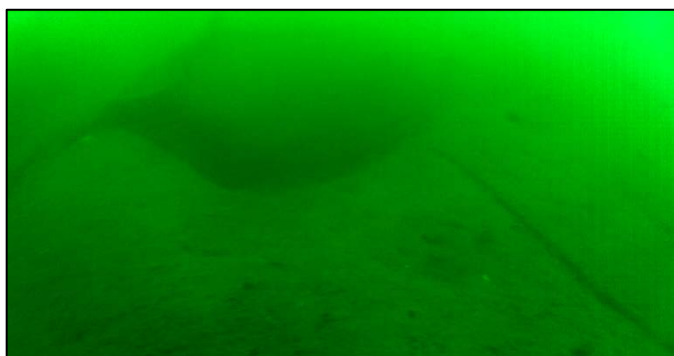


Fig. 9 (G)



Fig. 9 (H)

Figure 9. Screen shots from video recordings of hull impacts presumed to be associated with battle damage, as designated in Table 2/Figure 8: (A) shell damage in vicinity A, S; (B) shell damage in vicinity O, S, *; (C) shell damage in vicinity F, H; (D) shell damage in vicinity F, H; (E) shell damage in vicinity of wardroom; (F) shell damage in vicinity of wardroom; (G) torpedo damage in vicinity U; and (H) torpedo damage in vicinity of U with nearby dredge and rectangular frame.

VI. SITE CONDITION ASSESSMENT

Evidence of Unauthorized Disturbance to Structure

In addition to the unverifiable disturbance suggested above, during the documentation dives undertaken by MDSU-1 Company 1-5, several pieces of conclusive evidence indicated that systematic and ongoing unauthorized disturbance activities were occurring on USS *Houston*. Evidence was concentrated throughout the exposed port side of the vessel, and was multi-faceted in nature, as presented in Figure 10.

Rivets and Metal Hull Plate Removal

Rivets running along the edges of seams holding hull plates together have been methodically removed to allow for the plates to be maneuvered and lifted as part of unauthorized recovery operations. Figure 11(A) shows a gap between a plate that has already been removed and the initial lifting of the adjacent plate. The marker standing upright in the center of the image is placed on the last rivet that has been removed along the seam. Figure 11(B) shows a seam between metal hull plates with rivets removed along one side. Sequential removal of rivets was observed in multiple areas of the exposed port side of the hull.

In Situ Water Dredge

Areas of the port side of the wrecked vessel have caved in or been deformed by extensive battle-related damage. Figure 11(C) shows what appears to be a water-dredge, used to remove sediment from an underwater environment, adjacent to such a cavity resulting from a presumed torpedo hit, permitting access to the interior of the hull. Dredges of this type are commonly utilized in salvage or archaeological

operations to excavate through and remove compacted sediment. The condition of the dredge indicates it has been present on site for some time, while it is still being weighed down by a rectangular metal frame and what may be an adjacent cinder block, suggesting its continued use.

Hollow Breathing Hose

A modern hollow hose was observed coiled near the stern on the exposed port side of the vessel (Fig. 11(D)). The hose's loose end heading away from the coil was not traced as dive time was limited. The hose, through which compressed air can be pumped down to the seafloor for breathing purposes, is apparently consistent with the type of rudimentary surface-supplied diving system that local divers use to support prolonged underwater operations.

Porthole Gasket with Tool

The vast majority of portholes on the exposed port side of the hull have been removed; what remains is typically evidence of forceful removal in the form of a circular gap in the hull. Figure 11(E) shows a custom-made tool constructed for such a purpose, alongside a rubber gasket that once formed part of a porthole seal near a disfigured porthole. Divers observed that the tool utilized a handle made of a golf ball.

Hacksaw

Adjacent to the base of mainmast of the vessel, divers observed and recovered a hacksaw visible in Fig. 11(F). The condition of the hacksaw indicates that it was a very recent intrusive addition to the site, as there were no visible signs of corrosion on the metal blade.

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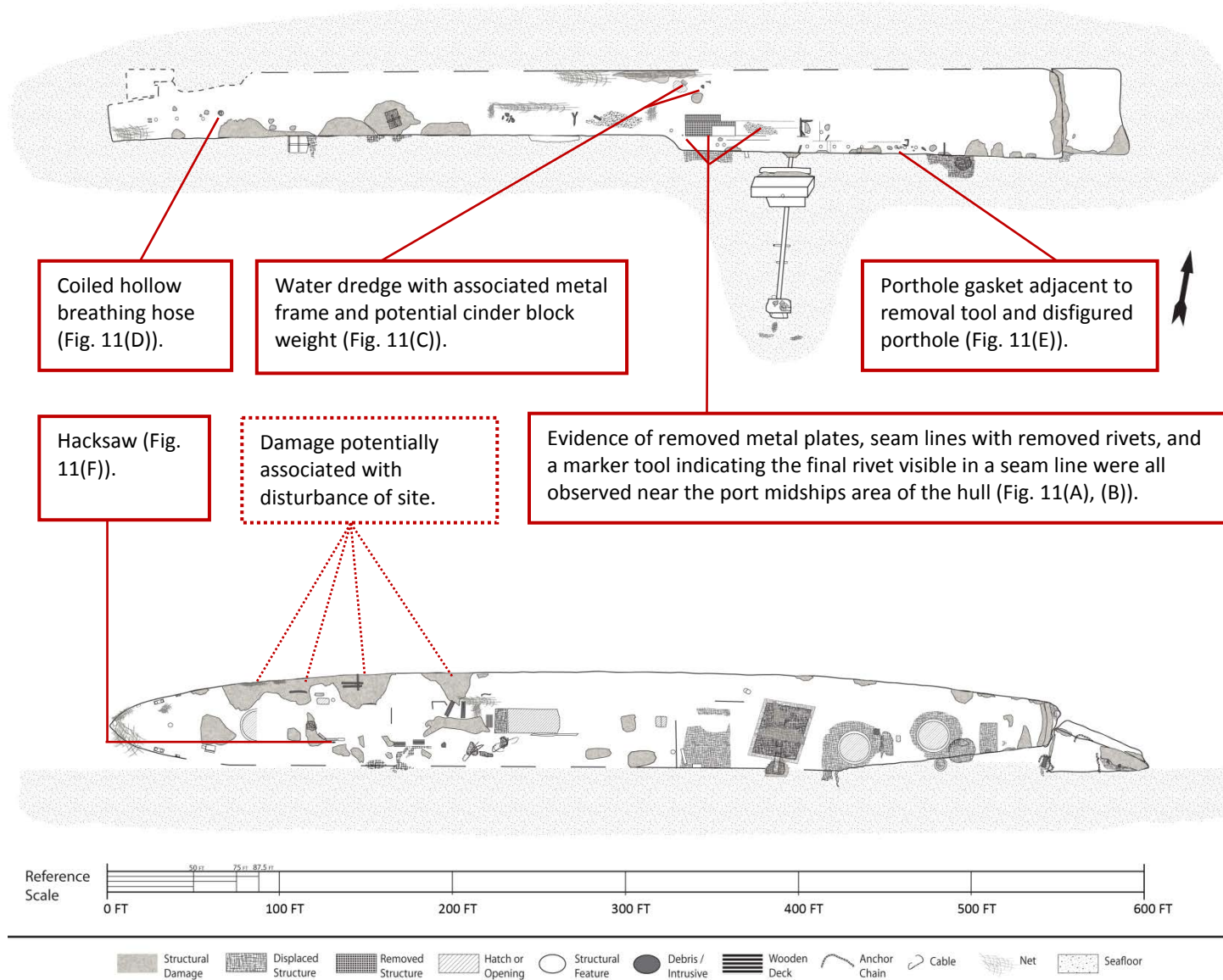


Figure 10. Indications of site disturbance of USS Houston observed during the 2014 DIVEX.

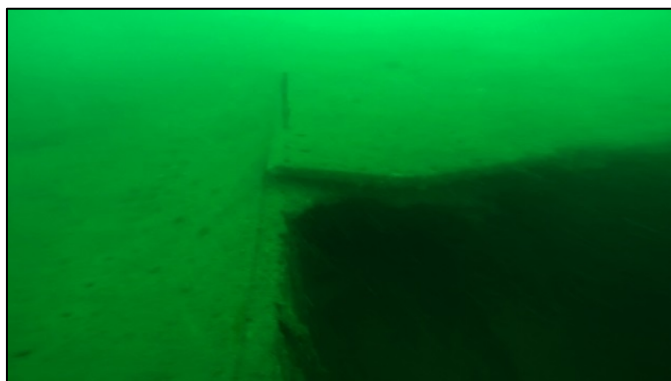


Fig. 11 (A)

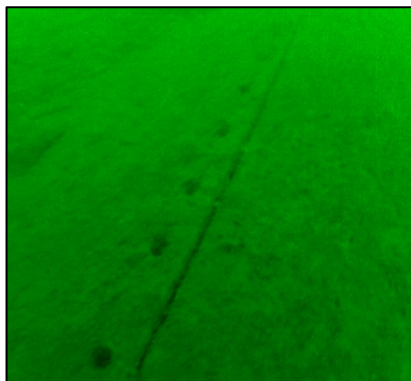


Fig. 11 (B)



Fig. 11 (C)

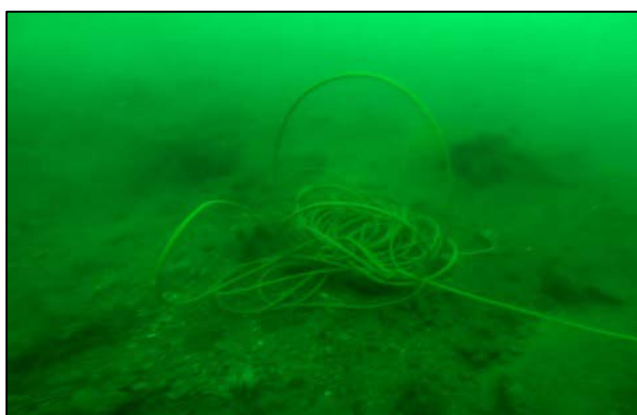


Fig. 11 (D)



Fig. 11 (E)

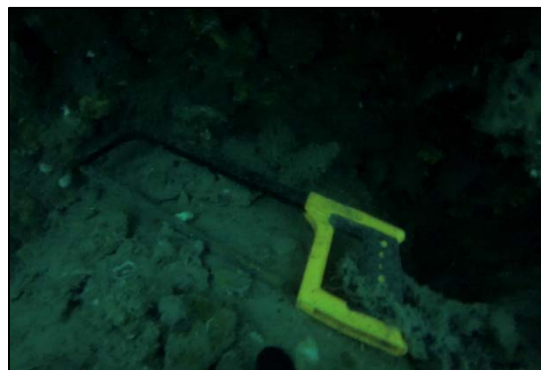


Fig. 11 (F)

Figure 11. Indications of unauthorized disturbance on exposed port side of the vessel as observed during the 2014 DIVEX: (A) interface between removed hull plate and subsequent plate still in position; note marker (center) indicating the last rivet to have been removed in the seam; (B) seam between hull plates where rivets have been systematically removed on one side; (C) water dredge being weighed down by metallic frame with one end resting within a cavity resulting from a presumed torpedo hit; (D) coiled yellow hose presumably utilized for basic surface-supplied diving operations; (E) evidence of a porthole gasket lying adjacent to a deformed porthole and a tool with a golf-ball handle ostensibly utilized for porthole removal; and (F) a hacksaw recovered from the site adjacent to the mainmast area.

Evidence of Unauthorized Removal of Ordnance

Divers observed an accumulation of shells and ordnance resting on the exposed port side of the hull alongside a secured bag, likely placed there in preparation for their recovery (Fig. 12/ Fig. 13(A)). Given the location of this accumulation, it is not deemed to be a natural collection but rather evidence of the unauthorized removal of presumably live ordnance from the site. What may be a second

artificial accumulation is located in the vicinity of the observed water dredge (Fig. 13(B)). Elsewhere, what appear to be individual casings, shells, and other ordnance are dispersed in several locations across the port side of the hull (Fig. 12). As no assessment has been conducted on any of the seemingly intact pieces of ordnance, any such ordnance must be presumed active, and therefore potentially a public safety hazard.

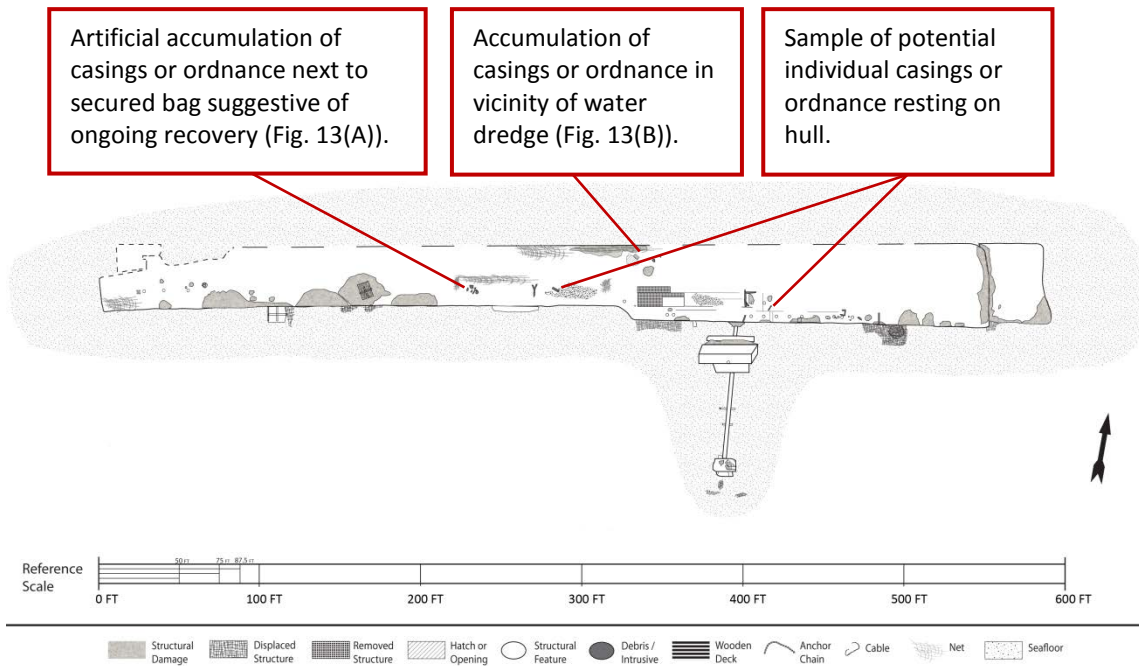


Figure 12. Location of accumulated ordnance on exposed port side of the vessel as observed during the 2014 DIVEX.



Fig. 13 (A)

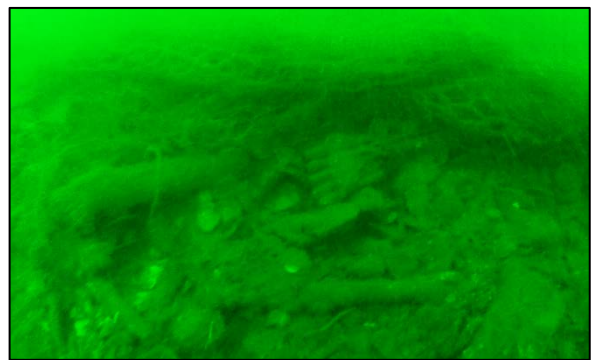


Fig. 13 (B)

Figure 13. Shell casings or ordnance on the exposed port side of the hull: (A) accumulation adjacent to a secured bag likely intended to aid in expected recovery; (B) accumulation held in place by nets near the water dredge observed amidships.

Evidence of Oil Seepage



Figure 14. Oil sheen concentrated over the DIVEX area of operations.

The presence of oil slicks on the surface of the water above and around the DIVEX site was noted by multiple project participants and observed in numerous locations scattered several hundred feet apart over the vessel. The first evidence of oil in the water column was recorded by the side-scan sonar team as the towfish was being recovered on 10 June. Subsequently, slicks and active seeps were witnessed during the mornings of 11, 12, and 13 June when the sea surface was calm. Figure 14 shows a moderately sized sheen that accumulated in the vicinity of USNS *Safeguard*. Figure 15 shows one of several small oil seeps in the adjacent area as the oil reached the water's surface and expanded, forming a sheen.

Observations and data collected during the 2014 DIVEX do not permit for an accurate assessment of the remaining fuel contents of USS *Houston*. Rather, what may be broadly reconstructed based on archival records is the degree to which *Houston* was laden with fuel upon arrival in Sunda Strait and at the time of its sinking following the engagement. A comparison of the distribution of the vessel's fuel tanks with apparent battle damage on the wreck site can also provide indications of

catastrophic fuel losses that likely occurred as a result of one or more of the four torpedoes that reportedly hit the hull below the waterline, along with battle damage that was suffered by the vessel. Furthermore, present data also does not account for the release of oil that likely occurred as a result of the wrecking event itself, or for gradual and periodic releases that have transpired since the sinking of the vessel in 1942. A more substantive survey would be required in order to estimate the remaining fuel contents that reside within the hull as it has come to rest.

Northampton-class vessels such as USS *Houston* held a total maximum fuel oil and diesel oil capacity of 825,388 gallons, or c. 2,976 tons (DON 1945d). According to the action report filed by gunnery officer Maher (DON 1945b), upon departure from Batavia (Jakarta), *Houston* had been refueled and held approximately 350,000 gallons (c. 1,260 tons) of fuel oil and diesel oil on board. This corresponds to approximately 40% of the maximum capacity of the vessel, which likely had been distributed within the hull systematically in order to ascertain any additional ballast requirements and maintain proper trim.



Figure 15. Three sequential images documenting a small oil seep over the DIVEX target as it rises to the surface of the water and disperses to form a small sheen.

To determine the vessel's consumption of fuel en route to Banten Bay, located approximately 50 nautical miles from Batavia (Jakarta), two separate sets of calculations were made aiming to identify the lower and upper consumption rates. These calculations relied upon the report entitled "War Service Fuel Consumption of U.S. Naval Surface Vessels" (DON 1945d), which specifically references the *Northampton* class of vessels, as well as data regarding *Houston* compiled in Gardiner and Chesneau (1980) and published in O'Hara (2007).

The first set of calculations is likely to be more accurate as it relies on higher consumption rates reflective of wartime operations; the second set relies on consumption rates that were based on pre-war economic speeds. In both instances the results were extrapolated to meet the 20-22 knots that *Houston* was reportedly making between Batavia (Jakarta) and Banten Bay (DON 1945a). The lower rate of consumption results in c. 15 tons of oil utilized, whereas the higher rate of consumption results in c. 23 tons of oil utilized. Given the relatively short distance, the discrepancy between the two is not significant. Accordingly, *Houston* is estimated to have contained between 343,500 gallons (c. 1,238 tons) and 346,000 gallons (c. 1,246 tons) of oil upon reaching the battlefield.

Taking into account the accelerated consumption rate of fuel during the 1.5 hour-long battle, *Houston* would conceivably have been lost with 340,000 gallons (+/- 2,500 gallons) of fuel and diesel oil, without accounting for catastrophic leaks resulting from

battle damage or subsequent releases. Preliminary estimates indicate that battle damage alone could account for the release of approximately a quarter of the oil load aboard *Houston* prior to it sinking.

Evidence of Human Remains

Human remains were not observed in the visual data collected during the 2014 DIVEX. It is likely that any human remains, if extant, might be preserved within the hull or buried in the adjacent sediment, rather than exposed on the deck or port side of the hull. At the same time, it is possible that remains may be found concreted to other exposed elements of the hull. The 2014 DIVEX, however, found no direct evidence that human remains associated with the site had been disturbed at the time of the survey.

VII. CONCLUSIONS

The 2014 USS *Houston* (CA-30) DIVEX, despite its short duration, fully accomplished its prescribed mission objectives due to the dedication and professionalism of USNS *Safeguard*, MDSU-1 Company 1-5, and Indonesian Navy team members who fully dedicated themselves to the task. Specifically, the DIVEX confirmed the identity of the wreck, established an accurate set of coordinates for the bow and stern of the vessel, documented the site and determined the extent and orientation of the main assemblage, assessed the site for environmental or public safety concerns, explored for evidence of exposed human remains, identified and documented evidence of unauthorized disturbance, and also identified and documented evidence of original battle-related damage. At the same time, the joint exercise enhanced regional cooperation, promoted understanding, and improved the interoperability of the forces involved.

A lengthier survey of the site would have permitted the development of reference points and resulted in a more accurate site plan, as well as potentially permitted the exploration of the full extent of the hull and the associated debris field, enabling the location of additional features. At present, there is insufficient evidence to ascribe the dislocation of certain elements to the wrecking event as opposed to unauthorized removal, as the adjacent seafloor was not fully surveyed. Accordingly, features that were not positively identified such as the mainmast or primary gun turrets 2 and 3 may rest only a few meters away from the main hull.

The operation produced convincing evidence that the wreck of *Houston*, which serves as the final resting place for hundreds of sailors, contains potentially live ordnance, is seeping oil, and is also being irreparably damaged by

the unauthorized disturbance of the site. In addition to the early, convincing indications of metal plate and porthole removal, as well as the salvage-related equipment observed on the site, the fact that the stern port quarter damage cannot be ascribed to battle injuries raises concerns of significantly heavier impacts to the hull than first indications suggested. Such impacts elevate the potential of the inadvertent release of oil still contained within the hull, to the detriment of the surrounding environment and the local fishing economy. Associated public safety or environmental concerns are exacerbated by the apparent recovery of potentially live ordnance from the port side of the hull.

Of great concern is that continuing unauthorized activities that intrude into the hull have the potential to impact any extant human remains that may have otherwise been preserved by their immediate environment.

A systematic survey would permit a more in-depth assessment of the environmental, public safety, and unauthorized disturbance concerns that became evident in the course of the 2014 DIVEX, and provide for a more reliable baseline upon which to base site management and preservation decisions.

Without the implementation of protective measures, unauthorized disturbance is likely to continue. Continued unauthorized disturbance will accelerate the deterioration of the wreck beyond that which may be expected from natural processes alone, with an accordingly increased risk of desecration of human remains, serious structural damage to the wreck, and adverse environmental effects.

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IX. APPENDIX A: LOG OF DIVEX OPERATIONS

| USS HOUSTON DIVEX OPERATIONS LOG | | |
|---|-------------|---|
| MONDAY JUNE 9, 2014 | | |
| | 0930 | SAFEGUARD moors at Jakarta International Container Terminal 2. |
| | 1000 | Force Protection Brief. |
| | 1030 | CAPT Stacpoole Brief. |
| | 1300 - 1345 | Kompas Interview Reporter: Iwan Santosa U.S. Embassy Rep.: Gregory McElwain, Asst. Press Attaché. |
| | 1400-1500 | Brief with Indonesian Diver Unit & Frogmen. |
| | 1600-1700 | Brief with CWO2 Shafer and MDV Phillips – NHHC Objectives, Operations, Documentation. |
| | 1745 | Meeting with MC3 Senyk to coordinate visual data management and daily release of photographs. |
| | 2000 | Filed report update. |
| TUESDAY JUNE 10, 2014 | | |
| | 0600 | Brief with CWO2 Shafer and MDV Phillips – Daily Operations. |
| | 0630 | Equipment preparation. |
| | 0645 | Small Boat launched to conduct side-scan sonar operations. |
| | 0715 | Side-scan operations begin. Equipment: Marine Sonics Seascan HDS 600/1200 Waypoint 1 – Published set of USS <i>Houston</i> coordinates 0715-0755 – Completed 3 passes over coordinates, no target was located. 0755-0845 – Completed 4 th pass over coordinates; no target located. Diverted course to nearby area with heavy fishing presence (4-5 vessels). SAFEGUARD verified coordinates with Indonesian partners. 0845-0915 – Completed 5 th , 6 th , and 7 th passes (last two perpendicular to former passes) on Waypoint 1; no target located. 0920 – Towfish recovered and Small Boat returning to SAFEGUARD. Decision made to head to Waypoint 2 – set of coordinates provided by Mr. Jerry Ranger. |
| | 0935 | Small Boat returned to SAFEGUARD. |
| | 1015 | SAFEGUARD approaching Waypoint 2 – 1 mile from shore, approx. 33m deep according to nautical charts. |

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| | 1045 | Small boat launched – 0.5 miles from Waypoint 2. |
| | 1100 | Side-scan operations begin. Towfish snagged during first pass on Waypoint 2. Oil sheen was visible when the towfish was recovered. 1105 – Towfish repositioned in the water, approaching Waypoint 2 along perpendicular to Pass 1. 1125 – 3 rd pass over target; orientation established as generally running East to West. Towfish snagged once more. Switched frequency from 1200 kHz to 600 kHz to permit for wider swath. 1135 – Positive hit – very large metallic object. Towfish recovered. SAFEGUARD made a pass over target, depth sounder ranged from 28 m to 11 m over target. Noted oil sheen. |
| | 1140 | Divers on site with zodiac. Dive 1 initiated to locate bow or stern based on side scan target coordinates. |
| | 1140 | MDV Phillips requested target confirmation with one last side-scan sonar pass. The pass was run at a perpendicular angle to former passes (hence N-S) in order to gain a different perspective. |
| | 1148 | Positive side-scan sonar hit, with a visible metal hull being traversed at the expected perpendicular angle. Approximately half of hull visible on 300 FT total swath – correlates well with 600 FT <i>Houston</i> LOA. |
| | 1150 | Divers sent to obtain a visual confirmation of target and place red buoy on extremity of vessel. 1152 – Divers down 1200 – Divers pull buoy to signal return to surface and buoy placement. Divers report that buoy is placed on bow [later proved inaccurate, however, buoy was placed adjacent to the Western extremity of the site]. 1205 – Divers up (separately) |
| | 1220 | Small Boat alongside SAFEGUARD. Held meeting with CWO2 Shafer and MDV Phillips |
| | 1345 | Indonesian divers enter water with the objective to place red buoy on the opposite extremity of the wrecked vessel. |
| | 1415 | Indonesian divers return to SAFEGUARD. Placed 2 nd buoy approximately 100 FT beyond the 1 st buoy towards the East. |
| | 1445 | Small Boat launched to undertake side-scan sonar ensonification of the length of the site, following the orientation established by the two buoys affixed to the hull. |
| | 1455 | Orientation of hull according to buoy-to-buoy compass measurement is 60° to 240°. |
| | 1455 | Divers descend (1 USN / 1 IND) on site to take second buoy and position it further along the hull towards the second, as-of-yet unidentified extremity. |
| | 1515 | Divers ascending, having moved the second buoy. New buoy-to-buoy compass measurement results in an orientation of 90° to 270°. |
| | 1520 | Lowering side-scan sonar towfish into the water along the second bearing. 1525 – Pass 1 snagged (600 kHz) (W to E) 1525 – Pass 2 located target (600 kHz) (E to W) alongside pass. Keel facing out to sea, superstructure facing |

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| | | towards shore. 1535 – Preparing for Pass 3, closer to shore (600 kHz) (W to E). West buoy was found to be by the extremity of the hull; East one was deemed to be several hundred feet away from second extremity. 1540 – Pass 3 hit target but data quality was poor. 1550 – Pass 4 (1200 kHz) (E to W) successful. 1605 – Pass 5 (1200 kHz) (W to E) successful. |
| | 1620 | Determination made to moor SAFEGUARD by Eastern buoy, which is expected to be affixed somewhere near amidships. |
| | 1635 | SAFEGUARD mooring operations are underway. |
| | 1715 | Oil sheen observed between buoys during mooring operations. |
| | 1815 | SAFEGUARD mooring operations complete. |
| | 1830 | Meeting with MC3 Senyk regarding daily image selection and data management. |
| | 1930 | Meeting with CWO2 Shafer and MDV Phillips regarding tomorrow's objectives. |
| | 2000 | Data analysis and organization. |
| | 2030 | Daily report submitted. |
| WEDNESDAY JUNE 11, 2014 | | |
| | 0600 | SAFEGUARD moor was observed to have shifted overnight. |
| | 0630 | Mooring operations underway to attempt to reposition SAFEGUARD over the site without shifting anchor locations. |
| | 0645 | Circular sheens of oil were visible on the water's surface on either side of the stern. |
| | 0700 | Mooring operations cease, having positioned SAFEGUARD as near to its original location as possible, however, not adjacent to the buoys marking the site. Diving operation preparations and gear preparations begin. |
| | 0745 | Diving station preparations underway. Fishing vessels (4-5) observed over the site, despite SAFEGUARD prominently positioned alongside. |
| | 0830 | Awaiting SAFEGUARD tagging preparations for diving. Indonesian Patrol Boat sent to dissuade fishermen (3-4 vessels) from laying nets on the site. |
| | 0835 | Diving operations brief underway. Objectives established as identifying the precise orientation of the vessel and its relation to the placement of the diving stage. First dive expected to last 15 minutes, with a maximum depth of 120 feet. |
| | 0840 | Diving operations brief complete. Dive checks ensue. |
| | 0855 | Divers over the side of SAFEGUARD and exiting stage report that visibility is disturbed, current is |

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| | | moderate/strong, and that the stage is resting on a thick layer of silt. MDV stated that SAFEGUARD would have to be repositioned as diving conditions did not permit the effective and safe investigation of the site. |
| | 0900 | Divers return to stage and ascent begins. |
| | 0915 | Decision is made to revert to SCUBA operations, with the objective of moving/installing new buoy on Eastern extremity of the site. |
| | 1000 | IND dive team sent to investigate Western extremity buoy and establish whether it represents the bow or stern. |
| | 1020 | IND dive team returns to SAFEGUARD with Western extremity buoy; line affixing buoy to wreck-site apparently unraveled during diver descent. |
| | 1030 | USN dive team descended along easternmost buoy proceeding towards Eastern extremity of vessel. |
| | 1045 | USN dive team on surface. Small boat operations secure a second (in the absence of the original red buoy) yellow buoy on site adjacent to Eastern extremity by 1055. |
| | 1050-1055 | IND divers in water; dive aborted upon receiving news of imminent arrival of VIP delegation. |
| | 1115 | VIP delegation arrives alongside SAFEGUARD on transport boat from Jakarta. VIP delegation included Deputy Chief of Mission Kristen Bauer, USN Attaché CAPT Richard Stacpoole, and USMC Attaché LTCOL Miguel Avila. Delegation was provided with an introduction to the project and lunch with senior project members and SAFEGUARD Officers. |
| | 1205 | Commemorative wreath-laying ceremony took place involving DCM speech and the handing of a wreath by the VIP delegation to a joint team of USN and IND divers for placement on the site (diving operations 1215-1240). |
| | 1245 | VIP delegation departs SAFEGUARD. |
| | 1315 | USN ROV operations commence near separated component in the vicinity of the Eastern extremity which is closer in proximity to the position of SAFEGUARD. 1320 ROV surfaces 1325 ROV descends 1405 ROV surfaces |
| | 1325 | USN divers in the water alongside Eastern extremity buoy to verify location of buoy and investigate extremity. |
| | 1340 | USN divers surface, reporting that buoy is affixed in the vicinity of the extremity, but that the bitter end is separated from the main hull as a result of significant damage to the area. |
| | 1400 | IND divers, charged with descending on the red midships buoy and placing original red buoy back on the Western extremity surface, descended on the Eastern extremity and placed the original red buoy adjacent to the red midships buoy. |

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| | 1435 | ROV concluded investigation of component in the vicinity of the Eastern extremity. |
| | 1440 | USN divers in the water to reposition second red buoy on the westernmost extremity. |
| | 1445 | ROV descends on the Eastern extremity of the main hull. |
| | 1455 | USN divers surface having placed red buoy on the westernmost extremity. |
| | 1500 | While conducting ROV operations, ROV cable became entangled on the site. |
| | 1515 | Dive brief held with USN divers. Following investigations thus far, divers confirm that the deck of the vessel is facing the adjacent island. If the vessel is indeed on its starboard side, as was the reported list of USS <i>Houston</i> while sinking, that would indicate that the stern is located adjacent to the Western extremity and the bow adjacent to the Eastern extremity. Ensuring there was no slack in the buoy lines, coordinates were taken on the two ends using a Dagger GPS handheld unit. |
| | 1530 | USN divers descend near yellow buoy in the vicinity of the bow to untangle ROV. |
| | 1545 | USN divers ascend. |
| | 1600 | Diver debrief and video analysis. Divers located evidence of unauthorized disturbance, an accumulation of ordnance, and a breathing hose. |
| | 1645 | Decision is made not to re-engage in surface-supplied diving as SCUBA diving was providing greater flexibility and efficiency in exploring the site. Accordingly, there would not be a need to dedicate time to mooring operations and diving could continue. |
| | 1710 | USN divers descend. |
| | 1725 | USN divers ascend. |
| | 1735 | Small Boat returns to SAFEGUARD. |
| | 1800 | Diver debrief and video analysis. |
| | 1815 | Full USN dive team brief on day's operations and accomplishments, as well as objectives for June 12, 2014. |
| | 1845 | USN dive team brief concludes. |
| | 1845-2000 | Data analysis and coordination with MC3 on data management and daily image selection. |
| | 2000 | ROV reported to have suffered a catastrophic failure of the fiber-optic cable during entanglement earlier in the day. As a result, ROV operations cease. |
| | 2030-2145 | Daily report drafted and submitted. |
| THURSDAY JUNE 12, 2014 | | |
| | 0630 | Brief with CWO2 Shafer and MDV Phillips on day's objectives and operations. |
| | 0800 | Equipment preparations underway. |
| | 0845 | Small Boat departs SAFEGUARD with divers. |

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| | 0905 | USN divers descend. Objective is to descend on midships buoy and proceed to bow along the exposed port side of the hull. |
| | 0925 | USN divers ascend. Reported reaching bow which lies beyond the extremity buoy, past the final porthole, and descended along the curvature of the hull at its extreme point, subsequently returning towards midships. Identified port-hole gasket and hand-made removal tool that included a golf ball handle. |
| | 0930 | IND divers directed to descend on stern buoy to explore interface between deck and seafloor along entire length of vessel. |
| | 1000 | USN divers descend. Objective is to descend on midships buoy and proceed to stern along the exposed port side of the hull, then proceed to explore the screw/rudder region. |
| | 1030 | IND dive complete. Divers observed yellow breathing hose and reported notable current. |
| | 1030 | USN divers return to SAFEGUARD, reporting heavy current that was too strong for them to make progress in reaching the stern. However, they observed evidence of a dredge entering into the vessel. |
| | 1100 | Due to diver-reported current conditions, MDV postponed further diving until 1400, which according to local current tables represents slack tide. |
| | 1145 | Completed review of video recordings obtained during the morning's dives. |
| | 1145 | Prepared and eventually sent requested response to CNO on reported evidence of unauthorized disturbance of the wrecked vessel (until late afternoon). |
| | 1400 | USN divers descend on midships buoy, with the objective to proceed towards the bow, sweeping the deck of the vessel to its extremity. |
| | 1415 | USN divers return to surface. |
| | 1500 | USN divers descend on midships buoy, with the objective to proceed towards the stern, sweeping the deck of the vessel to its extremity, and taking measurements of the distances between cleats, chocks, or bollard extant at the stern. |
| | 1515 | USN divers ascend. |
| | 1610 | USN divers descend on bow buoy, with the objective of exploring the bow and then turning towards the stern along the seafloor-deck interface. |
| | 1625 | USN divers ascend. |
| | 1400-1625 | IND divers complete two additional dives from the stern to the bow along the seafloor-deck interface. |
| | 1730 | Thunder and lightning cancelled the 3 last planned dives of the day that would have further explored the seafloor-deck interface in order to identify evidence of masts, guns, and superstructure features, as well as the stern area by the rudder/screws that was not able to be investigated earlier in the day. |
| | 1800-2000 | Reviewed and analyzed data obtained during the day's dives. |
| | 2000-2030 | Coordinated with MC3 on data management and image selection. |

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| | 2030-2145 | Prepared and submitted daily report. Initiated data exchange with MC3. |
| FRIDAY JUNE 13, 2014 | | |
| | 0630 | Breakdown operations begin. |
| | 0650 | USN divers launch small boat to recover buoys from site. |
| | 0800 | Diving operations complete. |
| | 0815 | IND team arrives for brief and CARAT14 concluding ceremony. |
| | 0900 | IND team departs marking the conclusion of the DIVEX. |
| | 0930 | Science party departs for Jakarta via small boat transfer. SAFEGUARD continues operations to remove the moor and is scheduled to directly proceed to its next mission. |

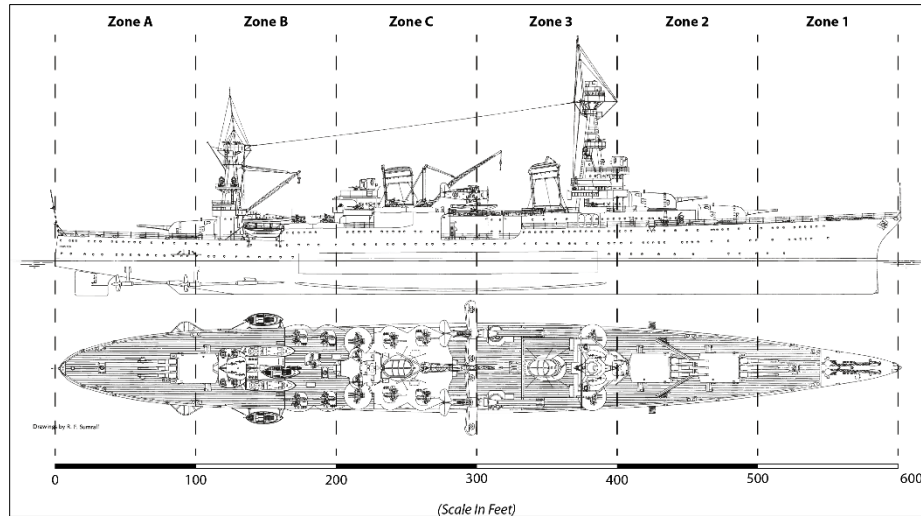
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X. APPENDIX B: TRANSCRIBED LOG OF DIVING OPERATIONS

| Overall Dive # | Diver | Buddy | Day | Dive # | Time in | Time out | Location / Zone | Description | Features/Observations |
|----------------|------------------|----------------------------|-----------|--------|---------|----------|-----------------------------------|--|--|
| 1 | NDC Chinn, Kevin | ND2 Stinson, Corbin | 6/10 2014 | 1 | 1150 | 1204 | Inspection Dive, Location Unknown | Locate and mark USS <i>Houston</i> with buoy | Noted Position of ship, laying Starboard side. *Recorded Video of dive |
| 2 | MC1 Perez | Haryono (Indonesian Diver) | 6/10 2014 | 2 | 1458 | 1512 | Mid-ship | Mark bow of USS <i>Houston</i> | None |
| 3 | NDCS Phillips | ND1 Gregg | 6/11 | 1 | 0852 | 0905 | | -Surface supplied dive -Locate USS <i>Houston</i> , divers need to shift moor | None |
| 4 | ND2 Lofgren | ND3 Clarke | 6/11 | 2 | Blank | Blank | Zone C | Mark [extremity] with buoy | Blank |
| 5 | ND2 Roth | ND3 Roubion, MCI Perez | 6/11 | 3 | 1220 | 1234 | Zone C | -Indonesia CARAT 2014 -Survey USS <i>Houston</i> | None |
| 6 | NDC Chinn | ND1 Amberger | 6/11 | 4 | 1326 | 1343 | Zone A&B | -Mark bow of USS <i>Houston</i> -Carat 2014 -Divers moved from west-east | Broken structure between zone A&B. Depth increase from 110fsw to 120fsw at bow |
| 7 | ND2 Winburn | UN2 Underwood | 6/11 | 5 | 1440 | 1455 | Zone 3- 1 | -Mark stern of USS <i>Houston</i> | None |
| 8 | ND2 Stinson | ND3 Roubion | 6/11 | 6 | | | Zone 1&2 | Explore stern for identifiable features | -Cleats -Identified ring for aft touret [sic] |
| 9 | CW02 Shafer | MC1 Perez | 6/12 | 1 | 0905 | 0922 | Zone C | Explore midship for USS <i>Houston</i> features | Started at midship buoy headed to bow buoy then followed curvature of ship and head [sic] toward midship buoy – up |

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| 10 | ND2 Underwood | ND2 Winburn | 6/12 | 2 | 1012 | 1031 | Zone C&B | -Fighting current limiting depth to 70fsw -Hull survey | -A lot of coral build up -Apparent damage to hull -24" W x 6' L appendage sticking out |
| 11 | ND2 Lofgren | ND2 Roth | 6/12 | 3 | 1400 | 1418 | Zone 3,2&1 | Swim out deck and attempt to identify bow, turrets, and any other identifiable features | -Large circular opening, potential turret hole -Rectangular holes, may have been hatches |
| 12 | ND1 Gregg | ND1 Amberger | 6/12 | 4 | 1502 | 1517 | Zone C&B | -Descend on midship buoy -Travel along deck side moving aft | -Hacksaw brought to surface -Small pile of boiler bricks -Massive gaping hole (approximately 20' diameter) (looked as if something was ripped out) |
| 13 | ND2 Stinson | ND2 Lambert | 6/12 | 5 | 1608 | 1625 | Zone 1&2 | -Locate Bow (descend on fwd buoy) -Travel down deck side of ship heading aft | -Bow possibly located (evidence on video) -Anchor chain |



Schematic of USS *Houston* separated into six zones (A-C, 1-3), each 100FT (30.5M) wide, utilized early on in the survey to afford divers a means of documenting provenience and enabling methodical exploration of the site. Zones are designated alphabetically and numerically with their origins based on each extremity, the intended position of the first buoys to be placed on site.

These zones correspond to the entries presented above in the Transcribed Log of Diving Operations.