Final

28 July 2016

Site Inspection Report

Naval Defensive Sea Area

Unalaska Island

Alaska

Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315

FINAL
SITE INSPECTION REPORT FOR NAVAL DEFENSIVE SEA AREA UNALASKA ISLAND, ALASKA

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EXECUTIVE SUMMARY

The U.S. Navy established a significant presence in the Unalaska-Dutch Harbor area during the World War II era, from approximately 1940 through 1944. Construction of military facilities began in July of 1940 and continued through 1944. A Naval Section Base, the Naval Air Station (NAS), and Fort Mears, all located in the Dutch Harbor area, were commissioned in 1941. The Japanese bombed the military facilities at Dutch Harbor on June 3 and 4, 1942. After the Japanese attacked in June 1942, the rate of construction increased and on January 1, 1943, the Dutch Harbor Naval Operating Base (NOB) was commissioned. As part of the defensive operations, the military maintained several coastal defense artillery (CDA) guns, anti-aircraft artillery (AAA) guns, and air defense squadrons. The military performed target practice at a minimum of one in-water range and handled ordnance over water at several locations in the Dutch Harbor and Chernofski Harbor areas. As World War II ended, all military activity decreased at Dutch Harbor, and the NOB was decommissioned in 1947.

The Naval Defensive Sea Area (NDSA) at Unalaska Island was established on March 22, 1941 by Executive Order 8680. The NDSA at Unalaska Island includes the territorial waters between the extreme high-water marks and the 3-mile marine boundaries.

Previous environmental and ordnance investigations conducted in similar water bodies have identified the potential for waters of NDSAs to be contaminated with munitions and explosives of concern (MEC). Activities that may have resulted in MEC contamination included the following:

- Ordnance fired over water from CDA and AAA gun batteries during target training and gun function testing that did not detonate as intended
- Ordnance lost into the water during transfer from transport ships to the shore, either at various fixed docks or possibly at anchorages situated in the harbor away from shore installations
- Discarded military munitions (DMM) deliberately disposed of into the marine environment at the conclusion of hostilities
- In the case of Dutch Harbor, ordnance deliberately dropped by the Empire of Japan on U.S. forces during two consecutive days in June 1942

Because there is a potential for MEC in the NDSA at Unalaska Island, the Navy is addressing the potential explosives safety, health, and environmental issues per the Navy's Munitions Response

Program. The Navy conducted a preliminary assessment of this NDSA in 2013. The preliminary assessment report recommended that the Navy perform a site inspection within the in-water areas that have a greater potential to contain MEC based on historical activities, where the water depth is less than 20 fathoms (120 feet).

This report summarizes the SI field work performed at the NDSA at Unalaska Island in May and June 2015.

The survey team had no stand-down days resulting from poor weather and was able to survey during each of the 14 work days. The survey vessel traveled to Chernofski harbor during the night on May 29, 2015 and returned to Dutch Harbor areas the night of June 2, 2015, thereby leaving the days available for survey work. An 80-foot vessel and 15-foot skiff were used to perform geophysical surveys. Of the 14 planned survey areas, wide-area assessment surveying was performed at all or a majority of 12 of these areas. Actual survey coverage according to recorded data is 2,150 acres. It was understood during the planning stage that the survey team may not be able to complete surveys in all areas within the allotted 14 days, but that the team would accomplish as much surveying as possible within that time frame.

No wide-area assessment (WAA) survey was conducted at these two survey areas: anti-aircraft training center (AATC) on Amaknak Island and Summer Bay Dock. The largest size of ammunition used at the AATC was 40-mm anti-aircraft rounds. The two smaller test shapes, the mock .50-calber round and 25-pound mortar shell, were not observed during QA/QC testing using the sidescan sonar, as described in Section 3.5. Therefore, WAA surveying would not have been helpful in the AATC area because of the expected size of munitions used. The crew on *Blackfoot* attempted to survey Summer Bay Dock area using the interferometric sidescan sonar; however, the kelp was very thick across the bay and surveying in this area was not possible.

A total of 1,672 targets were identified during the WAA survey. Appendix C includes a list, including related characteristics, of each target identified during the WAA survey for each survey area. Targets identified using the sidescan sonar were initially classified as objects such as debris, fish trap, piling, unknown, etc. during target characterization. Approximately 39 percent (646of 1,672) of the targets were classified as “unknown,” “box” (possible ammunition crate), or “cylinder” (possible bomb). Generally, if a target was initially classified as a likely inert item (debris, fish trap, piling, etc.) in the field, it was not selected as a target for reacquisition and verification (RV) surveying. Most targets selected for reacquisition in the field were initially classified as “unknown,” “box,” or “cylinder.”

The survey team performed RV surveying at 10 areas, and reacquired 109 targets (102 discrete targets plus 7 target lines). A target line is the general survey path of the ROV taken in an area of interest, particularly along the seafloor adjacent to a current or former dock face where MEC items may have been dropped in the water. Table 4-4 lists the characteristics of each reacquired target, and the following sections provide more detail on the results of surveying within each individual survey area. The geophysical subcontractor's report is included as Appendix D in this SI report.

Table 4-5 summarizes the percent of targets initially classified as "unknown," "box," or "cylinder" that were reacquired as part of the RV survey. Of the 102 targets reacquired (not including the target lines), 92 were initially classified as "unknown," "box," or "cylinder" as summarized for each survey area in Table 4-5. Therefore, 15% of the 646 targets that were initially classified as "unknown," "box," or "cylinder" were reacquired, reducing the number of targets initially classified as "unknown," "box," or "cylinder" to 554. Of those 554 targets, 136 met the size criterion (smaller than 5 feet in all directions). The size criterion is based on the approximate maximum size of expected MEC items; many inert items, such as pilings and other debris exceeded the size criterion and were less likely to be MEC. Targets of interest that were slightly larger than this criterion were still reacquired, however.

An interactive map is included on a DVD (Appendix E) that shows planned survey areas, areas surveyed, sidescan sonar results, target locations with links to target characteristics, reacquired target locations, and target lines. Reacquired targets and target lines are linked to videos taken with the remotely operated vehicle.

MEC items were found or suspected at three survey areas: Eider Point, Dutch Harbor Dock, and Mutton Cove Docks. At Eider Point, two MEC items were observed on the shoreline of Eider Point during an inspection of the intertidal area along the beach. The Navy led the effort to have these MEC items removed in late June 2015. By the beginning of July 2015, explosive ordnance disposal team had removed the two identified MEC items plus two additional MEC items found during a more thorough inspection of the area. At Dutch Harbor Dock survey area, one possible MEC item (possible bomb or tank) was identified and is located at a depth of less than 20 feet near the southeast end of the airport runway and approximately 125 feet from shore. At the Mutton Cove Docks survey area, two targets were identified as possible MEC items. One was classified as a possible bomb or tank. The other possible MEC item was classified as a possible bomb.

Based on the results of the 2015 SI surveys at the NDSA at Unalaska Island, no further action is recommended at the following survey area:

- Docks in the Iliuliuk Harbor Area (West)

Further RV surveying or an electromagnetic survey is recommended at the following 10 areas to reacquire and verify targets identified during the WAA survey phase:

- Army Dock in Captains Bay
- Seafloor near Dutch Harbor Landfill
- Additional Docks near Dutch Harbor Spit
- Docks in the Iliuliuk Harbor Area (East)
- Hog Island Dock
- Summer Bay Dock
- Fuel Oil Dock
- AATC on Amaknak Island
- Former Barge Docks at Otter Point
- Eastern Half of Chernofski Harbor

A remedial investigation is recommended for the three areas where possible MEC was identified:

- Eider Point
- Dutch Harbor Dock
- Mutton Cove Docks

The estimated cost to perform the remedial investigation and additional RV surveying is approximately $925,000.

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ABBREVIATIONS AND ACRONYMS

AAA	anti-aircraft artillery
AATC	anti-aircraft training center
AMTB	antimotor-torpedo boat
CDA	coastal defense artillery
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHIRP	compressed high-intensity radar pulse
cm	centimeter
Coast Guard	U.S. Coast Guard
DMM	discarded military munitions
GIS	geographic information system
GPS	Global Positioning System
Gravity	Gravity Environmental Consulting, LLC
hp	horsepower
Hz	hertz
kg	kilogram
kHz	kilohertz
km	kilometer
kW	kilowatt
MC	munitions constituent
MEC	munitions and explosives of concern
MHz	megahertz
Mk	Mark
mm	millimeter
MRP	Munitions Response Program
MV	motor vessel
N/A	not applicable
NARA	National Archives and Records Administration
NAF	Naval Air Facility
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
Navy	U.S. Navy
NDSA	Naval Defensive Sea Area
NIRIS	Navy Installation Restoration Information Solution
NOB	Naval Operating Base
nT	nanotesla
PA	preliminary assessment

ABBREVIATIONS AND ACRONYMS (Continued)

QA	quality assurance
QC	quality control
RDX	cyclotrimethylene trinitramine
ROV	remotely operated vehicle
RV	reacquisition and verification
SI	site inspection
URS	URS Group, Inc.
UXO	unexploded ordnance
WAA	wide-area assessment
WGS84	World Geodetic System 1984

1.0 INTRODUCTION

The U.S. Navy established a significant presence in the Unalaska-Dutch Harbor area during the World War II era, from approximately 1940 through 1944. Figure 1-1 shows the location of Unalaska Island in relation to Alaska and the Aleutian Island chain. Prior to World War II, the Navy established a communications facility (in 1911) and weather station (in 1939) in the Dutch Harbor area. Construction of military facilities began in July of 1940 and continued through 1944. A Naval Section Base, the Naval Air Station (NAS), and Fort Mears, all located in the Dutch Harbor area, were commissioned in 1941. The Japanese bombed the military facilities at Dutch Harbor on June 3 and 4, 1942. After the Japanese attacked in June 1942, the rate of construction increased and on January 1, 1943, the Dutch Harbor Naval Operating Base (NOB) was commissioned. As part of the defensive operations, the military maintained several coastal defense artillery (CDA) guns, anti-aircraft artillery (AAA) guns, and air defense squadrons. The military performed target practice at a minimum of one in-water range and handled ordnance over water at several locations in the Dutch Harbor and Chernofski Harbor areas. As World War II ended, all military activity decreased at Dutch Harbor, and the NOB was decommissioned in 1947.

The Naval Defensive Sea Area (NDSA) at Unalaska Island was established on March 22, 1941 by Executive Order 8680. A NDSA is a water area set aside by executive order of the President of the United States because of its strategic nature, or for purposes of defense. The NDSA at Unalaska Island includes the territorial waters between the extreme high-water marks and the 3-mile marine boundaries. The extent of the NDSA at Unalaska Island is shown on Figure 1-2.

Previous environmental and ordnance investigations conducted in similar water bodies have identified the potential for waters of NDSAs to be contaminated with munitions and explosives of concern (MEC). Activities that may have resulted in MEC contamination in the NDSA surrounding Unalaska Island include the following:

- Ordnance fired over water from CDA and AAA gun batteries during target training and gun function testing that did not detonate as intended

- Ordnance lost into the water during transfer from transport ships to the shore, either at various fixed docks or possibly at anchorages situated in the harbor away from shore installations

- Discarded military munitions (DMM) deliberately disposed of into the marine environment at the conclusion of hostilities

- In the case of Dutch Harbor, ordnance deliberately dropped by the Empire of Japan on U.S. forces during two consecutive days in June 1942

The Navy's Munitions Response Program (MRP) was established because the National Defense Authorization Act of 2000 required the U.S. Department of Defense to establish a program that addresses the potential explosives safety, health, and environmental issues caused by MEC and munitions constituents (MCs) used or released at sites during past operations and activities. Because there is a potential for MEC in the NDSA at Unalaska Island, the Navy conducted a preliminary assessment (PA) of this NDSA (U.S. Navy 2013).

At the conclusion of the PA report, it was recommended that the Navy perform a site inspection (SI) within the in-water areas that have a greater potential to contain MEC, as defined in the PA, where the water depth is less than 20 fathoms (120 feet).

The Navy prepared a site-specific work plan (U.S. Navy 2014) for conducting the SI to locate MEC in specific in-water areas within the NDSA surrounding Unalaska. Details of the SI surveying, including methods, equipment, and data collection, were specified in the work plan.

URS Group, Inc. (URS) provided the Navy with the related services for this SI under Delivery Order 80 of contract N44255-09-D-4001. Gravity Environmental Consulting, LLC (Gravity) was subcontracted to provide a geophysical survey team. Gravity also subcontracted the marine vessel services. Motor vessel (MV) *Island C* and its crew provided vessel services for the survey crew on this project.

1.1 PURPOSE

The purpose of the SI survey within the NDSA surrounding Unalaska Island was to conduct a detector-aided field investigation with visual verification of selected targets of specific in-water areas to obtain empirical evidence that MEC is present on the seafloor.

The purpose of this SI report is to document the findings of the SI surveys, present a refined conceptual site model, report the results of the initial munitions hazard screening process, and recommend further actions based on the SI results and evaluation.

1.2 PROJECT SCOPE AND OBJECTIVES

The scope of the SI was to investigate the presence of MEC on the seafloor within the Unalaska NDSA. Areas having a greater potential to contain MEC, as defined in the PA, include the 14 survey areas identified and described in Section 2.6.

This SI was not intended as a full-scale study of the nature and extent of explosives hazards. The National Oil and Hazardous Substances Contingency Plan identifies the SI as the on-site investigation to determine whether there is a release or potential release and the nature of the associated threats.

The objective of the SI is to provide conclusions and recommendations for further action or no additional action by providing supporting rationale based on the PA and SI findings.

This SI report presents the following information in the subsequent sections:

- Section 2, Review of Existing Information: To familiarize the reader about the site background information, this section summarizes previously reported information presented in the related PA report and SI work plan.

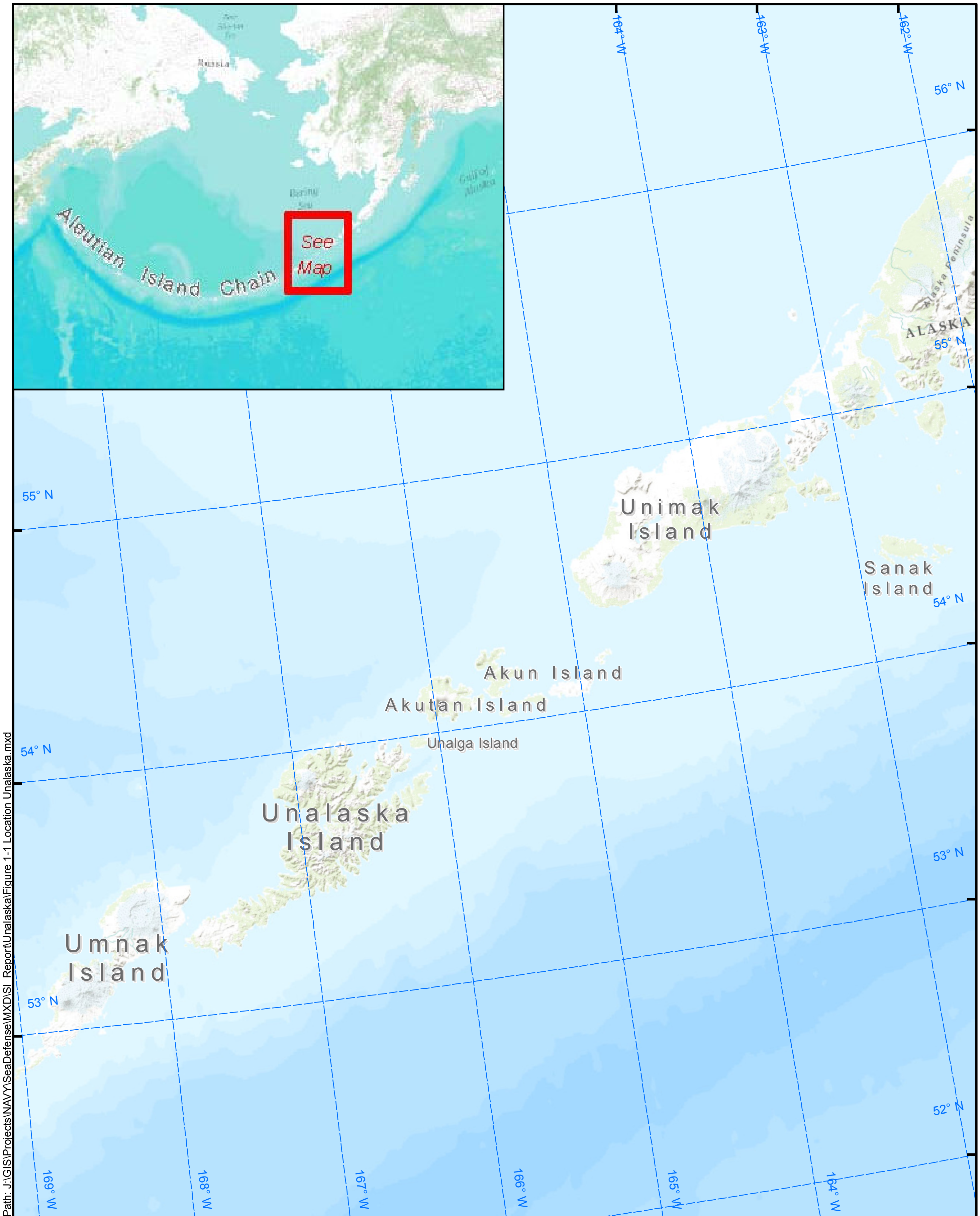
- Section 3, Site Inspection Survey Design and Methods: This section describes how the surveys were conducted with specific equipment, including data acquisition and processing.

- Section 4, Results of Site Inspection Survey: This section presents the areas that were surveyed and detailed information for each target identified and reacquired during the wide-area assessment (WAA) and reacquisition/verification phases of the surveys.

- Section 5, Conceptual Site Model: An updated conceptual site model, including exposure and migration pathways, and potential or existing MEC risks and hazards are presented.

- Section 6, Conclusion and Recommendations: This section contains a brief conclusion of the SI findings and recommendations for further actions, if applicable.

- Section 7, References



U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska		**Figure 1-1** **Location of Unalaska Island, Alaska**

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 1-2 Extent of NDSA Unalaska.mxd

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0 6.5 13
Scale In Miles

Figure 1-2
Extent of the Naval Defensive Sea Area Surrounding Unalaska Island

2.0 REVIEW OF EXISTING INFORMATION

Information regarding Unalaska Island and the military presence and operations on the island was researched during the PA phase of this project. Material presented in this section summarizes information presented in *Preliminary Assessment Report for Naval Defensive Sea Area Unalaska Island, Alaska* (U.S. Navy 2013) and *Site Inspection Work Plan for Naval Defensive Sea Area Unalaska Island, Alaska* (U.S. Navy 2014).

2.1 SITE LOCATION AND SETTING

Unalaska Island, located approximately 825 miles southwest from Anchorage, is the second-largest island of the Fox Island group of the Aleutian Islands. The Fox Islands are the closest of the Aleutian Islands to mainland North America. The larger of the Fox Islands from west to east are Umnak, Unalaska, Akutan, Akun, Unimak, and Sanak. Unalaska Island is approximately 79 miles (127 km) long and 35 miles (56 km) wide. It is located at 53° 38′ north latitude, 167° 00′ west longitude. The island has an area of approximately 1,051 square miles (2,720 square km). The coastline of Unalaska Island is markedly different in appearance than other major Aleutian Islands, with innumerable inlets and peninsulas. Figure 1-1 shows the location of Unalaska Island and the relative position of the remaining Fox Islands.

Unalaska Island is situated at a convergent boundary between two tectonic plates that make up the Earth's crust. The more southern or Pacific Plate is being subducted under the more northern North American plate. This results in an area that is spotted with active and/or dormant volcanos and is very earthquake prone. Earthquakes with magnitudes greater than 6 on the Richter scale are common. The island is rugged and mountainous, and the higher elevations are snow covered during much of the year.

The City of Unalaska, which includes all of Amaknak Island, is the most populated of all the communities in Southwest Alaska (4,283 persons [2000 census]). Most of the community's port facilities, better known as Dutch Harbor, are located on Amaknak Island. It is the largest fisheries port in the United States by volume caught.

2.2 MILITARY PRESENCE AND OPERATIONS

Prior to World War II, the Navy established a communications facility (in 1911) and weather station (in 1939) in the Dutch Harbor area (USACE 1993). Construction of military facilities began in July of 1940 and continued through 1944. In October 1940, a naval medical detachment and a detachment of the Marines to guard the naval installations arrived, occupying a new barracks on Amaknak Island. The Naval Section Base at Dutch Harbor was commissioned in January 1941. The first Army troops arrived at Dutch Harbor on May 8, 1941, replacing the Marines. These troops moved into the Marine barracks on Amaknak Island. Fort Mears was commissioned on August 28, 1941. The Naval Air Station (NAS) Dutch Harbor was commissioned on September 1, 1941 (Faulkner and Thompson 1986). After the Japanese attacked in June 1942, the rate of construction increased such that on January 1, 1943, the Dutch Harbor NOB was commissioned (Alaska Geographic Society 1991).

At its largest expanse, NOB Dutch Harbor's components included a NAS, a submarine base, a Marine barracks, radio station, section base, 200-bed hospital, 250-ton marine railroad, 3,000-ton floating dry dock, ammunition storage facilities, seven separate docks, ship repair shops, net depot, anti-aircraft training center (AATC), and facility for provisioning fleet units (Cohen 1988). During Lend-Lease activities (the system organized by the US in 1941 by which equipment and services were provided for countries fighting Germany), Soviet ship traffic through Dutch Harbor increased substantially. Eastbound Soviet ships were required to enter the harbor to pick up recognition signals, received fuel, and underwent any necessary repairs (Faulkner and Thompson 1986). To reduce ship congestion within Dutch Harbor, the Navy converted a civilian whaling station on Akutan Island into a separate refueling, repair, and provisioning station (USACE 1993). Soviet ships put into this station until it was decommissioned in April 1945.

Army-manned CDA gun and AAA gun batteries were established at Unalaska. These were established at Eider Point (Fort Leonard), Ulakta Head (Fort Schwatka), Dutch Harbor Spit (also known as Amaknak Spit and Dolphin Spit) (also Fort Schwatka), Summer Bay (Fort Brumback), and Hill 400 (Bunker Hill). Additional land defenses, called the Iron Ring, were constructed along the ridges and peaks from Captains Bay to Summer Bay. AAA batteries were also installed at Ugadaga Bay on Beaver Inlet, Raven Pass (location could not be identified), and at the west end of the runway at Dutch Harbor (Faulkner and Thompson 1986).

In August 1942 the Army agreed to turn the Fort Mears facility located on Amaknak Island over to the Navy, and the Navy agreed to have the Navy Construction Battalion, better known as the Seabees, construct new Army facilities on Unalaska Island. Construction took time, and the last Army unit left Amaknak Island in March 1944. The new encampment was on the south slope of Unalaska Ridge in Unalaska Valley. The post contained command buildings and housing and mess facilities for officers and enlisted men. In addition, the Army constructed a 500-bed hospital in Pyramid Valley and a 470-foot-long dock, warehouses, sheds, and storage areas at

Captains Bay. This reflected Unalaska's changing role during 1943 as a troop training area and supply base for installations farther west (Faulkner and Thompson 1986).

Chernofski Harbor Supply and Storage Site was established in early 1942 and encompassed the western 2 miles of Unalaska Island. It was located approximately 53 miles southwest of Dutch Harbor and 15 miles by boat from Otter Point where Fort Glenn and Naval Air Facility (NAF) Otter Point were located on Unmak Island. In July 1942, the Navy moved a ship that provides facilities for seaplanes into Chernofski Harbor and stationed a seaplane squadron from Patrol Wing Four there. At the same time, other units of Patrol Wing Four began operating from Otter Point. On September 5, 1942, Naval Operations approved construction of NAF Otter Point and Naval Section Base at Chernofski Harbor. NAF Otter Point was commissioned on October 22, 1942, with Chernofski as an auxiliary unit. In December, Fleet Air Wing Four moved its headquarters squadron to Otter Point from Dutch Harbor (ONH 1945).

Chernofski Harbor was established as the transshipment facility for supplies and material destined for Otter Point. Cargo ships offloaded at Chernofski Harbor, and barges then carried the supplies to a dock at Pustoi Point on Unmak Island. Initially the harbor had no facilities, and supplies were unloaded directly onto barges and transferred to Otter Point. Barges made an average of 150 round trips per month. Eventually Chernofski harbor included 50 Quonset huts, three wood-frame buildings, and a main pier that measured 72 by 402 feet, three barge docks, a separate repair dock, and two 6-inch guns for defense (Faulkner and Thompson 1986). Three barge docks and a tanker discharge facility were constructed at Otter Point (Cohen 1988). Three additional CDA gun batteries were installed at Fort Glenn (Coast Defense Office).

As World War II ended, military activity decreased at NAF Otter Point and Dutch Harbor. The NAF Otter Point was disestablished on November 1, 1944. All naval facilities at Chernofski Harbor were decommissioned in May 1945 (ONH 1945). By August 1944, the Army placed Fort Mears into caretaker status. The submarine facility was decommissioned in May 1945, and the NAS was reduced to a NAF in June. The last Navy personnel left Dutch Harbor in 1947, and the NOB was decommissioned at that time (Faulkner and Thompson 1986).

2.3 HISTORICAL WASTE MANAGEMENT PRACTICES

The primary waste of concern for this SI is MEC within the marine environment of the NDSA surrounding Unalaska Island. MEC includes unexploded ordnance (UXO), discarded military munitions (DMM), and MCs in high enough concentrations as to present an explosive hazard. The use and handling of ordnance and the Japanese attack on two consecutive days at Unalaska resulted in waste entering the marine NDSA by the following mechanisms:

- Practice firing of CDA and AAA guns during target training and gun function testing
- Ordnance lost into the water during transfer from transport ships to the shore, either at various fixed docks or at anchorages situated in the harbor away from shore installations
- DMM deliberately disposed of into the marine environment at the conclusion of hostilities
- In the case of Dutch Harbor, ordnance deliberately dropped by the Empire of Japan on U.S. forces during two consecutive days in June 1942

Ordnance that was fired or dropped and did not detonate as intended is known as UXO. An unknown quantity of MEC was lost, discarded, deliberately dropped, or fired into the marine environment of the NDSA surrounding Unalaska and neighboring islands during World War II. As much as 30 percent of the explosive ordnance that was dropped or fired during World War II did not detonate as intended (Francis and Alama 2011).

USACE evaluated Unalaska Island under the Formerly Used Defense Sites program and presented the findings in an archive search report of findings (USACE 1993). The evaluation applied to the on-land hazards of potential ordnance and chemical warfare material. The in-water ranges in the NDSA were not evaluated.

2.4 REGULATORY COMPLIANCE

The National Defense Authorization Act of 2000 required the Department of Defense to establish a program addressing military munitions as part of the Defense Environmental Restoration Program. The Navy's MRP complies with this requirement. The purpose of the MRP is to address the potential explosives safety, health, and environmental issues caused by MEC and MCs used or released on sites from past operations and activities. Based on Navy MRP policy (U.S. Navy 2007), the following criteria are used for inclusion of water sites in the MRP:

Shallow water areas where munitions releases are known or suspected to have occurred prior to September 30, 2002, where Navy actions were responsible for the release, and where the site is not:

- Covered by water deeper than 20 fathoms (120 feet)
- Part of, or associated with, a designated operational range
- A designated water disposal site
- A Formerly Used Defense Site
- A result of combat operations
- A maritime wreck
- An artificial reef

2.5 SOURCE CHARACTERIZATION

The sources of MEC released into the marine environment at NOB Dutch Harbor and the surrounding facilities by U.S. forces consist of CDA and AAA gun batteries, supply transfer points, and air combat units of the Empire of Japan.

Detailed records of training exercises, which are part of the operational records, were not required to be retained for the historical archives (Knechtmann 2012). Therefore, details of training exercises typically do not exist in the archived records. In rare instances, training exercise records may exist in the archive record if they were provided by a private individual (Knechtmann 2012).

2.5.1 Source Descriptions

Information reviewed during the PA identified U.S. CDA and AAA gun batteries in the vicinity of Unalaska Island (USACE 1993, NARA II, NARA Anchorage, and NARA Seattle). The following U.S. CDA and AAA gun batteries were identified in the vicinity of Unalaska Bay and Dutch Harbor:

- Battery No. 1 located at Summer Bay, Fort Brumback:
  - Four-gun 155-mm CDA battery
  - four .50-caliber AAA machine guns

- Battery No. 1a located on Dutch Harbor Spit, Fort Schwatka:
  - Four-gun 90-mm antimotor-torpedo boat (AMTB) battery
  - Two-gun 37- or 40-mm AAA battery
  - Eight .50-caliber AAA machine guns

- Battery No. 2 located at Hill 400:
  - Four-gun 155-mm CDA battery
  - Four .50-caliber AAA machine guns

- Battery No. 3 located on Ulakta Head, Fort Schwatka:
  - Two-gun 8-inch CDA battery (402)
  - Two-gun 37- or 40-mm AAA battery
  - Two .50-caliber AAA machine guns

- Battery No. 3a located on Eider Point, Fort Leonard:
  - Two-gun 90-mm AMTB battery
  - Two-gun 37- or 40-mm AAA battery
  - Eight .50-caliber AAA machine guns

- Battery No. 4 located at Eider Point, Fort Leonard:
  - Two-gun 6-inch CDA battery (298)
  - Two-gun 37- or 40-mm AAA battery
  - Two .50-caliber AAA machine guns

- An illustrated photo of the Dutch Harbor area dated May 25, 1942 identified the following additional AAA gun batteries located in various temporary positions at NOB Dutch Harbor:
  - Twelve 3-inch AAA guns
  - Nineteen 37-mm AAA guns
  - Twenty-two 20-mm AAA guns

- Coastal searchlight installations with two .30-caliber machine guns at each light were operated at various locations along the shoreline.

- The Army also maintained an Air Defense Site on Hog Island for the defense of a Radio Range Installation (USACE 1993). However, the presence and locations of guns on Hog Island are not clear.

Known locations of the U.S. gun batteries and searchlights in the vicinity of Unalaska Bay are shown on Figure 2-1. Temporary AAA gun batteries are not shown in the figure because they were not stationary.

The Unalaska NOB also contained an AATC where active firing was conducted using an unspecified number of .30-caliber machine guns, two .50-caliber machine guns, five 20-mm AAA guns, and one 40-mm AAA gun. It was located at the northwest base of Mount Ballyhoo on Amaknak Island. The facility was sized to handle 60 men a day, 30 men in the morning and 30 in the afternoon. Firing was directed into Unalaska Bay with a presumed 100-degree danger area extending 6,000 yards seaward. The location of this AATC and the presumed danger area (range fan) is shown on Figure 2-1.

Naval ammunition activities at NOB Dutch Harbor consisted of support of submarine and seaplane operations, supply for AAA air defense and the AATC, and temporary storage of ammunition during transit shipment to more forward bases, or resupply for Navy ships. In-transit ammunition storage was located in the vicinity of the dock in Captains Bay, with additional storage facilities near Mount Ballyhoo. Navy ammunition facilities were about 90 percent full at all times (USACE 2003). Army ordnance was typically dispersed to gun batteries in the Dutch Harbor area by truck. However, because of a lack of roads, ordnance provided to Eider Point, Hog Island, and perhaps Summer Bay was transferred by barge.

No records were located during the development of the PA that indicate the presence of an explosive anchorage in Dutch Harbor, Captains Bay, or Unalaska Bay. This suggests that ordnance was offloaded or transshipped at fixed docks at NOB Dutch Harbor.

The locations of known docks in the Dutch Harbor area are shown on Figure 2-2. The Navy-operated docks include the Dolphin Spit Dock, possibly an unnamed small dock south of the Dolphin Spit Dock, Advance Base Depot Dock, Ballyhoo Dock, Dutch Harbor Dock, Fuel Oil Dock, Y.P. Dock, docks at the submarine base, Marine Railway Dock, P.T. Dock, and Net Depot Dock. The Army-operated docks include the Summer Bay Dock, Unalaska Dock, Captains Bay Dock, Hog Island Dock, the main Eider Point Dock, the unnamed small dock at Eider Point, and several small docks at the Agnes Beach Facility.

The following U.S. CDA and AAA gun batteries were identified in the vicinity of Otter Point and Chernofski Harbor:

- Two 6-inch naval CDA guns at Chernofski Harbor, Unalaska Island
- One 6-inch naval CDA gun at Otter Point, Umnak Island
- Four 155-mm CDA guns at Cape Idak, Umnak Island
- Four 155-mm CDA guns at Umnak Pass, Umnak Island

- Coastal searchlight installations with two .30-caliber machine guns at each light were operated at various locations along the shoreline.

Known locations of the U.S. gun batteries and searchlights in the vicinity of Otter Point and Chernofski Harbor are shown on Figure 2-3.

The following additional AAA batteries and large caliber guns were also identified at the Chernofski Harbor Otter Point area (DIO 1943):

- Forty 20-mm Navy AAA guns
- Twelve 105-mm howitzers
- Sixteen 3-inch AAA guns
- Thirty-two 37-mm AAA guns
- Thirty-two .50-caliber AAA machine guns
- Eighteen 60-mm mortars
- Twelve 81-mm mortars

The locations of these guns could not be determined from the available information.

Army ammunition activities consisted of those required to support the CDA gun batteries and associated Air Defense Operations at Fort Glenn discussed above. Ordnance was dispersed to the individual batteries and stored locally in magazines (USACE 2003). All ordnance provided to Fort Glenn was transshipped through Chernofski Harbor.

No records were located during the development of the PA that indicate the presence of an explosive anchorage in Chernofski Harbor. This suggests that ordnance was offloaded or transshipped at fixed docks at Chernofski Harbor.

The locations of known docks in the Chernofski Harbor and Otter Point area are shown on Figure 2-4. Chernofski Harbor included a main pier that measured 72 by 402 feet, three barge docks, and a separate repair dock; however, the locations of four of these docks could be identified in Figure 2-4. Three barge docks were also constructed at Otter Point (Fort Glenn) at the following locations:

- North Dock: 53^{o}23'46" north latitude by 167^{o}50'30" west longitude
- Middle Dock: 53^{o}23'42" north latitude by 167^{o}50'37" west longitude
- South Dock: 53^{o}23'40" north latitude by 167^{o} 50'36" west longitude

Occasionally DMM was lost into the harbors during ordnance-handling activities. No record was found documenting the loss or recovery of MEC from the marine environment at these locations during the PA.

Ammunition data sheets for ordnance reportedly used at the Unalaska NDSA are included in Appendix B.

2.5.2 Evidence of Munitions and Explosives of Concern or Related Hazardous Substances in the Marine Environment

Historical records related to NOB Dutch Harbor were reviewed to evaluate the magnitude of gun training exercises that occurred during war-time activities. Although the CDA guns installed at Eider Point, Hill 400, Summer Bay, Amaknak Spit, Ulakta Head, Chernofski Harbor and Otter Point (Fort Glenn) were most certainly fired for gun registration and practice, no record of firing activities was discovered during the archive review conducted for this project.

However, the AATC facility at NOB Dutch Harbor was used extensively during World War II for the training of both Army and Navy personnel. The archive search for this project produced monthly reports to the Commandant of the Seventeenth Naval District indicating that thousands of men were trained at this AATC by firing at targets over Unalaska Bay. The War Diary for NOB Dutch Harbor indicates that during 1944 the AATC trained 4,860 men, while between January and August 1945 an additional 1,635 men received training (War Diary n.d.).

The following records were found during the archive search documenting the loss or discovery of DMM or UXO within the marine environment at locations in the Dutch Harbor area:

- On June 3 and 4, 1942, naval air units of the Empire of Japan attacked NOB Dutch Harbor. The attacks consisted of aerial bombing of U.S. military positions. One instance was reported of a Japanese bomb that that impacted the Dutch Harbor dock near where the U.S.A.T. *President Fillmore* was docked, but did not explode. The remains of this bomb were reportedly kicked into the waters of Dutch Harbor by a sailor (NAGD 1942).

- A report of combat actions during the June 1942 Japanese attack on Dutch Harbor indicated that the Number 1 3-inch gun on the U.S.A.T. *President Fillmore* experienced a “hangfire” during the raid. After the raid the gun was unloaded, the shell was inspected and thrown overboard (NAGD 1942).

- In January 1987 local divers working on the former Captains Bay ammunition dock (Captains Bay Dock in Figure 2-5) discovered four metal containers washed up on the shore. Each container measured about 5 inches in diameter and 30 inches long and contained a total of 44 glass vials. The containers were turned over to the Unalaska Police Department, which notified the 176th Explosive Ordnance Detachment, Fort Richardson, Alaska. Ordnance specialists identified the vials as elements of the Ml War Gas Identification Set, which was a World War II training kit used to teach soldiers how to identify chemical warfare agents by odor and immediate effects. The Explosives Ordnance Detachment repacked and transported the vials to the disposal facility at Johnston Atoll. The Technical Escort Unit conducted an additional underwater search and shoreline survey at the ammunition dock in February 1987. More containers with vials were found in the water and on the shore. A total of 469 additional vials were found, repacked, and transported to Johnston Atoll (U.S. Army Program Manager for Chemical Demilitarization 1996).

- Following a 1995 field investigation, the 176th Explosive Ordnance Disposal Unit from Fort Richardson disposed of thirty-six 90-mm projectiles discovered on the beach of Unalaska Bay, near former Magazine J, at Fort Leonard. Six additional projectiles observed in the intertidal area were determined to be inaccessible. These DMM items were identified as kick-out remnants from the detonation of Magazine J during earlier demilitarization activities conducted by the Army (USACE 2003).

- The 1995 field investigation included an underwater examination of seven sites by a remotely operated vehicle. These sites included the Former Army Dock in Captains Bay, Former Dock at the Dutch Harbor Naval Base, the Ferry Crossing at Iliuliuk Harbor, Margret Bay, Expedition Island, Iliuliuk Bay, and two areas at Eider Point. This investigation resulted in the finding of one and one-half 40-mm shell casings in the Eider Point area and one 40-mm round near the Former Navy Dock in Captains Bay, but no UXO (USACE 2003).

- A follow up investigation at Eider Point conducted in the summer of 2001 included the removal of an additional forty-three 90-mm high-explosive projectiles. These were recovered from the top 1 foot of the beachfront in the vicinity of former Magazine J located at Fort Leonard (USACE 2003). These projectiles were consolidated and destroyed on site.

- An interview was conducted with a Ms. Marti Murray of Unalaska on June 19, 1993 as part of the information search for the archives search report for Unalaska Island (USACE 2003). During the interview Ms. Murray indicated that in the 1970s, two separate instances occurred where fishing boats from Dutch Harbor brought up land mines. The locations of these occurrences were not reported.

Alaska State Wildlife Trooper Sergeant Robin Morrisett stated that troopers have assisted local police with disposal of MEC. Navigational charts of the area identify areas with military explosives in the waters in the local waters (Rosenthal 2012).

According to Unalaska police officer Brandon Hunter, ordnance may have been dumped in the water off the tip of the Dutch Harbor Spit, in deep water of Captains Bay approximately 100 yards from shore at the Crowley Dock, and at the end of World War II, ordnance may have been dumped in the deepest part of Captains Bay (Hunter 2012).

Alaska State Wildlife Trooper Sergeant Morrisett, an avid diver in the Dutch Harbor area, provided information relating to the following two MEC finds:

- A shell casing measuring approximately 2 inches in diameter and 6 to 8 inches tall was discovered by a diver in Iliuliuk Bay near the Dutch Harbor Landfill.

- A shell measuring approximately 6 inches in diameter and 24 inches tall was discovered by a diver in 60 feet of water in Dutch Harbor between the Delta Western Dock (former Dutch Harbor Dock) and Rocky Point (Morrisett 2012).

Figure 2-2 shows the approximate locations within the vicinity of Dutch Harbor where DMM or UXO have been observed within the marine environment or removed from the seafloor and disposed of.

An interview was conducted with Mr. Randall Baker who lived at Chernofski Harbor continuously from 1979 to 1986, then routinely visited the area from 1986 until 2001. His family owns 80 acres in the Chernofski Harbor area. As a young boy or teenager, he witnessed divers recover hundreds of .50-caliber rounds and several larger DMM rounds from the bottom of Chernofski Harbor near both existing docks in Mutton Cove (Figure 2-4). The larger DMM were approximately 2.5 feet long and 5 inches in diameter (Baker 2012). In addition, Mr. Baker recalled seeing impact craters in the mud flats at the head of the bay to the south, as shown on Figure 2-4, believed to result from the practice firing of guns at Chernofski Harbor.

There have been other instances of evidence of MEC in the marine environment near Dutch Harbor, but outside of the NDSA surrounding Unalaska Island. The evidence includes a 1947 ordnance disposal area and 2012 instances of commercial fishers bringing up MEC from the seafloor. Details on the 1947 ordnance disposal area and the 2012 MEC site are included in Appendix C of the PA report (U.S. Navy 2013).

2.5.3 Estimated Quantity of Munitions and Explosives of Concern

No reliable estimate of the quantity of MEC in the marine waters of the NDSA surrounding Unalaska Island could be determined from the information reviewed for the PA, although a large volume of ordnance was transshipped through NOB Dutch Harbor and the Chernofski Harbor Supply and Storage site.

Little information regarding the quantity of ordnance used during a typical CDA training exercise was discovered during the review of archive records. No record was found indicating the number of rounds (90 mm and larger) fired during periodic training or gun-registry activities. Because NOB Dutch Harbor was equipped with an AATC, all gun crew training for .30-caliber, .50-caliber, 20-mm, and 40-mm guns was conducted at this facility. The War Diary for Dutch Harbor indicates that during a three-day period in January 1945, the AATC trained 830 men, of which 450 men fired 17,100 rounds of 20- and 40-mm ammunition and 3,850 rounds of .30- and .50-caliber rounds (War Diary n.d.).

MEC exist in the marine waters of the NDSA surrounding Unalaska Island based on the following facts:

- MEC was found in the marine environment of the Dutch Harbor and Chernofski Harbor areas.
- The AATC facility at NOB Dutch Harbor was heavily used. Up to 30 percent of ordnance may not have detonated as intended, likely resulting in a portion of the fired ordnance unexploded.

2.6 PLANNED SURVEY AREAS

The sources of MEC released into the marine environment of the Unalaska Island NDSA by U.S. forces consist of CDA and AAA gun batteries, an AATC, on-water ordnance transfer operations, and ordnance disposal following the war. The areas potentially affected by MEC releases encompass a broad reach of the NDSA surrounding Unalaska Island. The Navy decided to focus available funding to survey areas within the NDSA that have a higher likelihood of human exposure to MEC on the seafloor based on the following:

- Reported discovery
- Proximity to human activity
- Known frequency of MEC release

The SI work plan (U.S. Navy 2014) qualitatively prioritized the known MEC release sites based on information presented in the associated PA (U.S. Navy 2013). The survey areas were grouped into the following two investigation areas:

- Dutch Harbor Area
- Chernofski Harbor and Otter Point

The known release sites were prioritized because there was a 2-week period established in which to perform the field work at the site. The prioritization of the known release sites helped determine the order of field investigation. It was understood that it was likely that the known release sites with a lower priority would not be surveyed because of the time constraints. Table 2-1 lists each of the 14 survey areas, its survey priority, and the estimated size of each area in acres. The survey area names are similar those presented in the SI Work Plan.

2.6.1 Dutch Harbor Area

Information presented in the PA report confirms that MEC have been found on the seafloor near the former Army Dock in Captains Bay, along the shoreline of Unalaska Bay at Eider Point, on the seafloor near Dutch Harbor Landfill, and on the seafloor near the Dutch Harbor Dock. These locations were designated as first priority areas for site survey activities and are shown on Figure 2-5.

Dutch Harbor was a major through-shipping point for materials and supplies bound for combat units in the Aleutians. The lack of an identified explosive anchorage area suggests that MEC were handled at fixed docks in these areas. Although it has not been confirmed, available information suggests that the bulk of the ordnance-handling activities occurred in the Captains Bay area but ordnance may have been handled at other dock locations in the Dutch Harbor and Iliuliuk Harbor area. In addition, ordnance provided to Eider Point, Hog Island, and perhaps Summer Bay was transferred by barge and off-loaded at local docks. Occasionally MEC were lost into the marine environment during ordnance-handling operations. These dock locations were designated as second priority for survey activities and are shown on Figure 2-5.

One AATC was operated on Amaknak Island (Dutch Harbor) during World War II. This was located at the northwestern base of Mount Ballyhoo where 40-mm, 20-mm, .50-caliber, and .30-caliber guns fired north-northwest over Unalaska Bay. Information obtained during the PA indicates that this AATC experienced heavy usage. The presumed danger area (range fan) for this AATC where water is less than 120 feet deep was designated as third priority for survey activities and is shown on Figure 2-5.

The PA identified U.S. CDA and AAA gun batteries on Unalaska Island as described in Section 2.5.1. The area covered by these gun batteries included a large expanse of ocean surrounding Unalaska Harbor. Ordnance fired over water from these batteries would consist of gun function testing and accuracy practice firing at fixed and towed targets. However, no information was found documenting these gun function or practice firing activities during the PA (U.S. Navy 2013). Therefore, related survey areas cannot be identified.

2.6.2 Chernofski Harbor and Otter Point

Information presented in the PA report confirms that MEC have been found on the seafloor near the former docks in the Mutton Cove portion of Chernofski Harbor. This location was designated as first priority for survey activities and is shown on Figure 2-6.

Chernofski Harbor was the primary through-shipping point for materials and supplies bound for Fort Glenn located on nearby Umnak Island. The lack of an identified explosive anchorage area suggests that MEC was handled at fixed docks in these areas. Occasionally MEC were lost into the marine environment during ordnance-handling operations. These former dock locations at Otter Point were designated as second priority for survey activities and are shown on Figure 2-6.

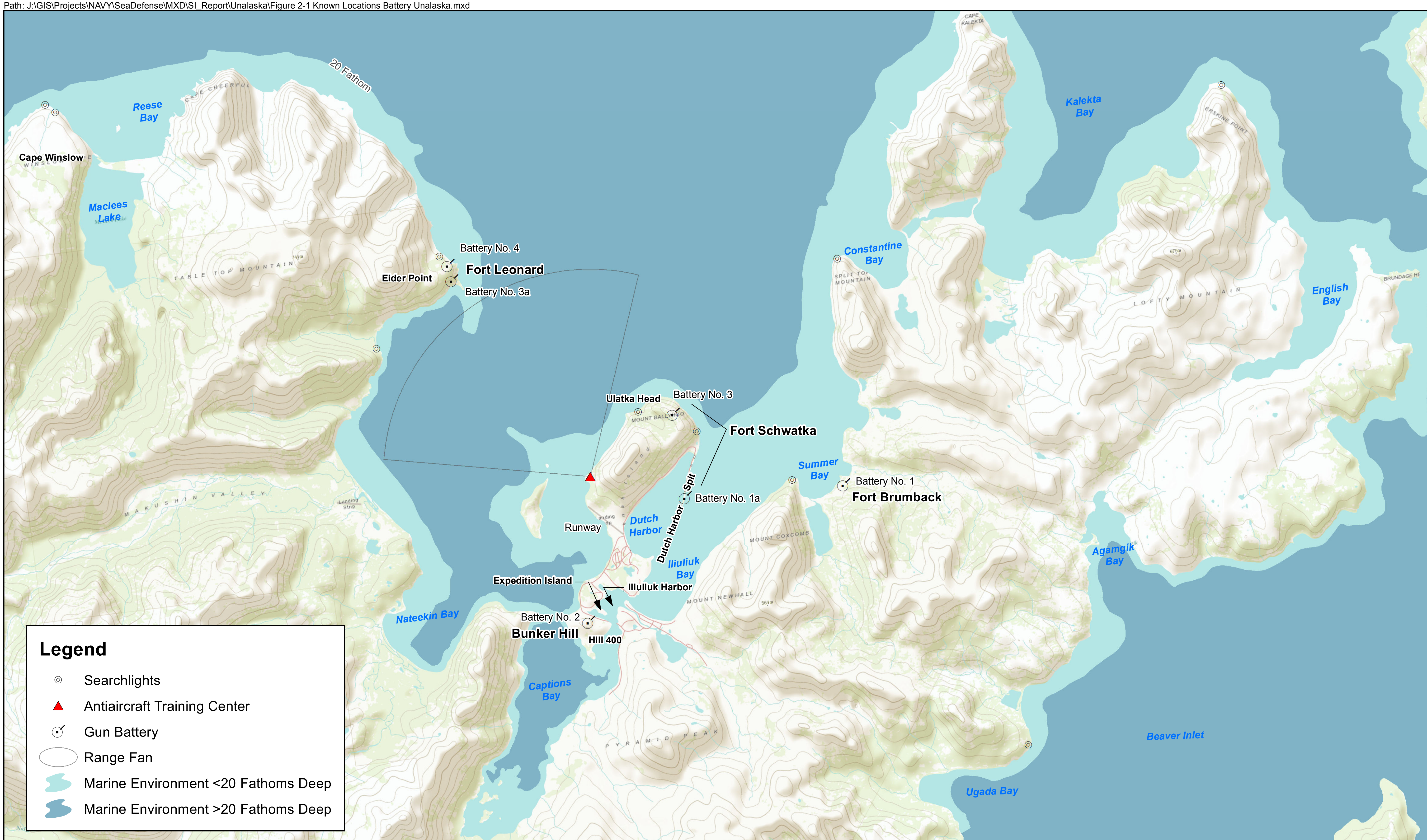
There is a reported impact area in the southeastern edge of Chernofski harbor, suggesting that the CDA near Mutton Cove may have practice fired over the eastern half of Chernofski Harbor. A small dock is also located on the western shore of this area of Chernofski Harbor. The eastern half of Chernofski Harbor was designated as third priority for survey activities and is shown on Figure 2-6.

The PA identified U.S. CDA and AAA gun batteries in the Chernofski Harbor and Otter Point areas as described in Section 2.5.1. No gun practice record associated with these batteries was discovered during the PA that could be used to establish target areas potentially containing MEC (U.S. Navy 2013). Therefore, related survey areas cannot be identified.

2.6.3 Reprioritization of Survey Areas Based on Weather Conditions

After the SI work plan was completed, the project team decided during the first field kickoff meeting that some of the survey areas should be reprioritized if there were periods of poor weather conditions that prevented the survey crew from conducting surveys during the planned 14-day survey window. If there were forecasted periods of poor weather conditions during the survey period, the plan was to conduct surveys based on the reprioritization of the survey areas (Figure 2-7) when surveying could be conducted during good weather conditions. The reprioritized areas are located in less protected areas and are more vulnerable to poor weather conditions. Figure 2-7 was presented as Addendum 2 to the SI work plan. Fortunately, weather conditions were favorable such that surveying could be performed each day during the 14-day window, and the reprioritization of the survey areas was not necessary.

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 2-1 Known Locations Battery Unalaska.mxd



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0 0.75 1.5
Scale In Miles

Figure 2-1
Known Locations of U.S. Gun Batteries, Searchlights and an Antiaircraft Training Center in the Vicinity of Dutch Harbor, Unalaska Island

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 2-2 Known Military Docks Dutch Harbor.mxd

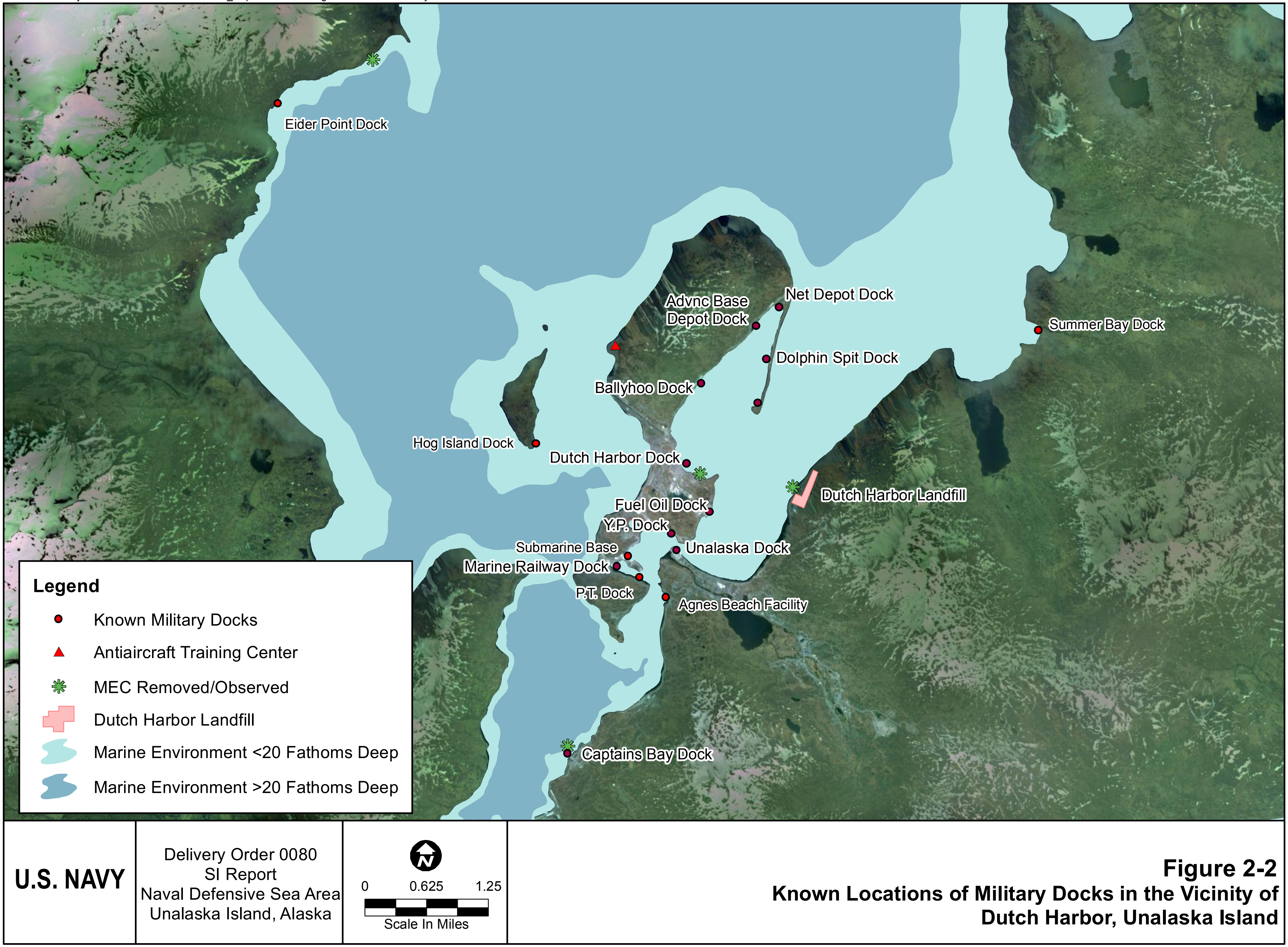

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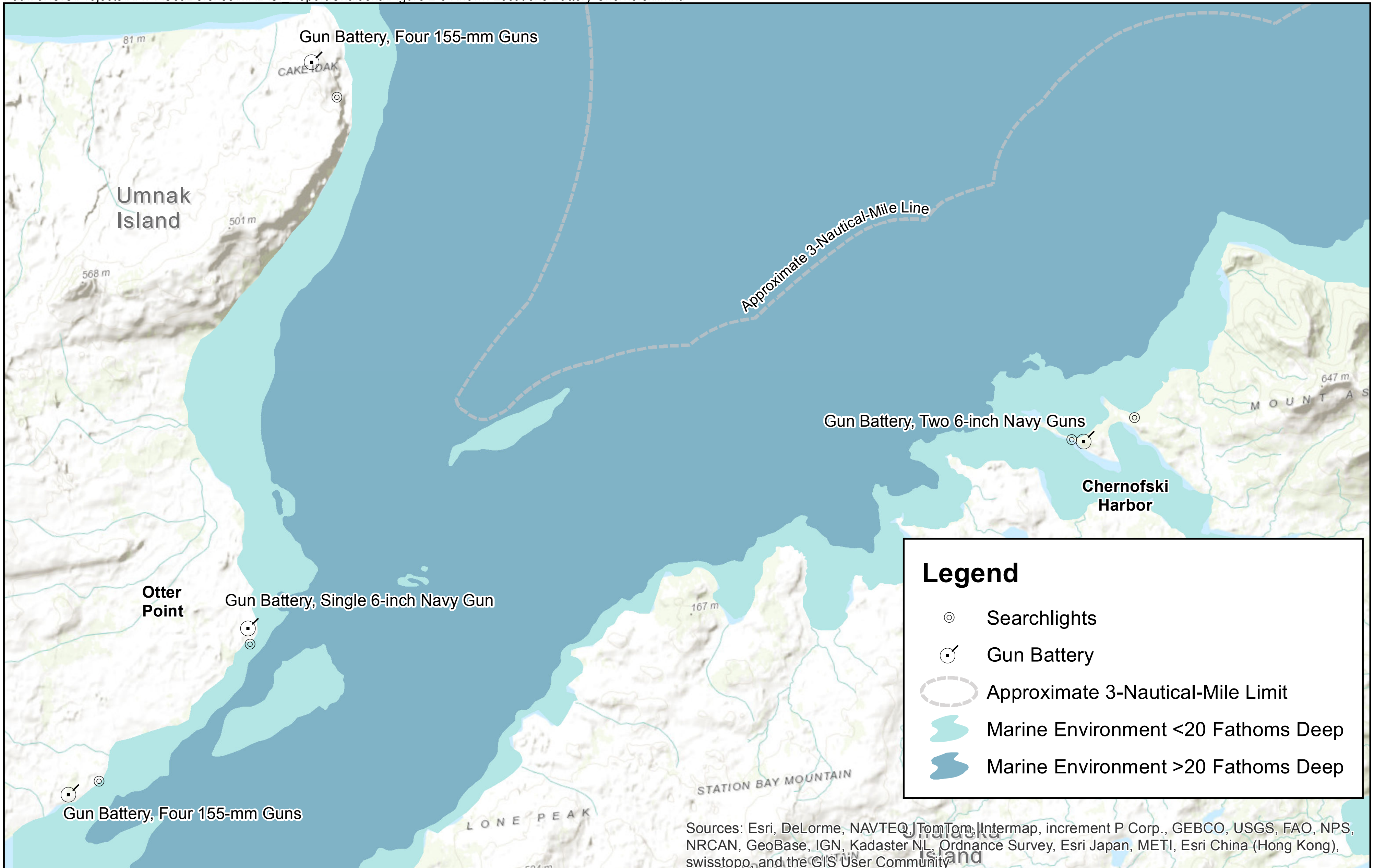
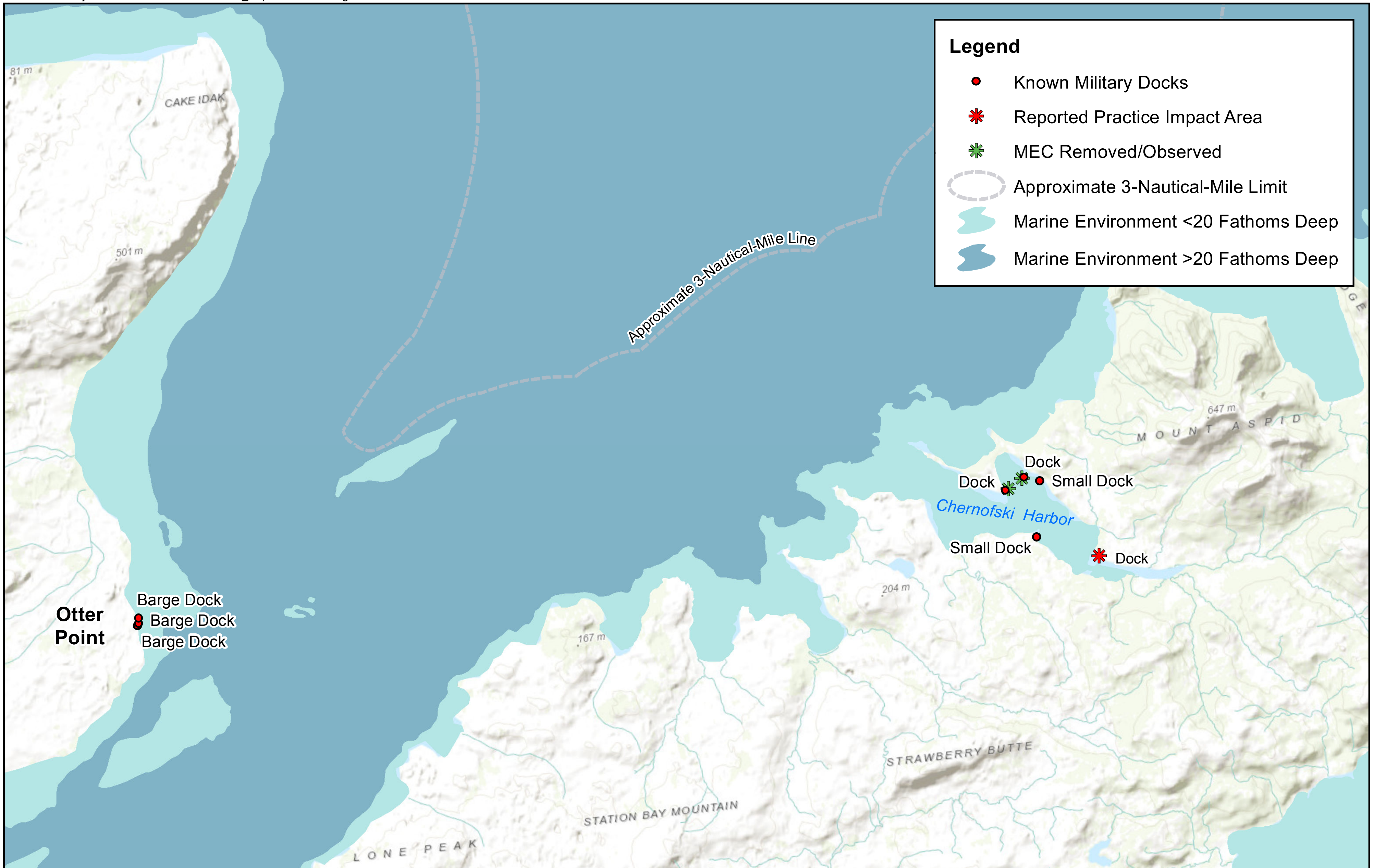
Figure 2-2
Known Locations of Military Docks in the Vicinity of Dutch Harbor, Unalaska Island

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 2-3 Known Locations Battery Chernofski.mxd



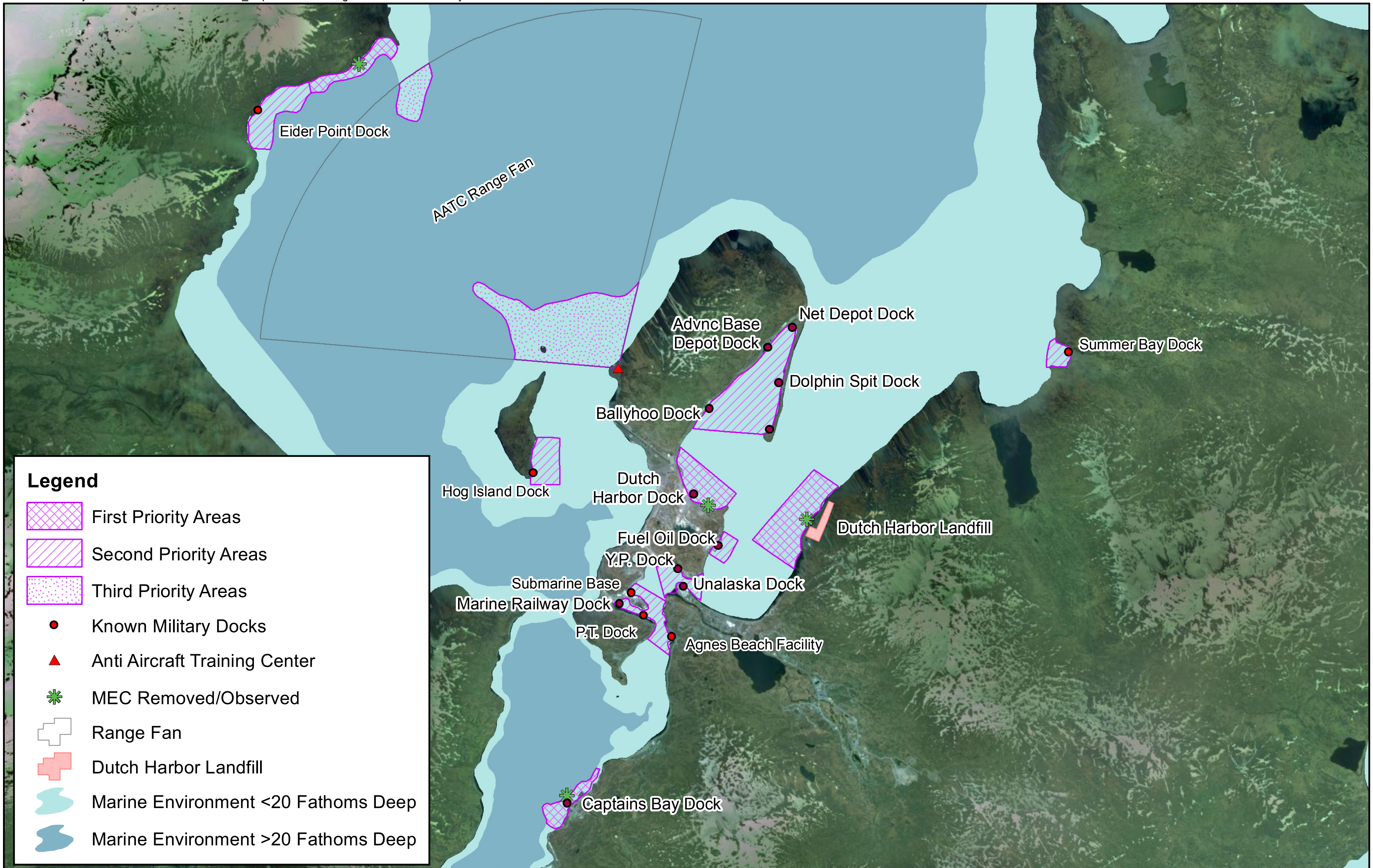
U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	0 1 2 Scale In Miles	**Figure 2-3** **Known Locations of U.S. Gun Batteries and Searchlights in the Vicinity of Otter Point, Umnak Island and Chernofski Harbor, Unalaska Island**

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 2-4 Locations Former Docks Munitions Chernofski Otter Point.mxd



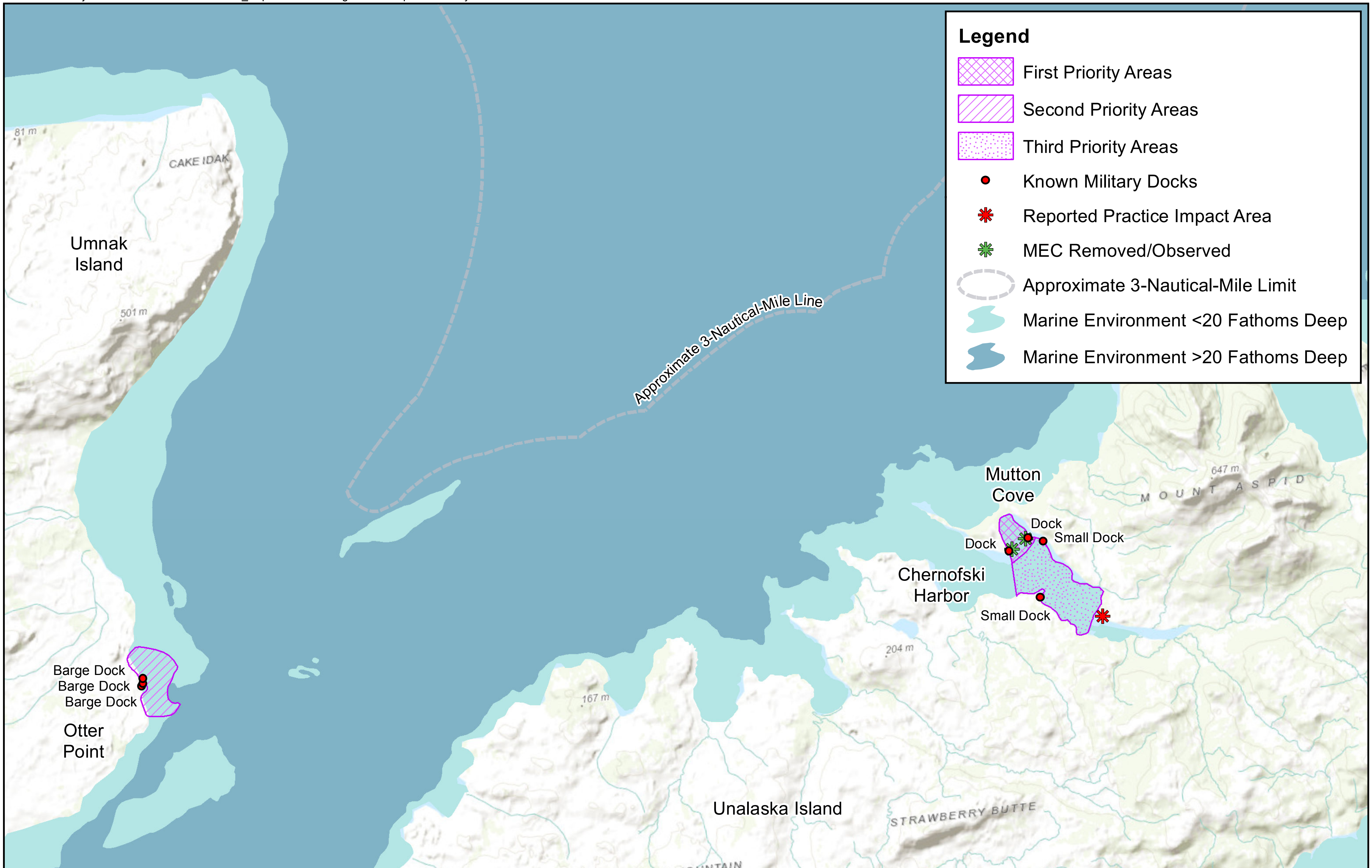
U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	N 0 1 2 Scale In Miles	**Figure 2-4** **Known Locations of Military Docks at Chernofski Harbor, Unalaska Island, and Otter Point, Umnak Island**

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 2-5 Planned Survey Areas Dutch Harbor.mxd



U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	0 0.625 1.25 Scale In Miles	**Figure 2-5** **Planned Survey Areas in the Vicinity of Dutch Harbor, Unalaska Island**

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 2-6 Proposed Survey Areas Chernofski Otter Point.mxd



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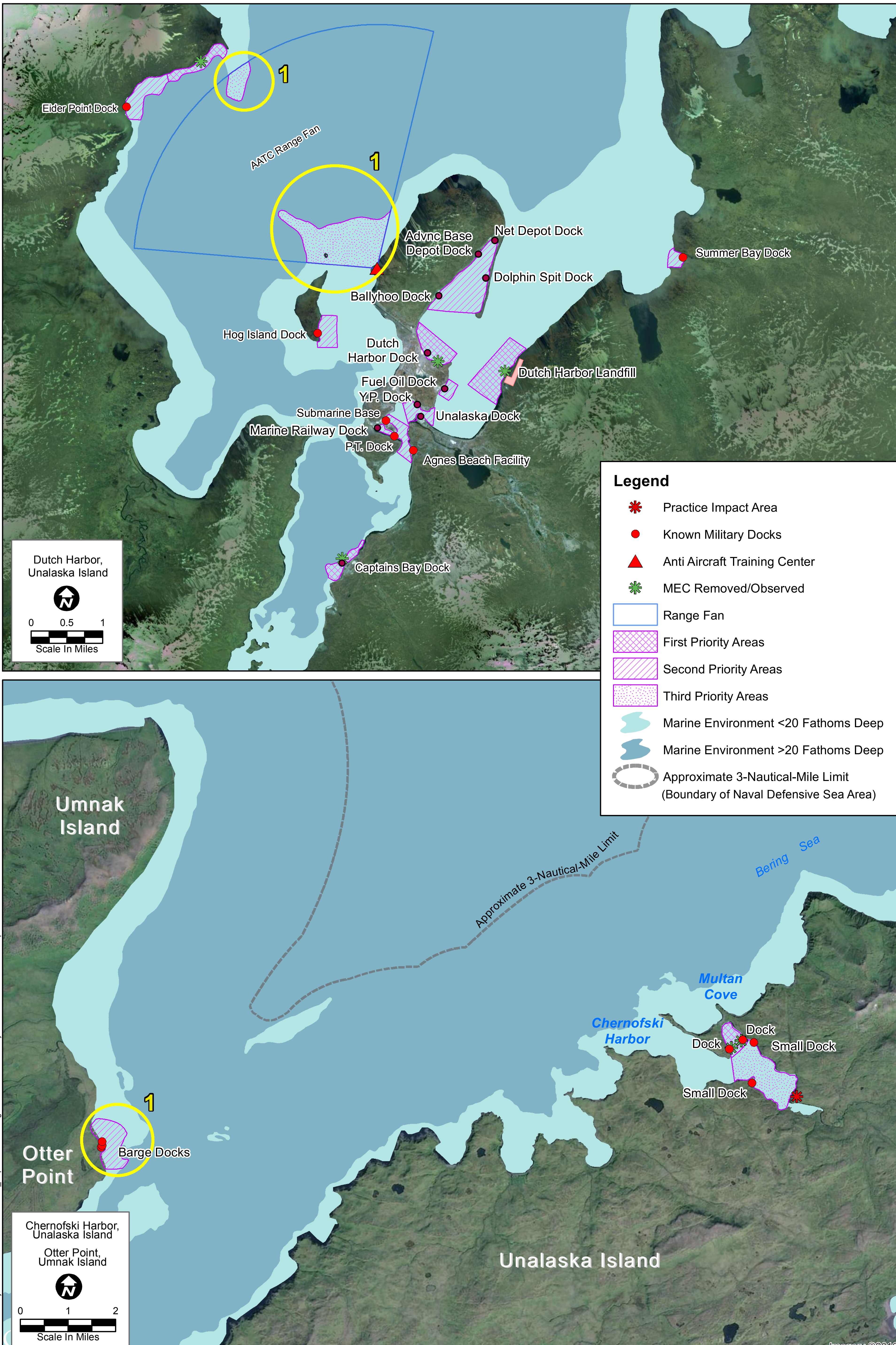
N
0 1 2
Scale In Miles

Figure 2-6
Planned Survey Areas at Chernofski Harbor, Unalaska Island, and Otter Point, Umnak Island



Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 2-7 Planned Survey Areas Based on Weather Reprioritization.mxd

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 2-7** **Reprioritization of Planned Survey Areas Based on Weather Conditions in the Naval Defensive Sea Area, Unalaska Island**

Table 2-1
Planned Survey Areas in the Vicinity of Unalaska Island

Survey Area	Priority	Surface Area (Acres)
Dutch Harbor (Figure 2-5)		
Army Dock in Captains Bay	1st	52
Eider Point[a]	1st/2nd	181
Seafloor near Dutch Harbor Landfill	1st	188
Dutch Harbor Dock	1st	103
Additional Docks near Dutch Harbor Spit	2nd	283
Docks in Iliuliuk Harbor (East)[b]	2nd	50
Docks in Iliuliuk Harbor (West)[b]	2nd	73
Hog Island Dock	2nd	73
Summer Bay Dock	2nd	30
Fuel Oil Dock	2nd	26
AATC on Amaknak Island	3rd	546
Total Area		**1,605**
Chernofski Harbor and Otter Point (Figure 2-6)		
Mutton Cove Docks	1st	137
Former Barge Docks at Otter Point	2nd	336
Eastern Half of Chernofski Harbor	3rd	602
Total Area		**1,075**
Total Surface Area of All Planned Survey Areas		**2,680**

[a]Eider Point survey area consists of two adjacent areas that were surveyed together: Shoreline of Unalaska Bay at Eider Point (1st priority) and Eider Point Dock (2nd priority).
[b]Docks in Iliuliuk Harbor was divided into two areas (east and west) based on data collected by Gravity.

3.0 SITE INSPECTION SURVEY DESIGN AND METHODS

The SI survey was performed with the use of two vessels and consisted of two phases. The first phase was a WAA survey and the second a reacquisition and verification (RV) phase. This section describes the vessels, equipment, and methods used to acquire data.

3.1 VESSEL DESCRIPTION

Research vessel (R/V) *Thunder* was originally slated to provide vessel service for the SI field work at the NDSA at Unalaska Island. However, after departing Kodiak on May 15, 2015, on their transit to Unalaska Island, R/V *Thunder* took safe harbor in a bay until May 18, 2015, because of poor weather conditions. The master of the R/V *Thunder* decided that it was best if the R/V *Thunder* did not travel to Unalaska.

The MV *Island C,* based in Kodiak and owned by *Island C* Enterprises, LLC, was hired on May 21, 2015, to provide vessel services for the SI surveys at Unalaska Island (Figure 3-1). MV *Island C* is an 80-foot, twin-screw vessel constructed of heavy steel plating and is built to withstand difficult weather conditions. The *Island C* can lift and accommodate on-deck auxiliary vessels weighing 3,000 pounds, and up to 20 feet in length. In her normal configuration she carries two welded aluminum work skiffs on deck. Equipment on deck includes a knuckle-boom crane, 6-inch diameter cargo boom, an articulated pot pulling davit, net/line drum reel, power stern roller and controllable high-volume wash-down pumps. The *Island C* weighs 199 tons with a 9-foot draft compared to the R/V *Thunder* which weighs approximately 55 tons with a 2.5-foot draft. Therefore, the *Island C* was affected much less by the wind and heavy seas and was better suited for the survey work than was R/V *Thunder*.

MV *Island C* provided a four-person crew to support the surveying effort. The duties of the crew included a master, engineer, deck hand, and cook. The accommodations were more than adequate for the survey team of five scientists and the vessel crew.

A second smaller manned vessel (referred to as *Blackfoot*) was used for surveying rather than an autonomous underwater vehicle, as originally planned (Figure 3-2). Gravity recommended this change on March 4, 2015, prior to departure to the field, as documented in Addendum 1 to the SI work plan. *Blackfoot* is a 15-foot-long plastic inflatable skiff with a covered cabin and is owned by Gravity. Using the manned vessel was recommended for shallow nearshore areas, which would work better than the autonomous underwater vehicle because of strong subsea currents, uneven bathymetry, and curved shorelines. *Island C* transported *Blackfoot* from Kodiak, Alaska prior to starting the surveying at Unalaska. *Island C* also transported *Blackfoot* from the Dutch Harbor area to Eider Point, Chernofski Harbor, and Otter Point.

3.2 WIDE-AREA ASSESSMENT SURVEYING

During the WAA, the survey team used sidescan sonar to search for targets on the seafloor in the planned survey areas. Gravity provided a four-person survey team that operated the equipment for the survey. The field team arrived in Unalaska on May 26 and prepared for the start of the WAA surveying that began on May 27, 2015.

3.2.1 Equipment Descriptions

The survey team brought different types of geophysical equipment on board. However, to survey the maximum amount of seafloor within the 14-day window planned to survey areas, standard sidescan and interferometric sidescan sonar were used during the WAA phase of the SI field work. The *Island C* survey team used standard sidescan sonar while the *Blackfoot* crew used interferometric sidescan sonar. The marine magnetometer was not used during surveying because more area could be surveyed within the time allotted using the sidescan sonar.

Standard Sidescan Sonar

The survey team towed an EdgeTech 4125 dual frequency 400-kHz/900-kHz compressed high-intensity radar pulse (CHIRP) sidescan sonar (Figure 3-3) that was designed as a towfish attached to a cable behind a vessel. A depressor wing was attached to the top of the sidescan sonar soon after its initial deployment so that it could be towed closer to the seafloor to provide better data. The survey team paired the EdgeTech sidescan sonar with a submeter accurate Hemisphere GPS R320 GNSS receiver. The Hemisphere GPS R320 supplied World Geodetic System 1984 (WGS84) latitude and longitude positioning at a rate of 20 Hz, with the positioning data distributed simultaneously to the EdgeTech 4125 acquisition system and a hydrographic survey software package for monitoring real-time navigation relative to preplanned survey lines during all survey operations.

The sidescan sonar surveys yielded plan-view imagery of large areas of the seafloor and served as an efficient means of identifying items that are present above the level of the seafloor, identifying the texture and type of seabed, and detecting debris and other navigational obstructions.

Sidescan sonar uses a special transducer that aims conical/fan-shaped acoustic pulses toward the seafloor across a wide angle perpendicular to the sensor's path. The acoustic pulses are directed downward toward the port (left) and starboard (right) sides. The sidescan sonar does not emit an acoustic pulse directly below the equipment, which causes a black line called a nadir gap that results from the lack of acoustic reflections. The intensity of this fan-shaped acoustic beam's reflections off the seafloor is recorded as a series of cross-track slices. Figure 3-4 shows two example screenshots of the real-time output of the sidescan data on a monitor during a survey. The nadir gap is shown as the black line in the center of the display. The seafloor is approximately 50 to 75 feet below the sidescan sonar, as indicated by the nadir gap in the screenshots. Rock formations and sand waves are visible in the first screenshot. An anomaly is easily visible on the seafloor on the starboard side below the sidescan sonar as shown in the second screenshot.

Interferometric Sidescan Sonar

The survey team used a Ping DSP 3DSS 460 interferometric sonar and SBG Systems Ekinox-D Inertial Navigation System on *Blackfoot* to survey smaller survey areas generally close to shore. These survey areas had geometries that required tighter turning radii or shallower water, generally less than a 5-meter depth. The Ping DSP sonar is a high-resolution sidescan sonar operating at 460 kHz that collects simultaneous sidescan sonar imagery and bathymetry data. The SBG Inertial Navigation System couples a dual-antenna Trimble Global Positioning System (GPS) receiver with a tactical-grade inertial measurement unit to generate decimeter-level accurate positioning at a rate of 50 Hz. The Ping DSP sonar, rigidly mounted to a pole on the port beam of the survey skiff, integrates all of the positioning and orientation data in real time to generate high-resolution sidescan sonar imagery, 3D rendered sonar imagery, and high-resolution bathymetry.

3.2.2 Survey Geometry

Survey transects lines were established prior to the survey at each location. Transect lines were either parallel to the shoreline for nearshore areas, or were oriented in the same direction as the length of the area. Transects were spaced so that the coverage of the seafloor overlapped. Transects were conducted in water that is less than 20 fathoms (120 feet) to comply with the Navy MRP policy (U.S. Navy 2007) described in Section 2.4.

Survey operations with both the EdgeTech 4125 sidescan sonar and the Ping DSP interferometric sonar required similar survey geometries, with some variations according to water depth and overall survey area shape. The survey team used the following guidelines for planned survey transects:

- Survey lines should cover the entire survey area.
- Turns should be gently sweeping maneuvers.
- Lines that follow the shoreline should be used in nearshore survey areas.
- Line spacing for the survey lines should be set at the range setting for the sonar.
- Sonar range for the EdgeTech should be set at 50 to 70 meters. Sonar range for the Ping DSP should not exceed 50 meters.

Setting the line spacing equivalent to the sonar range (the range of a single channel) may appear on the surface to be somewhat inefficient, because both the EdgeTech and the Ping DSP sonars generate a swath width that is double the set range. However, the advantage to setting the line spacing equal to (or slightly less than) the sonar range is that coverage gap below the sonars, called the nadir gap, is minimized if not rendered completely inconsequential. Also, individual targets are likely illuminated in successive passes of the sonar, thus providing additional opportunities to identify, measure, and characterize targets.

3.2.3 Data Acquisition

Survey data acquisition with the EdgeTech 4125 sidescan sonar required deployment of the sonar from the knuckle-boom crane at the stern of the *Island C* (Figure 3-5) with a preset cable pay-out. During all survey operations, the survey team manually recorded the amount of sonar towfish tow cable paid out to the turning block on the knuckle-boom crane so that postprocessing can accurately correct the location of the towfish for cable payout, layback geometry, and distance between the turning block and the Hemisphere GPS R320 antenna. The sidescan sonar was generally towed at a speed of approximately 3 to 5 knots.

During survey operations, the survey team and vessel operator simultaneously monitored the track line positioning, towfish positioning, and survey vessel positioning in Hypack 2015 (a hydrographic survey software package) in the pilothouse. An example of the planned survey lines as observed on a monitor during a survey is shown on Figure 3-6. All data with the EdgeTech 4125 were collected with the EdgeTech Discover software and recorded to the proprietary JSF file format that records sonar data with geographic positioning information from the Hemisphere GPS R320 receiver.

The Ping DSP sonar was attached to a metal pole that was lowered about 2 to 3 feet below the port side of *Blackfoot* (Figure 3-7). The survey crew used the Hypack 2015 hydrographic survey software to integrate and record the Ping DSP data with the SBG Ekinox-D inertial navigation data, monitor vessel positioning and track line positioning, and monitor completed survey coverage. Device offsets between the Ping DSP and the SBG inertial navigation system required only one measurement and entry into survey configuration files prior to all survey operations. For all survey operations, Hypack generated the HSX file format for each discrete survey line that integrated sidescan sonar, bathymetry, positioning, and orientation information.

3.2.4 Data Processing

The survey team completed all data processing (both in the field and in the office after field work) using Chesapeake Technologies' SonarWiz 6. SonarWiz is an industry-leading sidescan sonar processing software that allows review and post processing of a variety of data from commercially available sidescan sonars. The survey team organized all data according to survey area and treated each survey area separately for purposes of processing.

The survey team used the following general workflow for processing data from each survey area:

1. Import JSF or HSX data with proper geodesy and initial signal gain settings.

2. Enter and confirm device and vessel geometry to account for GPS location, turning block location, and cable layout so as to properly calculate towfish layback for all sidescan sonar imagery.

3. Review all data and track bottom in all survey lines. Slant-range correct all survey data once bottom tracking is complete.

4. Review data and impose automatic gain control and/or time-varied gain signal processing techniques to improve image quality and maximize image detail.

5. Review all files individually to select targets.

6. Reconcile targets that have been selected multiple times in multiple survey files.

7. Measure and characterize targets.

8. Manipulate files to generate sidescan sonar image mosaics of entire survey area.

9. Generate deliverable files for each survey area, relative to the project horizontal datum, which is North American Datum of 1983, Alaska (Zone 10) State Plane in feet.

The survey team rapidly executed steps 1 through 7 above when reviewing data in the field in order to select targets for the RV phase in each survey area. Rapid targeting identified several unique targets in each survey area that could be investigated later in the RV phase during field work, while comprehensive office-based postprocessing after the field period yielded dramatically increased numbers of targets in each survey area, some of which were clearly not MEC targets.

Steps 8 and 9 were performed in the office after completing the field work. Properly performed sidescan sonar surveys produced accurate geographically referenced data, postprocessed and converted to nearly seamless mosaics of plan-view sonar imagery in step 8. These mosaics of the seafloor of the entire survey area were produced by stitching together numerous adjacent sidescan sonar tracks, as shown for each surveyed area presented in Section 4. In addition to highlighting bottom conditions, the mosaics can be fed into a variety of computer-aided design (CAD) and geographic information system (GIS) software packages, including visualization software such as Google Earth. After processing was complete, all data files were delivered to URS in September 2015 on a hard drive to complete step 9.

3.3 REACQUISITION AND VERIFICATION SURVEYING

The RV phase included a closer inspection of selected targets identified during the WAA phase of the survey. A remotely operated vehicle (ROV) was the primary tool used in the RV phase to reacquire and visually inspect selected targets based on recorded GPS coordinates. The ROV provided ground-truth video and high-resolution sonar imagery of specific targets of interest identified by the survey team. The expectation was that if the water near the seafloor was relatively clear, the currents were not strong, and biological growth on the target was not excessive, the survey team would be able to visually find and identify the target.

To identify potential MEC targets of interest for the RV phase after completing WAA sidescan sonar surveys in the various project survey areas, the survey team performed a rapid review, processing, and interpretation of the data. Field determination of potential targets for reacquisition and verification was based on several characteristic features in sidescan sonar imagery, including the following:

- Size: less than approximately 5 by 5 feet. Some large targets may be of interest.

- Shape: cylindrical (for bombs/artillery shells) or rectangular (for crates)
- Strength of acoustic signal return

Targets identified during using the sidescan sonar were initially classified as objects such as debris, fish trap, piling, unknown, etc. during target characterization. Generally, if a target was initially classified as a likely inert item (debris, fish trap, piling, etc.) in the field, it was not selected as a target for the RV phase of surveying using the ROV unless it met the size criterion described above or was adjacent to another target of interest. Most targets selected for reacquisition in the field were initially classified as "unknown," "box," or "cylinder" and met the size criterion. The size criterion is based on the approximate maximum size of expected MEC items; many inert items, such as pilings and other debris exceeded the size criterion and were less likely to be MEC.

3.3.1 Equipment Description

An ROV is a tethered, unmanned, highly maneuverable vehicle that is operated from the shore or aboard a vessel. ROVs are typically linked to a topside interface by either a neutrally buoyant tether or a load-carrying umbilical cable. The tether/umbilical cable contains electrical conductors and fiber optics to simultaneously carry power, vehicle control, video, and data signals between the vehicle and the operator. Most ROVs are equipped with a video camera and lights, but may be customized to increase the vehicle's capabilities.

The ROV system deployed for the RV surveys in the Unalaska NDSA is shown on Figure 3-8 and consisted of the following inventory of equipment:

- VideoRay Pro4 Mini-ROV
    - Electrically-powered Mini-ROV with three DC-brushless thrusters for horizontal and vertical vehicle control
    - 570-line resolution video camera
    - Auto-depth and auto-heading capability
    - External LED lighting

- Over 500 feet of control umbilical cable

- Topside control unit with integrated control box featuring:
    - Windows-based graphic user interface
    - Head-up display of ROV heading, depth, and water temperature

  - Real-time video display
  - Real-time digital video recording to Windows Media Video (WMV) or AVI formats
  - Real-time digital video still-capture capability
  - Multifunction hand controller

- TriTech Gemini forward-looking multibeam imaging sonar

The VideoRay Pro4 model used for the RV survey was custom modified to include additional lighting, self-contained camera equipment, and additional sensors. While video was assumed to be the primary RV survey tool, the ROV was also outfitted with a Tritech Gemini high-resolution forward-looking imaging sonar that provided longer range (greater than 100 feet) plan-view imagery in real time to aid the operator with understanding the underwater surroundings beyond what may be readily visible with the ROV onboard camera. The ROV provided real-time video, heading, and depth information, as well as time and date stamps and user-definable text title fields that provided the operator with the ability to maintain situational awareness during underwater survey operations and a proper video record of all survey activities.

The survey team used an ROV on MV *Island C* while *Blackfoot* continued to conduct the WAA using the interferometric survey. On one occasion, the ROV was used aboard Blackfoot where the water was shallow near the barge docks at Otter Point. Two redundant ROVs were available on board the *Island C*.

3.3.2 Acquisition and Survey

After identifying and prioritizing potential targets for RV surveys, the survey team directed the vessel to anchor in the vicinity of each target. The vessel operator had to consider wind direction when determining the anchoring location for the best placement of the vessel closest to the targets. The heavy weight of the *Island C* made the vessel quite stable in strong winds and heavy seas.

Upon anchoring at each target location, the survey team marked the location of the survey vessel relative to the target and determined the bearing and range from the ROV launch location to each intended target. The ROV was hand launched from the stern of the survey vessel and descended directly down from the stern of the vessel. The operator used the onboard ROV compass to bring the ROV to bear on the intended target while using the forward-looking Tritech Gemini sonar to reacquire the target on sonar, as shown on the example screenshot of the sonar output during reacquisition on Figure 3-9. The operator then flew the ROV to the target until the target could be detected visually with the video camera on the ROV. The live video was monitored on the vessel, as shown in an example screenshot (Figure 3-10) of a target on a video monitor. At most locations where the survey vessel anchored to reacquire targets, multiple targets were inspected that were within reach of the available length of the ROV umbilical cable.

The ROV collected video, still image, and sonar imagery of each target. The survey team classified the targets based on observations. Onboard scaling lasers, spaced at 3.25 inches apart, provided scale in the imagery to aid with characterizing target size. In some cases, the ROV was redeployed to collect higher quality video and still photographic imagery of specific targets of interest, using a high-resolution still camera and high-definition video camera. All data were organized and named in accordance with the conventions established in the SI work plan (U.S. Navy 2014). All data files, including videos and still photographs of reacquired targets, were delivered to URS on a hard drive in September 2015.

3.4 QUALITY ASSURANCE/QUALITY CONTROL TESTING

Quality assurance/quality control (QA/QC) procedures related to the geophysical equipment were employed to verify how the geophysical equipment responded to test shapes that represented MEC on the seafloor. This testing occurred during the SI surveys at the Kodiak Island on May 8 and 10, 2015, prior to the SI surveys at Unalaska Island. The survey crew deployed a mock .50-calber round, inert 25-pound mortar, and inert 100-pound bomb as known targets during the Kodiak SI field work in Explosive Anchorage No. 1 for testing of the EdgeTech 4125 sidescan sonar (Figure 3-11). The mock .50-calber round was an approximately 12-inch-long, 1.25-inch-diameter, thick-walled steel pipe. The 25-pound dummy mortar shell was approximately 24 inches long with a thick steel shell and fins and weighed about 25 pounds. The 100-pound dummy bomb was a hollow metal shell weighing approximately 15 pounds. It was filled with gravel to more closely resemble the density of the MEC item it represented and better reflect sound waves.

After deploying each inert test shape at a preplanned location and recording the position, a series of survey passes with the instruments were performed to test detection and position accuracy. The position accuracy has been demonstrated throughout this project by virtue of the successful identification of targets in the WAA sidescan sonar surveys and RV of targets with the ROV.

The results of the sidescan sonar tests using the three test shapes showed that only the largest test shape was positively detected. In the case of the .50-calber round and 25-pound mortar shell, neither the 400-kHz nor the 900-kHz frequencies indicated a positive detection of the test shape. However, both frequencies appeared to indicate the ability to detect the 100-pound test shape. It is important to note, however, that the 100-pound bomb test shape does not necessarily look like a bomb. Rather, it could easily be mistaken for a rock or a fuel tank or other storage tank. A sample sidescan sonar survey pass at 900 kHz over the 25-pound mortar and the 100-pound bomb test shapes is shown on Figures 3-12. An enlarged view of the 100-pound bomb and processed information is shown on Figure 3-13.

The approximate distance between the dropped location and the detected location of the test shape is roughly 30 feet. The error can be attributed to several sources of error during the deployment of the test shapes and sources of error inherent in the survey technique. As stated above, however, effective positioning has been demonstrated in practice via successful detection and reacquisition of targets.

As expected, though both the 400 and 900-kHz frequencies detected the 100-pound bomb target, the 900-kHz frequency appeared to provide better resolution and detail. Measurements of the target with 400- and the 900-kHz frequency on multiple passes indicated an object approximately 2 feet in length, 1 foot in diameter, and approximately 7 to 8 inches above the seafloor (comparable to the test shape).

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Figure 3-1
Marine Vessel
Island C

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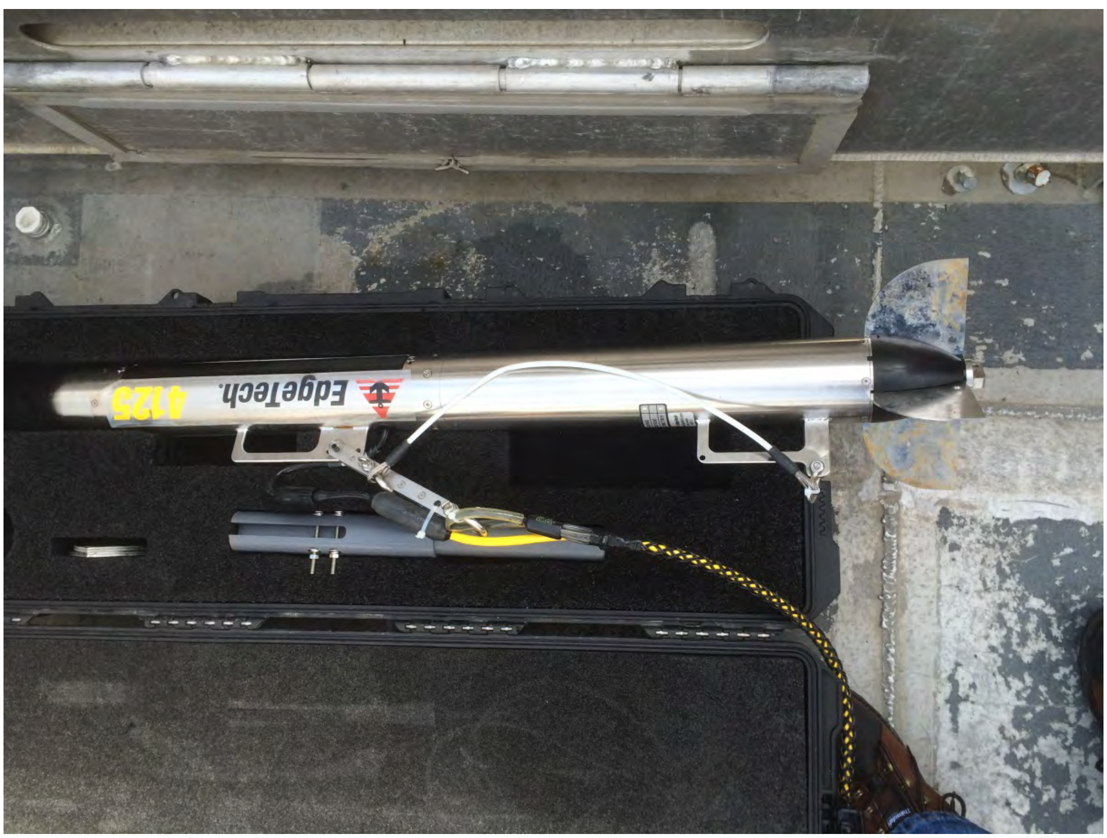
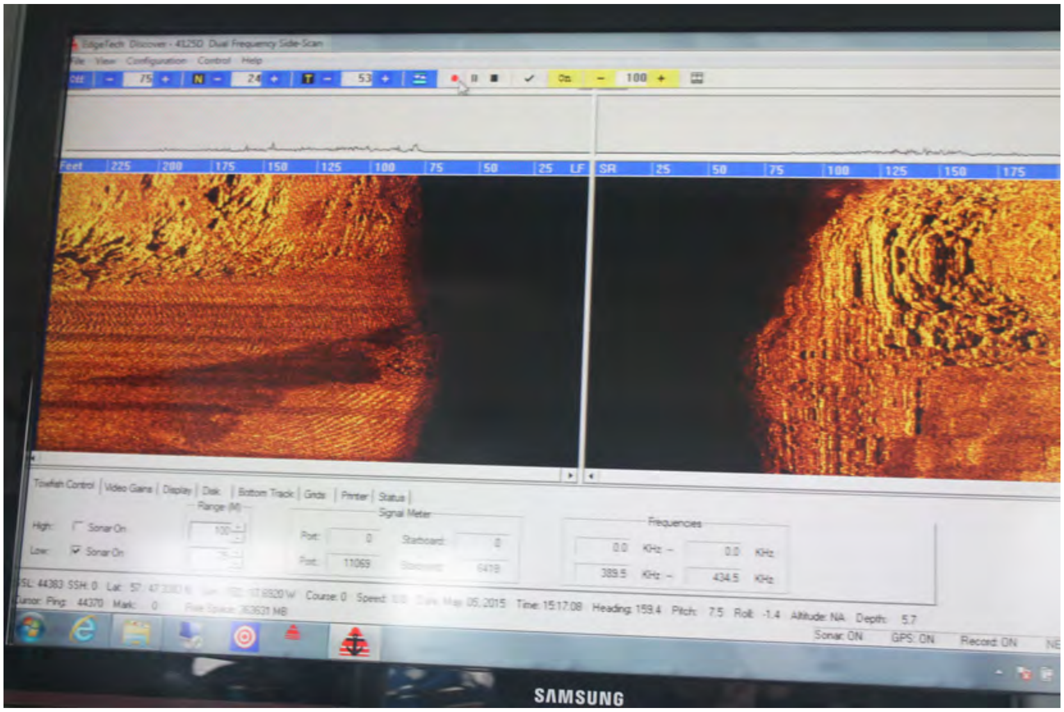
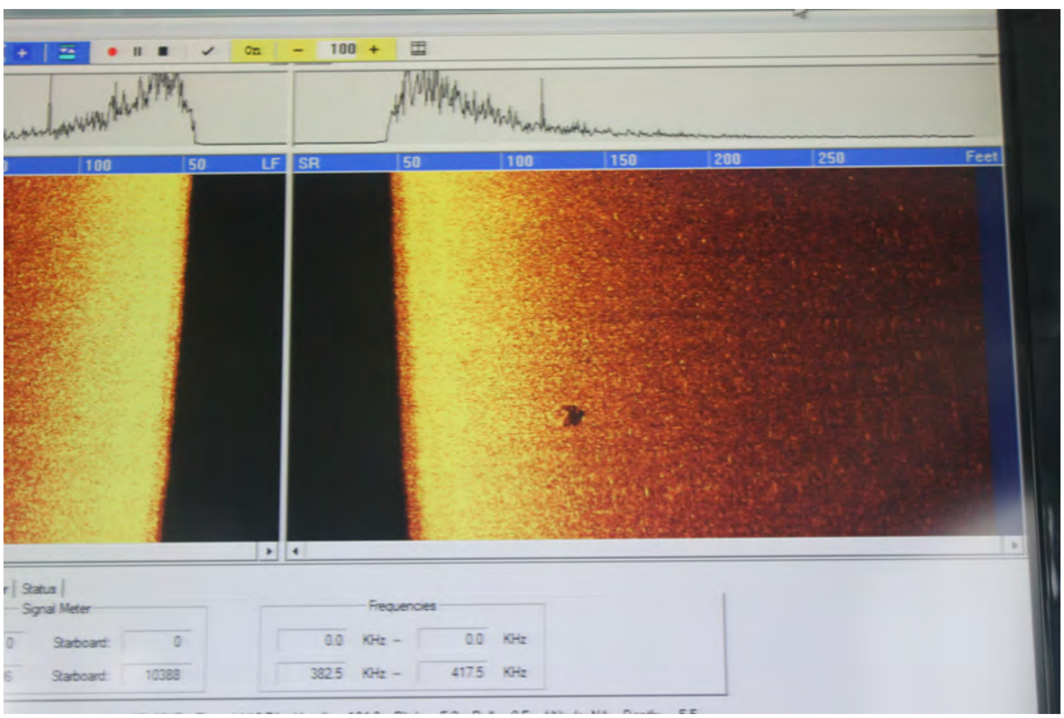


U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 3-3** **Sidescan Sonar With and Without Depressor Wing**





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Alaska

Figure 3-4
Screenshots of the Real-Time Output of the Sidescan Sonar

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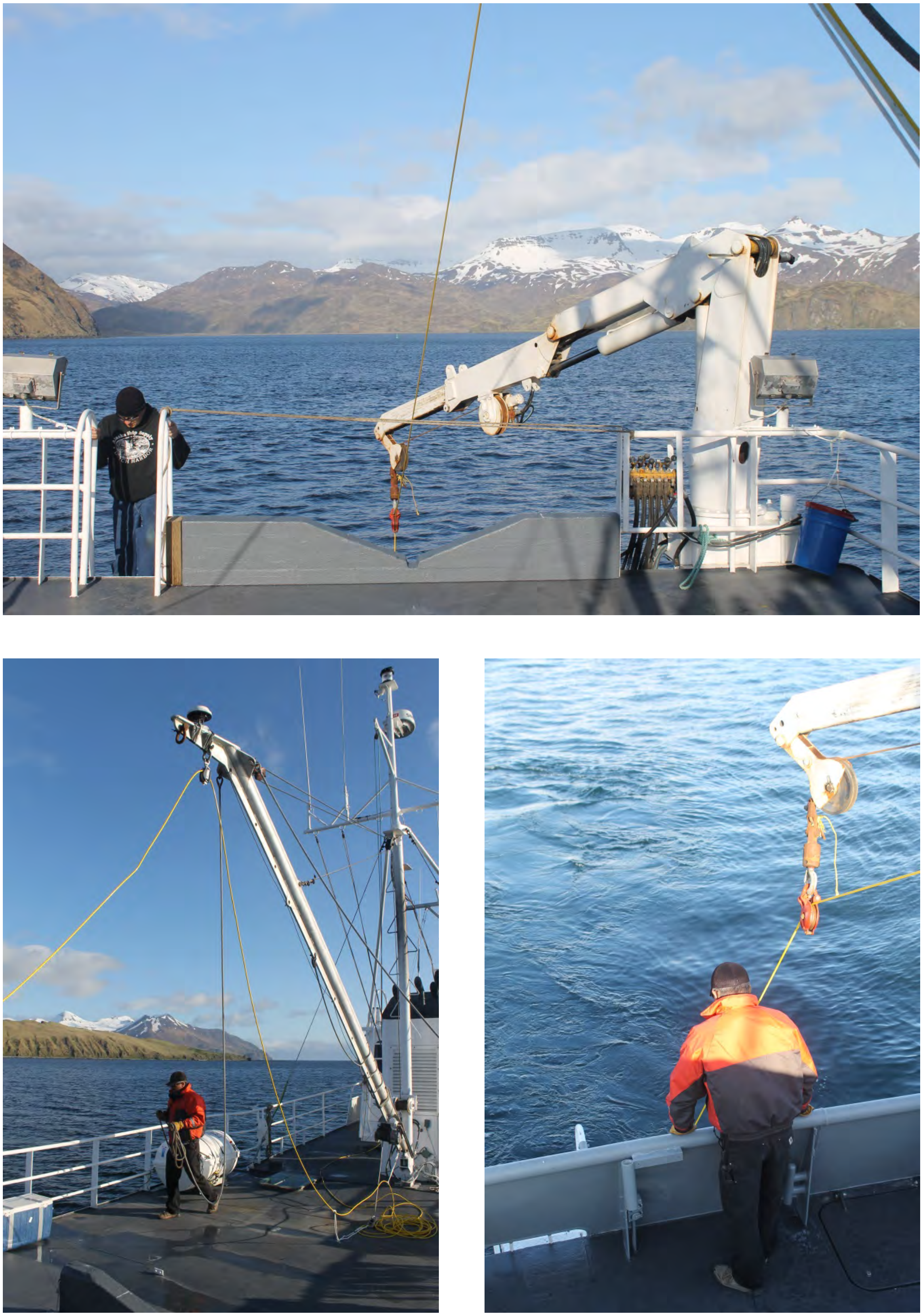

Figure 3-5
Towing Sidescan Sonar off Knuckle Boom Crane at Rear of M/V Island C

60413578_33.ai

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 3-6** **Example of Planned Survey Lines**

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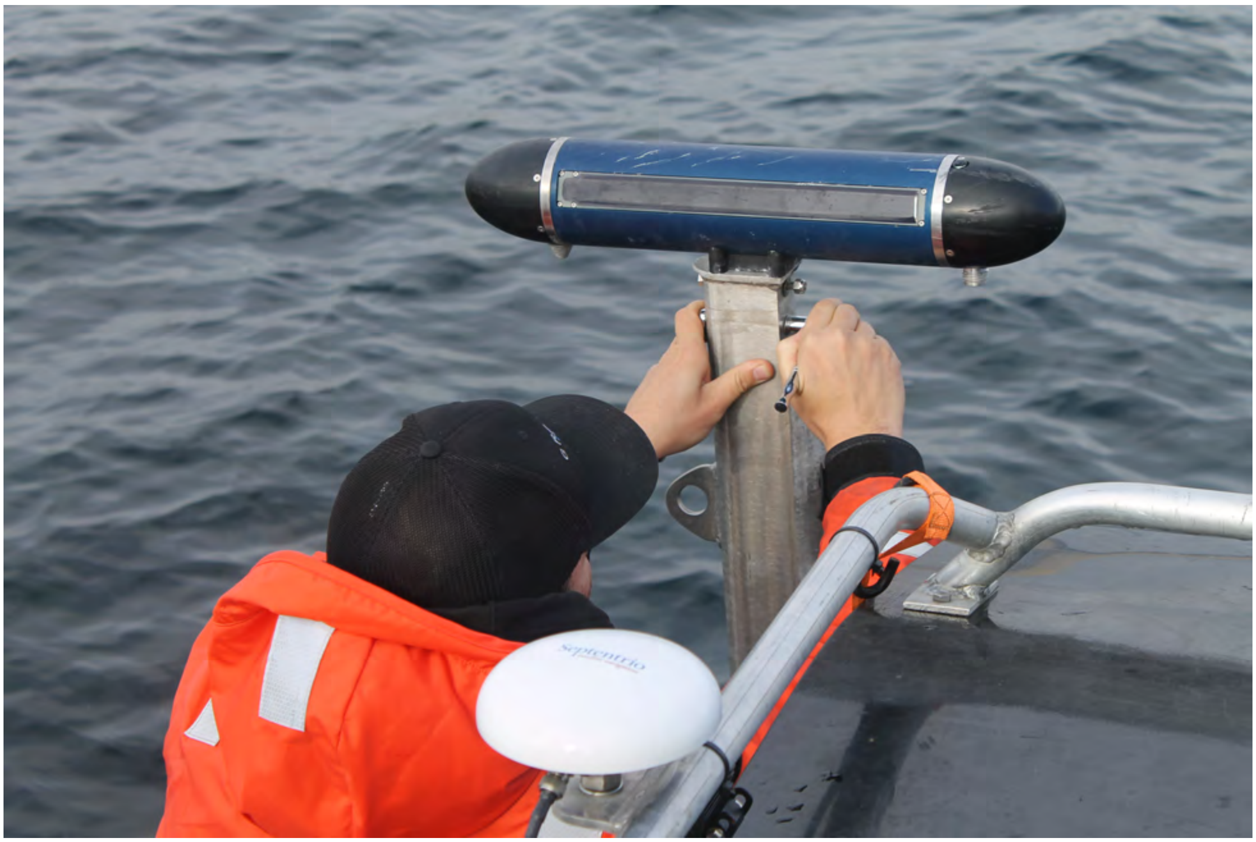

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 3-7** **Interferometric Sidescan Sonar**

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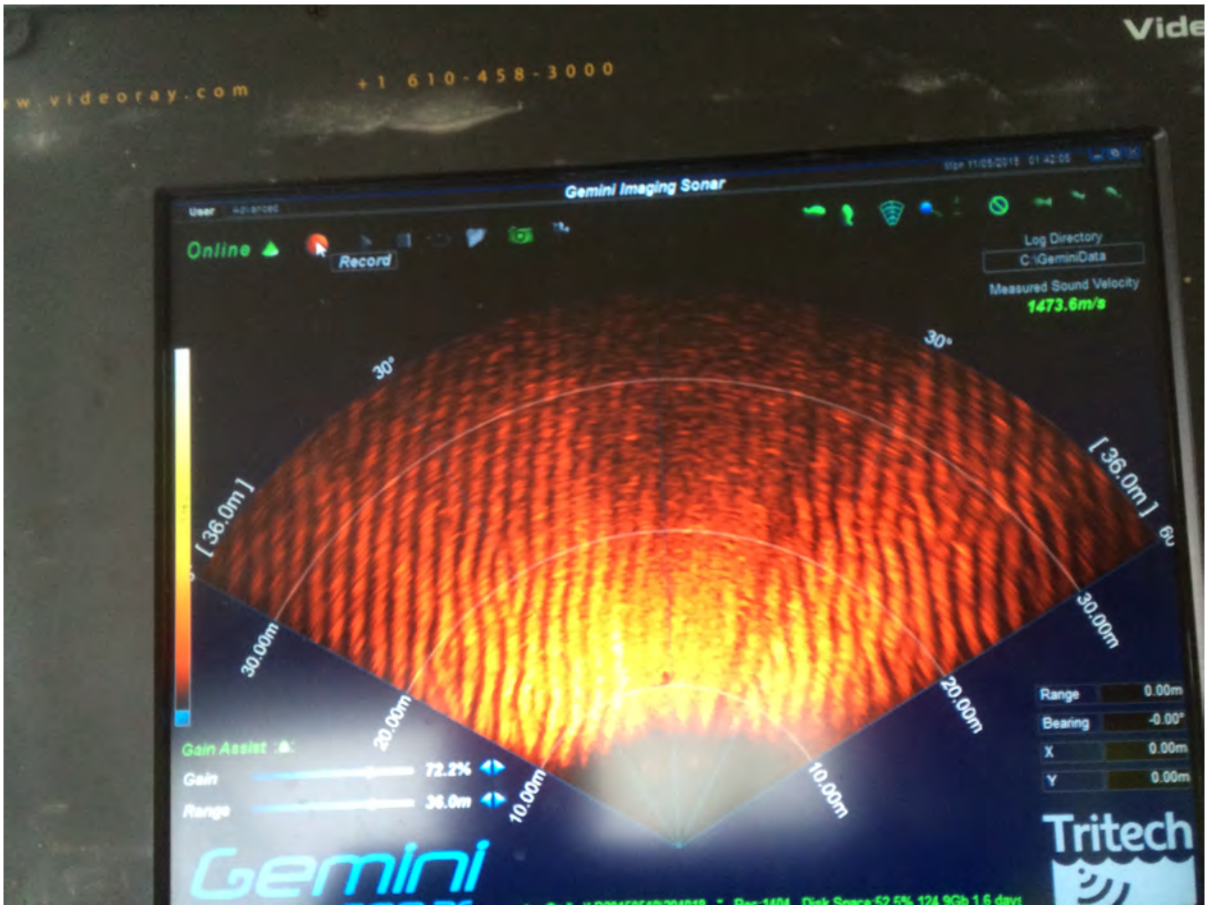
U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 3-8** **Remotely Operated Vehicle** **Used for Surveying**



U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 3-9** **Screenshot of Real-Time Output of Sonar on ROV**

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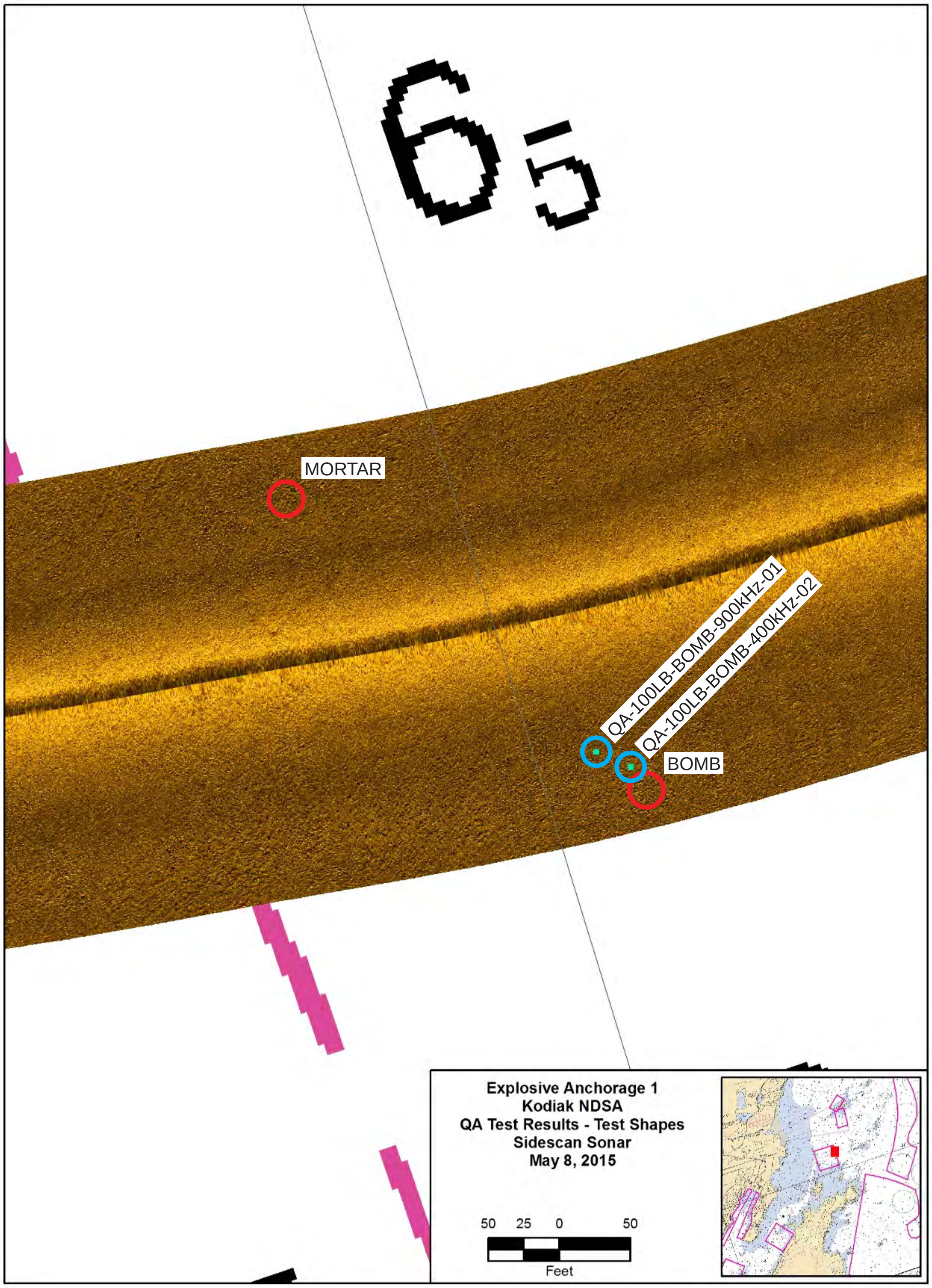
Figure 3-10
Acquiring a Target Using the Remotely Operated Vehicle

Figure 3-11a
Test Shape – Mock 40-mm Shell

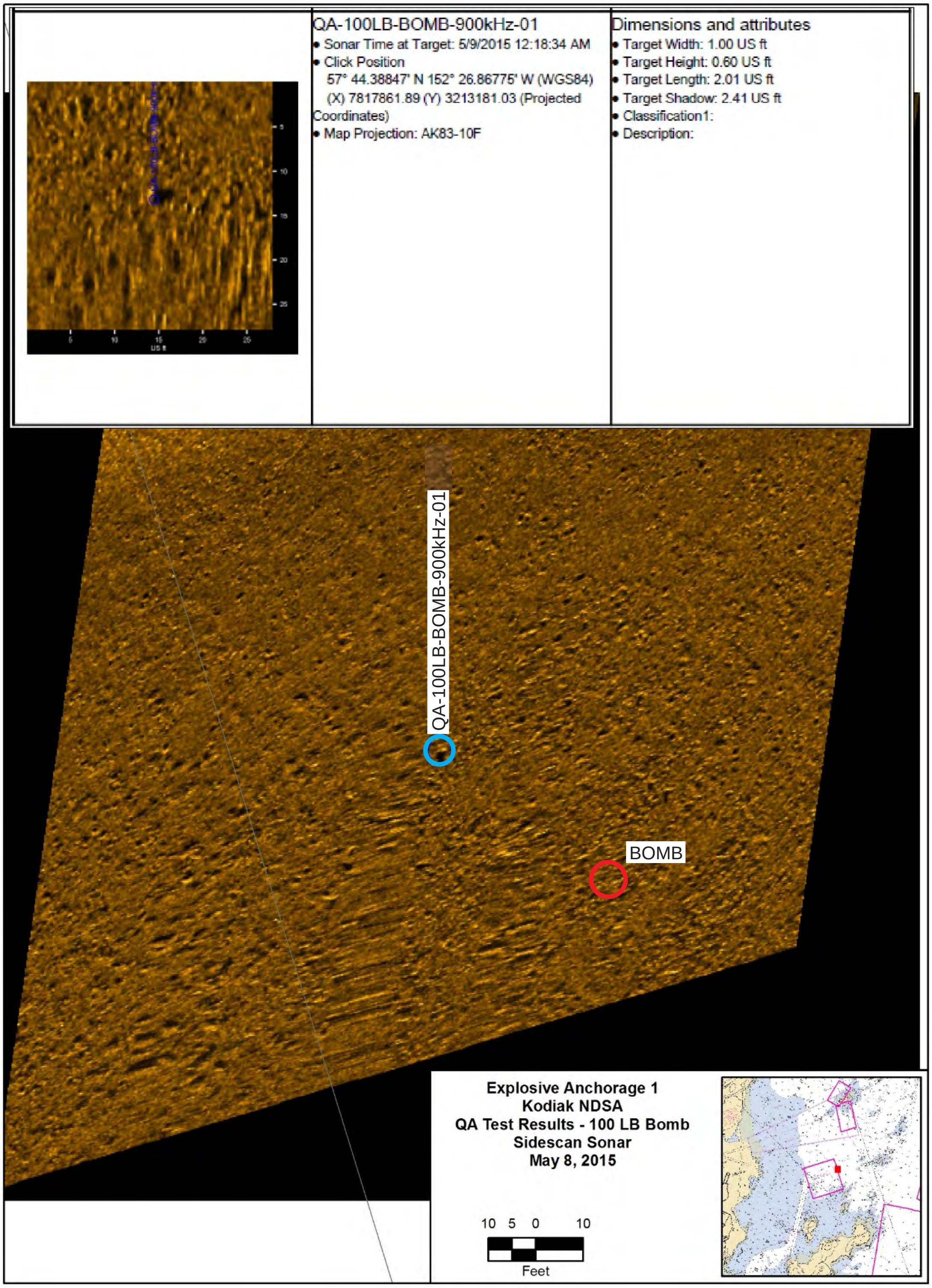
Figure 3-11b
Test Shape – Inert 25-Pound Mortar Shell

Figure 3-11c
Test Shape – Inert 100-Pound Bomb



Note:
The dropped locations of the test shapes are indicated with red circles, while the interpreted locations of the 100-pound bomb (from multiple passes) are indicated with cyan circles.

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 3-12** **Sample QA/QC Sidescan Sonar Survey Pass**



Note:
The dropped locations of the test shapes are indicated with red circles, while the interpreted locations of the 100-pound bomb (from multiple passes) are indicated with cyan circles.

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 3-13** **Detected Target Characteristics, 100-Pound QA/QC Test Shape**

Table 3-1
Survey Vessels and Associated Equipment

Survey Vessel	Equipment	Goal
Island C	EdgeTech 4125 400/900-kHz digital CHIRP sidescan sonar	High-resolution imagery to detect very small targets
	Remotely operated vehicle with high-definition video camera and forward-looking sonar	Provide high-resolution videos and photographs of targets
Blackfoot	Ping DSP 3DSS 460-kHz interferometric sidescan sonar with SBG inertial navigation system	High-resolution sidescan sonar imagery and high-resolution bathymetry
	Remotely operated vehicle with high-definition video camera and forward-looking sonar	Provide high-resolution videos and photographs of targets

Note: kHz - kilohertz

4.0 RESULTS OF SITE INSPECTION SURVEY

4.1 OVERVIEW OF RESULTS

The NDSA at Unalaska was surveyed from May 27 through June 7, 2015. The SI field work was conducted in early spring when the visibility of the seafloor was expected to be good and weather conditions acceptable. During the PA research conducted prior to the SI work plan, divers in the area stated that when the water warms during the summer, algal blooms hamper visibility near the seafloor.

The survey team on the *Island C* had no stand-down days resulting from poor weather and was able to survey during each of the 14 work days. The survey vessel traveled to Chernofski harbor during the night on May 29, 2015 and returned to the Dutch Harbor areas the night of June 2, 2015, thereby leaving the days available for survey work. *Blackfoot* was not needed to conduct surveying on the last two days because all WAA surveys had been completed. The dates on which the specific areas were surveyed and the type of equipment used to survey are listed on Table 4-1. A daily record of field events are documented in the field notes provided in Appendix A.

Of the 14 planned survey areas listed on Table 2-1, WAA surveying was performed at all or a majority of 12 of these areas. The total area of these planned survey areas is 2,104 acres, which is approximately 79 percent of the 2,680 total areas planned for SI surveying as listed on Table 2-1. Actual survey coverage according to recorded data is 2,150 acres. It was understood during the planning stage that the survey team may not be able to complete surveys in all areas within the allotted 14 days, but that the team would accomplish as much surveying as possible within that time frame.

No WAA survey was conducted at these two survey areas: AATC on Amaknak Island and Summer Bay Dock. The largest size of ammunition used at the AATC was 40-mm anti-aircraft rounds. The two smaller test shapes, the mock .50-calber round and 25-pound mortar shell, were not observed during QA/QC testing using the sidescan sonar, as described in Section 3.5. Therefore, WAA surveying would not have been helpful in the AATC area because of the expected size of munitions used. The crew on *Blackfoot* attempted to survey Summer Bay Dock area using the interferometric sidescan sonar; however, the kelp was very thick across the bay and surveying in this area was not possible.

For each survey area, Table 4-2 lists the WAA survey date, number of targets identified, the RV survey date, and number of targets reacquired. A total of 1,672 targets were identified during the WAA survey. Appendix C includes a list, including related characteristics, of each target identified during the WAA survey for each survey area.

Targets identified using the sidescan sonar were initially classified as objects such as debris, fish trap, piling, unknown, etc. during target characterization. Table 4-3 is a summary of how the targets were initially classified. Approximately 38 percent (646 of 1,672) of the targets were classified as “unknown,” “box” (possible ammunition crate), or “cylinder” (possible bomb). Generally, if a target was initially classified as a likely inert item (debris, fish trap, piling, etc.) in the field, it was not selected as a target for RV surveying. Most targets selected for reacquisition in the field were initially classified as “unknown,” “box,” or “cylinder.”

The survey team performed RV surveying at 10 areas, and reacquired 111 targets (104 discrete targets plus 7 target lines). A target line is the general survey path of the ROV taken in an area of interest, particularly along the seafloor adjacent to a current or former dock face where MEC items may have been dropped in the water. Table 4-4 lists the characteristics of each reacquired target, and the following sections provide more detail on the results of surveying within each individual survey area. The geophysical subcontractor’s report is included as Appendix D in this SI report.

Table 4-5 summarizes the percent of targets initially classified as “unknown,” “box,” or “cylinder” that were reacquired as part of the RV survey. Of the 102 targets reacquired (not including the 7 target lines), 92 were initially classified as “unknown,” “box,” or “cylinder” as summarized for each survey area in Table 4-5. Therefore, 14% of the 646 targets that were initially classified as “unknown,” “box,” or “cylinder” were reacquired, reducing the number of targets initially classified as “unknown,” “box,” or “cylinder” to 554. Of those 554 targets, 136 met the size criterion (smaller than 5 feet in all directions) specified in Section 3.3. However, targets of interest that were slightly larger than this criterion were still reacquired.

Possible MEC items were identified at three survey areas as described in Section 4.3 for Eider Point, Dutch Harbor Dock, and Mutton Cove Docks.

4.2 INTERACTIVE GIS MAP OF SURVEYED AREAS

Prior to describing the results for each individual area, it may be of interest to the reader to become familiar with using the interactive GIS map, which is provided in Appendix E. The data are presented on seven DVDs because the video files and sidescan data are too large to fit onto fewer DVDs. The interactive GIS map is in a published map file format (.pmf file extension) and is opened only with ArcReader. ArcReader, which was developed by ESRI, can be downloaded for free at ESRI's website at http://www.esri.com/software/arcgis/arcreader/ download. Appendix E includes basic instructions for opening and using the interactive GIS map.

Figures 4-1 and 4-2 show an overview of all surveyed areas in the vicinity of Dutch Harbor and the vicinity of Chernofski Harbor and Otter Point. The interactive GIS map shows all surveyed areas, sidescan survey results of the seafloor, the 1,672 target locations identified during the WAA survey with linked target information, and videos of reacquired targets.

When viewing the coverage areas on the GIS map, one can zoom in to any surveyed area, see all target points identified during the WAA survey, and turn on various layers (e.g., sidescan sonar results of the seafloor, planned survey areas and priority, etc.). By clicking on the targets target points, the target information (target identification, coordinates, and dimensions) appears. Red points signify those targets reacquired using the ROV and have a linked video of the target. Yellow targets do not have a linked video. Note that the reacquired targets will be linked to videos only on one of the DVDs, as described above.

Each of the seven DVDs includes coverage of all surveyed areas. As mentioned previously, no surveys were completed at AATC on Amaknak Island and Summer Bay Dock. The differences in the content of the DVDs include sidescan sonar and video content of specific areas associated with the reacquired targets in specific areas.

DVD1 includes sidescan sonar results and links to videos of reacquired targets for:

- Eider Point

DVD2 includes sidescan sonar results and links to videos of the target line for:

- Eider Point

DVD3 includes sidescan sonar results and links to videos of reacquired targets for:

- Additional Docks near Dutch Harbor Spit

DVD4 includes sidescan sonar results and links to videos of reacquired targets and a target line for:

- Hog Island Dock
- Dutch Harbor Dock

DVD5 includes sidescan sonar results and links to videos of reacquired targets and a target line for:

- Army Dock in Captains Bay
- Fuel Oil Dock
- Dutch Harbor Landfill
- Docks in the Iliuliuk Harbor Area (East)
- Docks in the Iliuliuk Harbor Area (West)

DVD6 includes sidescan sonar results and links to videos of reacquired targets and a target line for:

- Eastern Half of Chernofski Harbor

DVD7 includes sidescan sonar results and links to videos of reacquired targets and target lines for:

- Former Barge Docks at Otter Point
- Mutton Cove Docks

4.3 SURVEY AREAS NEAR DUTCH HARBOR

Results of the areas that were surveyed are summarized in the following sections. There is no subsection for AATC on Amaknak Island or Summer Bay Dock because no surveying was conducted at either area, as explained in Section 4.1.

4.3.1 Army Dock in Captains Bay

The survey team on the *Island C* conducted the WAA survey of Army Dock in Captains Bay on May 27, 2015, and detected 65 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown in Figure 4-3. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicates that 53 targets were likely inert items (debris, fish traps, pilings, etc.), 5 targets were boxes, 1 target was cylindrical, and 6 targets were unknown (Table 4-3).

On June 5, 2015, the survey team on MV *Island C* used the ROV for the RV survey. Four targets were reacquired with the ROV during the RV survey and are shown as the red-colored target locations on Figure 4-3. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD). In addition to reacquiring specific targets, the survey team used the ROV to visually inspect the seafloor along the face of the pier where items may have been lost off the pier during transfers from ship to shore. The red target line shown on Figure 4-3 represents the approximate location of the ROV path represented by the linked video on the interactive map.

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Four of the 12 targets (33%) that were initially classified as “unknown,” “box,” or “cylinder” were reacquired (Table 4-5). No MEC was positively identified. The reacquired targets were classified as one heavily corroded rectangular object, one battery, one tire, and one corroded 55-gallon drum. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are four targets that were initially classified as “unknown,” “box,” or “cylinder,” and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

4.3.2 Eider Point

The survey team on *Blackfoot* conducted the WAA survey of Eider Point (Unalaska Bay side) on June 4, 2015, and detected 139 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-4. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 28 targets were likely inert items (debris, fish traps, pilings, etc.), and 111 targets were unknown boxes, cylindrical objects, or other unknown objects (Table 4-3).

On June 5, 2015, the survey team on *Island C* used the ROV to reacquired five targets that are shown as the red-colored target locations on Figure 4-4. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD). In addition to reacquiring specific targets, the survey team used the ROV to visually inspect the seafloor along the face of the former dock where items may have been lost off the pier during transfers from ship to shore. The red target line shown on Figure 4-4 represents the approximate location of the ROV path represented by the linked video on the interactive map.

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Five of the 111 targets (5%) that were initially classified as “unknown,” “box,” or “cylinder” were reacquired (Table 4-5). No MEC was positively identified in the water. The reacquired targets were classified as two timber pilings, one pipe, one fish trap, and timber debris and fishing gear. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are 22 targets that were initially classified as "unknown," "box," or "cylinder," and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

While the survey team on the *Island C* was reacquiring targets, the team on *Blackfoot* surveyed the shoreline from the beach because of the previously documented history of the presence of MEC in this area as described in Section 2.5.2. Two MEC items were observed at the coordinates on Figure 4-4. Figure 4-5 shows the two partially buried MEC items found on the shoreline of Unalaska Bay at Eider Point. The information about the MEC findings was relayed to the Navy. Steve Saepoff, Environmental Restoration Team Supervisor, requested the explosive ordnance disposal team at Joint Base Elmendorf-Richardson to remove of the MEC items from the shoreline. By the beginning of July 2015, explosive ordnance disposal team had removed the two identified MEC items plus two additional MEC items found during a more thorough inspection of the area.

The beach area near Magazine J (Figure 4-4) is gently sloping and rocky, and has abundant kelp (Figure 4-6) which prevented surveying from approximately 50 to 100 feet from the shoreline. This area that could not be surveyed may contain MEC items given the history of the area, especially near Magazine J.

4.3.3 Seafloor near Dutch Harbor Landfill

The survey team on the *Island C* conducted the WAA survey of the seafloor near Dutch Harbor Landfill on May 28, 2015, and detected 153 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-7. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 111 targets were likely inert items (debris, fish traps, pilings, etc.), and 42 targets were a box, a cylinder, or other unknown objects (Table 4-3).

As part of the RV survey of the seafloor near Dutch Harbor Landfill on June 6, 2015, the survey team on *Island C* used the ROV to reacquire seven targets. The associated target locations are shown as the red-colored target locations on Figure 4-7. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD).

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Five of the 42 targets (12%) that were initially classified as "unknown," "box," or "cylinder" were reacquired (Table 4-5). No MEC was positively identified. The reacquired targets were classified as a timber with cable and heavy growth, one fishing buoy, one unknown item with an access door, and two fish traps. The survey team attempted to reacquire two additional targets, but those targets were not observed. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are four targets that were initially classified as "unknown," "box," or "cylinder," and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

4.3.4 Dutch Harbor Dock

The survey team on *Blackfoot* conducted the WAA survey of the Dutch Harbor Dock area on May 29, 2015, and detected 120 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown in Figure 4-8. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 62 targets were likely inert items (debris, fish traps, pilings, etc.), and 58 targets were unknown objects (Table 4-3).

As part of the RV survey of the Dutch Harbor Dock area on June 6, 2015, the survey team on *Island C* used the ROV to reacquire four targets shown as the red-colored target locations on Figure 4-8. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD). In addition to reacquired targets, the seafloor below the face of the southeastern edge of the dock was inspected for MEC items. The line representing this ROV survey is shown by the curved red target line on Figure 4-8.

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Four of the 58 targets (7%) that were initially classified as "unknown" or "box" were reacquired (Table 4-5). Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are 20 targets that were initially classified as "unknown" or "box" and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

One possible MEC item was found. Target 1 appears to be a possible bomb or tank (Figure 4-9). Based on the sidescan sonar images, Target 1 appears to be roughly 6.3 feet long, 3.2 feet wide, and rises 1.3 feet above the seafloor. It is covered with heavy marine growth. The target appears to be a corroded metallic object with a bulbous end as viewed from the end that was not covered with marine growth. Target 1 is located at a depth of less than 20 feet located north of the southeast end of the airport runway and approximately 125 feet from shore. The remaining reacquired targets were classified as one tire, one rock, and one crab pot.

The current dock at Dutch Harbor Dock appears to be an active fuel dock referred to as the Delta Western Fuel Dock that may have been rebuilt in recent years. During the RV survey, the seafloor near the dock was very clean. It appeared that gravel may have been recently placed around the dock area, and young biological growth was present.

4.3.5 Additional Docks near Dutch Harbor Spit

The survey team on the *Island C* conducted the WAA survey of the Additional Docks near Dutch Harbor Spit area on June 3, 2015, and detected 373 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-10. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E on DVD). The initial classification based on the WAA survey indicate that 279 targets were likely inert items (debris, fish traps, pilings, etc.), and 94 targets were unknown objects (Table 4-3).

As part of the RV survey of the Additional Docks near Dutch Harbor Spit area on June 7, 2015, the survey team on *Island C* used the ROV to reacquire 18 targets shown as the red-colored target locations on Figure 4-10. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD).

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Eighteen of the 94 targets (19%) that were initially classified as “unknown” or “box” were reacquired (Table 4-5). No MEC item was identified. The reacquired targets were classified as one fish trap, several pieces of timber, one rusted drum, five rocks, one television, one corroded rectangular object, a piece of steel sheeting, two pieces of steel pipe, fishing gear, and one timber fender panel. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are 15 targets that were initially classified as “unknown” or “box” and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

This area appeared to contain more debris than most other areas surveyed, probably because this is an area of significant historical and current use.

4.3.6 Docks in Iliuliuk Harbor Area (East)

The survey team on *Blackfoot* conducted the first WAA survey of the Docks in Iliuliuk Harbor Area (East) area on May 27 and 28, 2015, and detected 73 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-11. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E on DVD). The initial classification based on the WAA survey indicate that 30 targets were likely inert items (debris, fish traps, pilings, etc.), and 43 targets were unknown objects (Table 4-3). Because of the allotted time for conducting surveys, no RV survey of the Docks in the Iliuliuk Harbor Area (East) area was conducted. Although no RV survey was conducted, sorting of the characteristics of the targets in Appendix C shows that there are 7 targets in this survey area that were initially classified as “unknown” or “box” and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

4.3.7 Docks in Iliuliuk Harbor Area (West)

The survey team on *Blackfoot* conducted the first WAA survey of the Docks in Iliuliuk Harbor Area (West) area on May 29 and 28, 2015 and detected 149 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-11. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E on DVD). The initial classification based on the WAA survey indicate that 149 targets were likely inert items (debris, fish traps, pilings, etc.), and no targets were classified as unknown objects (Table 4-3). Because of the allotted time for conducting surveys, no RV survey of the Docks in the Iliuliuk Harbor Area (West) area was conducted. Although no RV survey was conducted, sorting of the characteristics of the targets in Appendix C shows that there are no targets in this survey area that were initially classified as “unknown” or “box” and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

4.3.8 Hog Island Dock

The survey team on the *Island C* conducted the WAA survey of the Hog Island Dock area on May 29, 2015, and detected 19 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-12. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 8 targets were likely inert items (debris and pilings), and 11 targets were classified as unknown objects (Table 4-3).

As part of the RV survey of the Hog Island Dock area on June 5, 2015, the survey team on *Island C* used the ROV to reacquire 3 targets. The associated targets are colored red on Figure 4-12. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD).

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Two of the 11 targets (18%) that were initially classified as “unknown” or “box” were reacquired (Table 4-5). No MEC item was identified. The reacquired targets appear to be two steel pipes and one steel beam. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there is one target that was initially classified as “unknown” or “box” and meets the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

4.3.9 Fuel Oil Dock

The survey team on the *Island C* conducted the WAA survey of the Fuel Oil Dock area on May 29, 2015, and detected 60 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-13. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 28 targets were likely inert items (debris, fish traps, a box, and pilings), and 32 targets were classified as unknown or box-like objects (Table 4-3).

As part of the RV survey of the Fuel Oil Dock area, the survey team on the *Island C* used the ROV on June 6, 2015, to reacquire 4 targets that were initially classified as a box or unknown objects. The associated targets are colored red on Figure 4-12. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD).

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Four of the 32 targets (13%) that were initially classified as “unknown” or “box” were reacquired (Table 4-5). No MEC item was identified. The reacquired targets were classified as three rocks and one concrete block. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are nine targets that were initially classified as “unknown” or “box” and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

The existing dock at the former Fuel Oil Dock is currently referred to as American President Lines, Dutch Harbor Wharf. It has a large crane for loading and unloading large containers. It is owned by Dutch Harbor Development Corporation and operated by American President Lines Limited and Delta Western.

4.4 SURVEY AREAS AT CHERNOFSKI HARBOR AND OTTER POINT

4.4.1 Mutton Cove Docks

The survey team on the *Island C* conducted the WAA survey of the Mutton Cove Docks area on May 31, 2015, and detected 152 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-13. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 90 targets were likely inert items (debris and pilings), and 62 targets were classified as unknown objects (Table 4-3).

As part of the RV survey of the Mutton Cove Docks area on June 1 and 2, 2015, the survey team on the *Island C* used the ROV to reacquire 23 targets that are shown as the red-colored target locations on Figure 4-14. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD). In addition to the reacquired targets, the seafloor near the edges of the two large docks on the western and eastern shores of Mutton Cove were inspected for MEC items. These two areas are represented by the two red target lines on Figure 4-14. Linked videos of the seafloor in these areas can be viewed by clicking on the red target lines on the associated DVD in Appendix E.

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Twenty of the 62 targets (32%) that were initially classified as “unknown” or “box” were reacquired (Table 4-5).

Two targets were identified as possible bombs or tanks. Target 4 is classified as a possible bomb or tank and is shown in the photographs in from the high definition video camera on the ROV (Figure 4-15). Target 4 is cylindrical with a bulbous end, is approximately 5.3 feet long, and has a diameter of 1.2 feet. Similarly, Target 36 is classified as a possible bomb and is shown in the photographs from the high definition video camera on the ROV (Figure 4-16). Target 36 is cylindrical with a bulbous end, and is approximately 4.7 feet long and has a diameter of 2.3 feet. The remainder of the reacquired targets were classified as eight possible anchors (primarily of concrete), three wood or timber objects, one 55-gallon drum with a lid and partial label, two rocks, one or more sunken buoys, a cylindrical item, four unknown objects, and one target that could not be located.

Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are 12 targets that were initially classified as “unknown” or “box” and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

4.4.2 Eastern Half of Chernofski Harbor

The survey teams on the *Island C* and *Blackfoot* conducted the WAA survey of the Eastern Half of Chernofski Harbor area on May 31 and June 1, 2015, and detected 210 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-14. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 47 targets were likely inert items (debris, fish traps, and pilings), and 163 targets were classified as unknown or box-like objects (Table 4-3).

As part of the RV survey of the Eastern Half of Chernofski Harbor area on May 31 and June 1, 2015, the survey team on the *Island C* used the ROV to reacquire 22 targets shown as the red-colored target locations on Figure 4-14. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD). A ship wreck was found in the southwest portion of the area where a small red target line is shown on Figure 4-14. The ROV inspected the wreck for evidence of MEC on the deck, but none was observed as shown on the linked video in Appendix E.

Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Eighteen of the 163 targets (11%) that were initially classified as “unknown” or “box” were reacquired (Table 4-5). No targets were identified as MEC items. The reacquired targets were classified as nine anchors, one piece of angle iron, one crab pot, several pieces of timber or pilings, two drums, two sunken buoys, and unknown debris. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there are 41 targets that were initially classified as “unknown” or “box” and meet the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

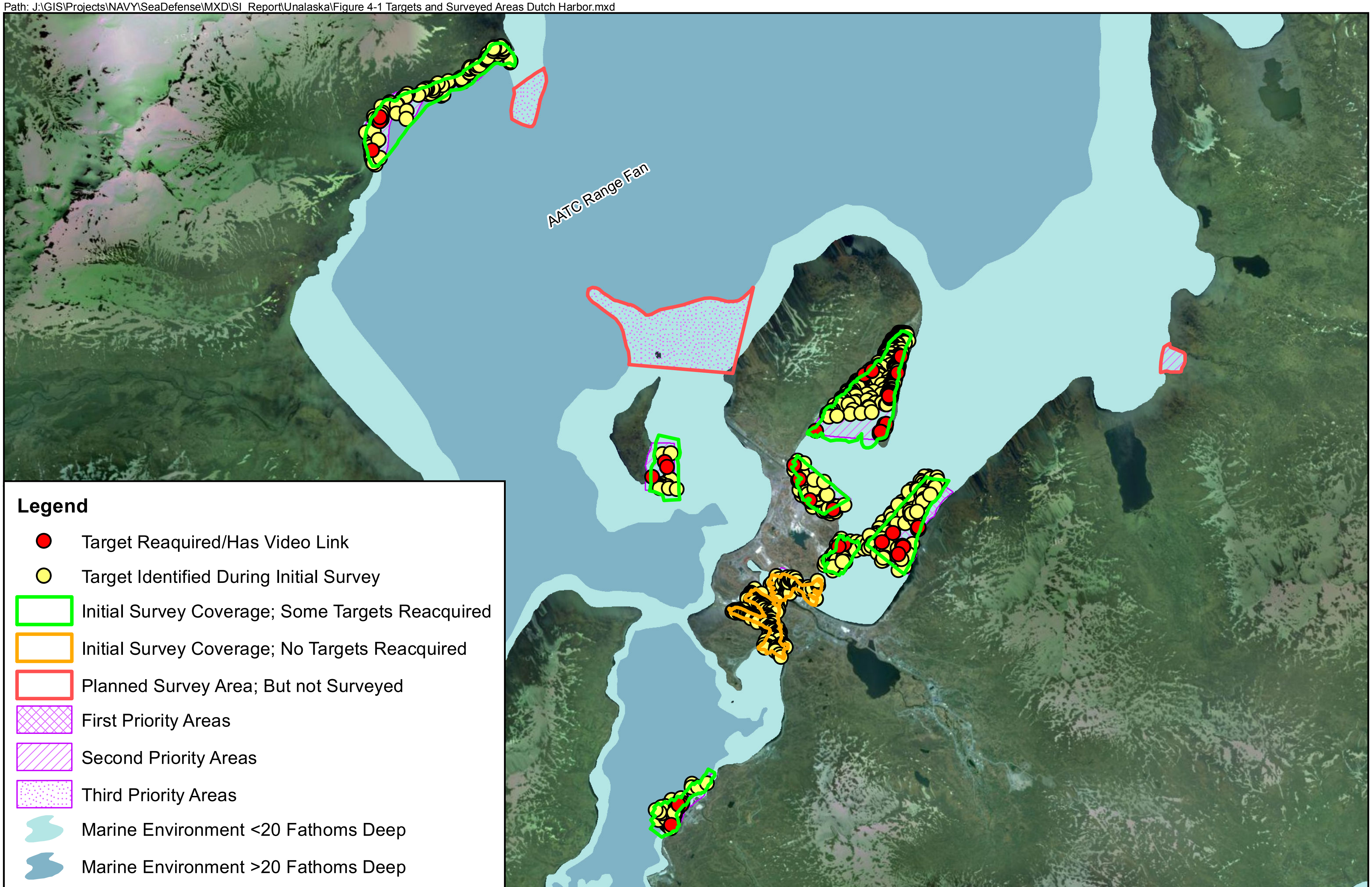
4.4.3 Former Barge Docks at Otter Point

The survey team on Blackfoot conducted the WAA survey of the Former Barge Docks at Otter Point area on May 31, 2015, and detected 159 targets. The locations of the targets identified during the WAA survey using the sidescan sonar are shown on Figure 4-17. Better viewing of the sidescan sonar results may be seen in this area on the interactive GIS map (Appendix E). The initial classification based on the WAA survey indicate that 141 targets were likely inert items (debris and pilings), and 18 targets were classified as unknown objects (Table 4-3).

As part of the RV survey of the Former Barge Docks at Otter Point area on June 2, 2015, the survey team on the *Island C* used the ROV to reacquire 14 targets shown as the red-colored target locations on Figure 4-17. Videos recorded while reacquiring these targets are linked to the red targets on the interactive map (Appendix E on DVD). In addition, the seafloor near the northernmost former barge dock was inspected items using the ROV as represented by the small red line on Figure 4-17. Several of the reacquired targets were near the other two former barge docks.

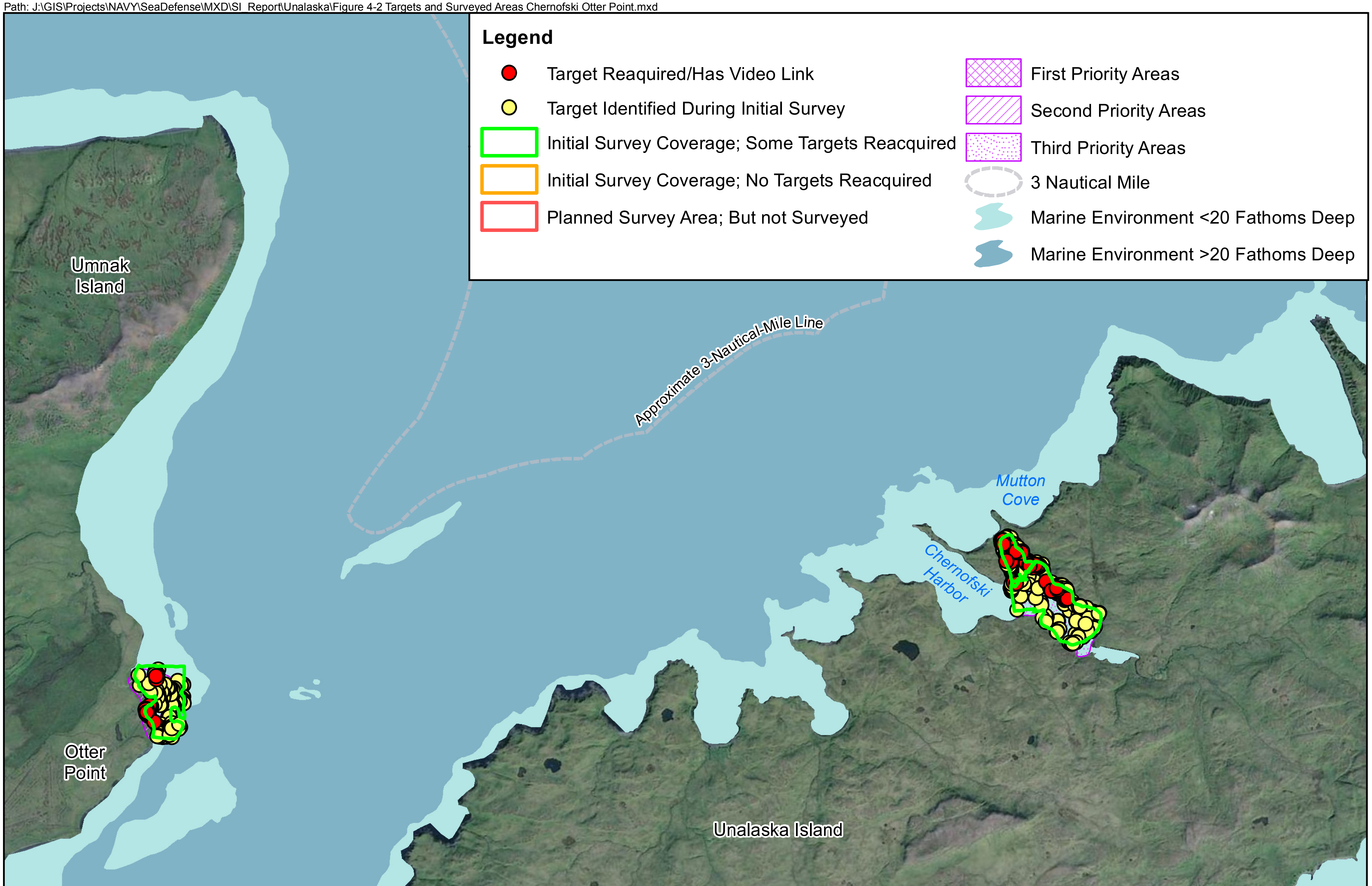
Table 4-4 lists the characteristics of each reacquired target, including coordinates, approximate dimensions, and classification. Twelve of the 18 targets (67%) that were initially classified as “unknown” or “box” were reacquired (Table 4-5). No MEC item was identified. The reacquired targets were classified as timber pilings, one fence panel, four metal frames, four rocks, and three unknown items because they were covered with kelp. Further sorting of the characteristics of the targets in Appendix C shows that of the remaining targets that were not reacquired in this survey area, there is one target that was initially classified as “unknown” or “box” and meets the size criterion (less than 5 feet in all directions per Section 3.3) (Table 4-5).

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-1 Targets and Surveyed Areas Dutch Harbor.mxd

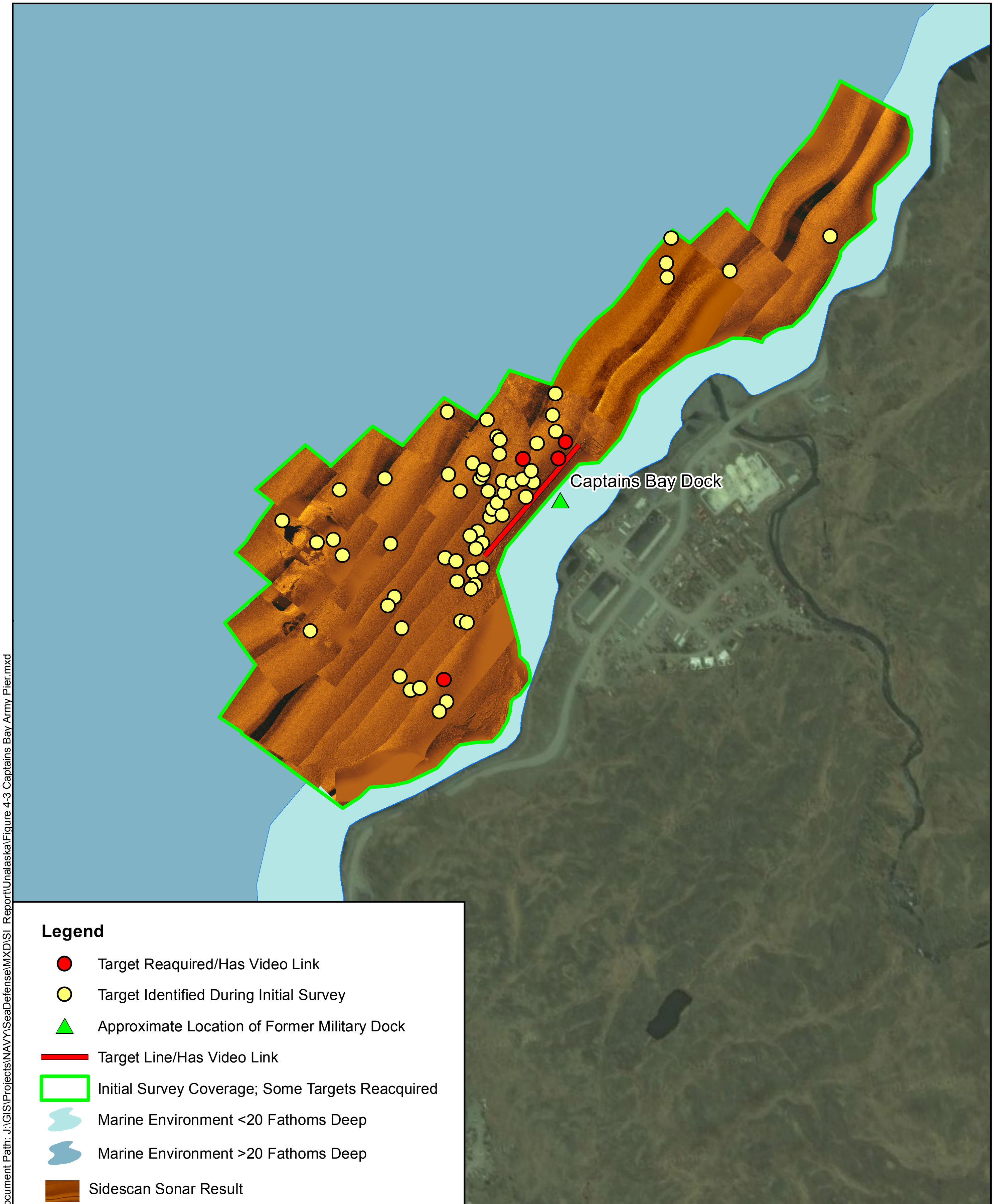


U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska		**Figure 4-1** **Surveyed Areas Showing Target Locations in the Vicinity of Dutch Harbor, Unalaska Island**

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-2 Targets and Surveyed Areas Chernofski Otter Point.mxd



U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	0 1 2 Scale In Miles	**Figure 4-2** **Surveyed Areas Showing Target Locations in the Vicinity of Chernofski Harbor, Unalaska Island, and Otter Point, Umnak Island**



Legend

- Target Reaquired/Has Video Link
- Target Identified During Initial Survey
- Approximate Location of Former Military Dock
- Target Line/Has Video Link
- Initial Survey Coverage; Some Targets Reacquired
- Marine Environment <20 Fathoms Deep
- Marine Environment >20 Fathoms Deep
- Sidescan Sonar Result

Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-3 Captains Bay Army Pier.mxd

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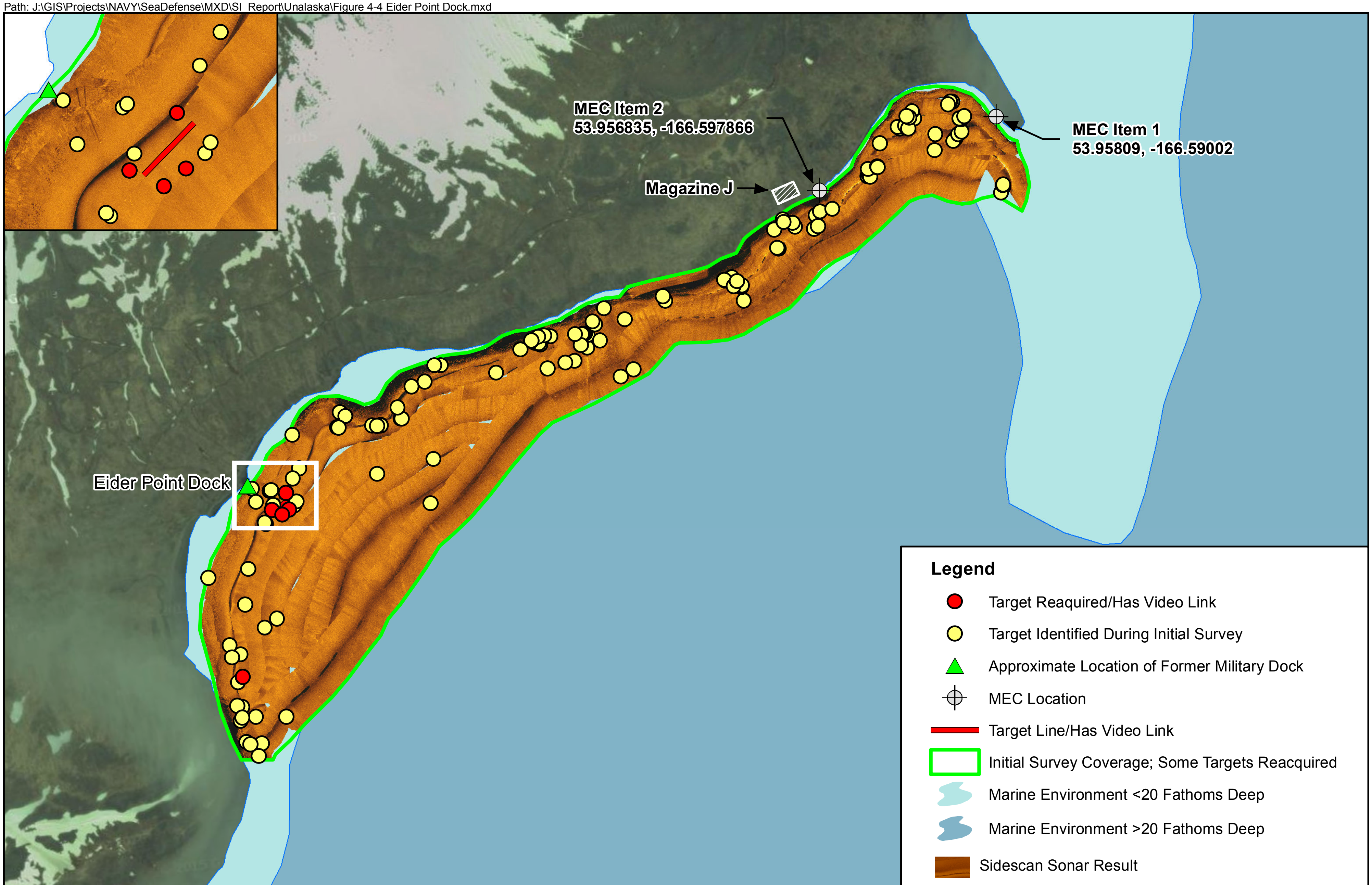
Unalaska Island, Alaska

0 300 600
Scale In Feet

Figure 4-3
Army Dock in Captains Bay,
Sidescan Sonar Results and Target Locations

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-4 Eider Point Dock.mxd



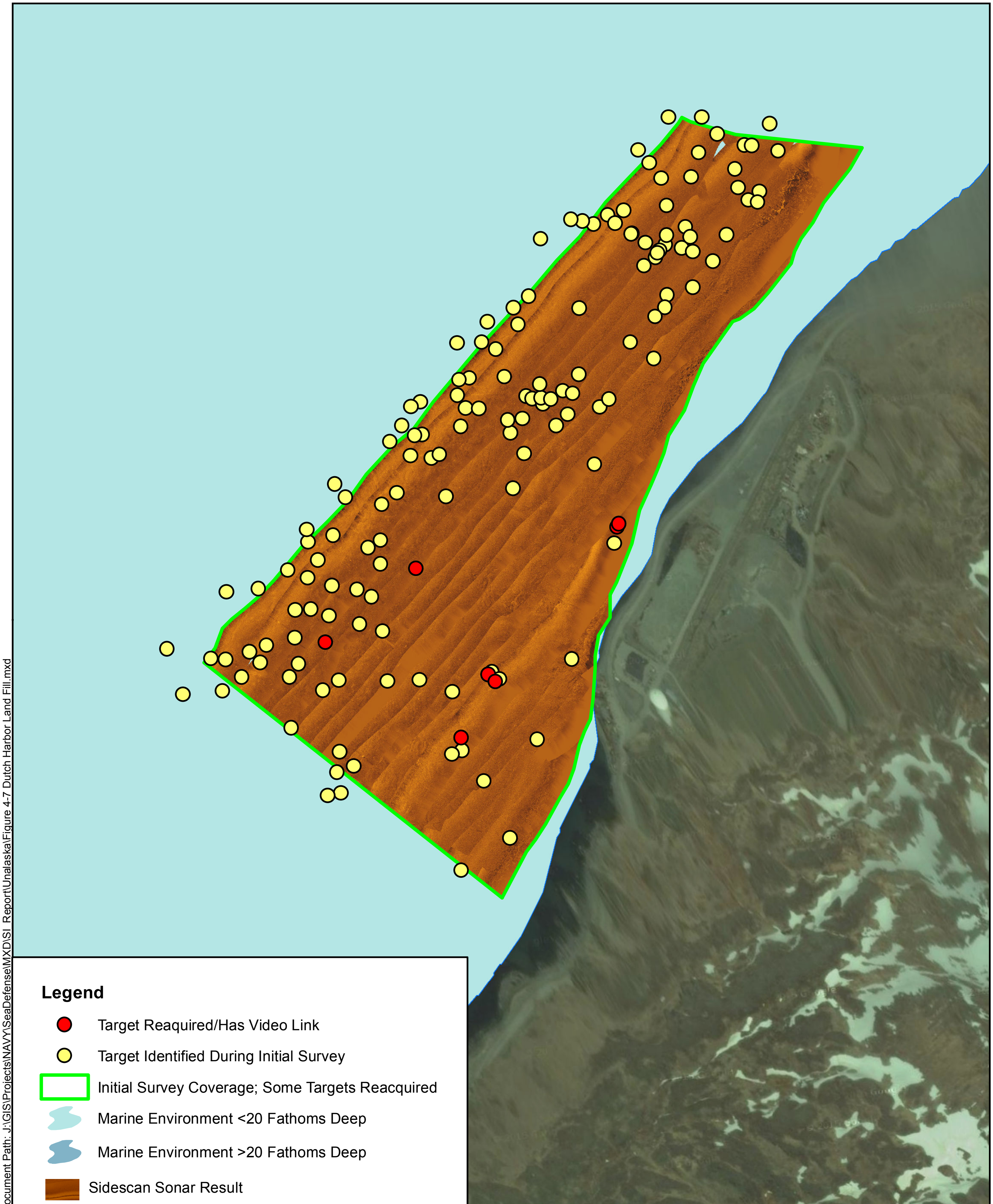
U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	0 600 1,200 Scale In Feet	**Figure 4-4** **Shoreline of Unalaska Bay at Eider Point Dock, Sidescan Sonar Results and Target Locations**

MEC Item 1

MEC Item 2

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 4-5** **MEC Items Found on Shoreline of Unalaska Bay at Eider Point**

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 4-6** **Abundant Kelp Along Eider Point Shoreline**



Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-7 Dutch Harbor Land Fill.mxd

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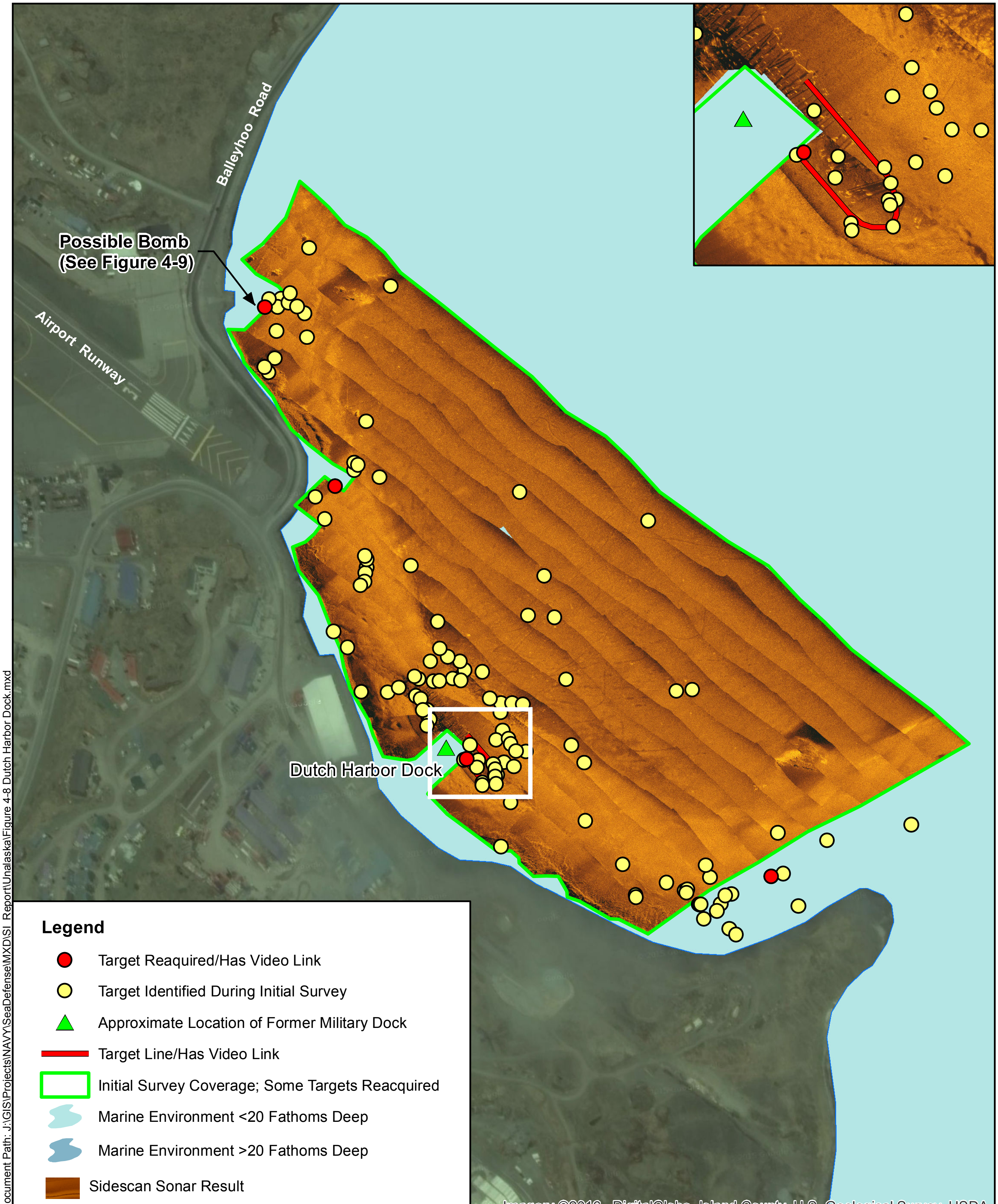
Unalaska Island, Alaska

0 400 800
Scale In Feet

Figure 4-7
Seafloor Near Dutch Harbor Land Fill, Sidescan Sonar Results and Target Locations



Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI Report\Unalaska\Figure 4-8 Dutch Harbor Dock.mxd

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	N 0 250 500 Scale In Feet	Figure 4-8 Dutch Harbor Dock Sidescan Sonar Results and Target Locations

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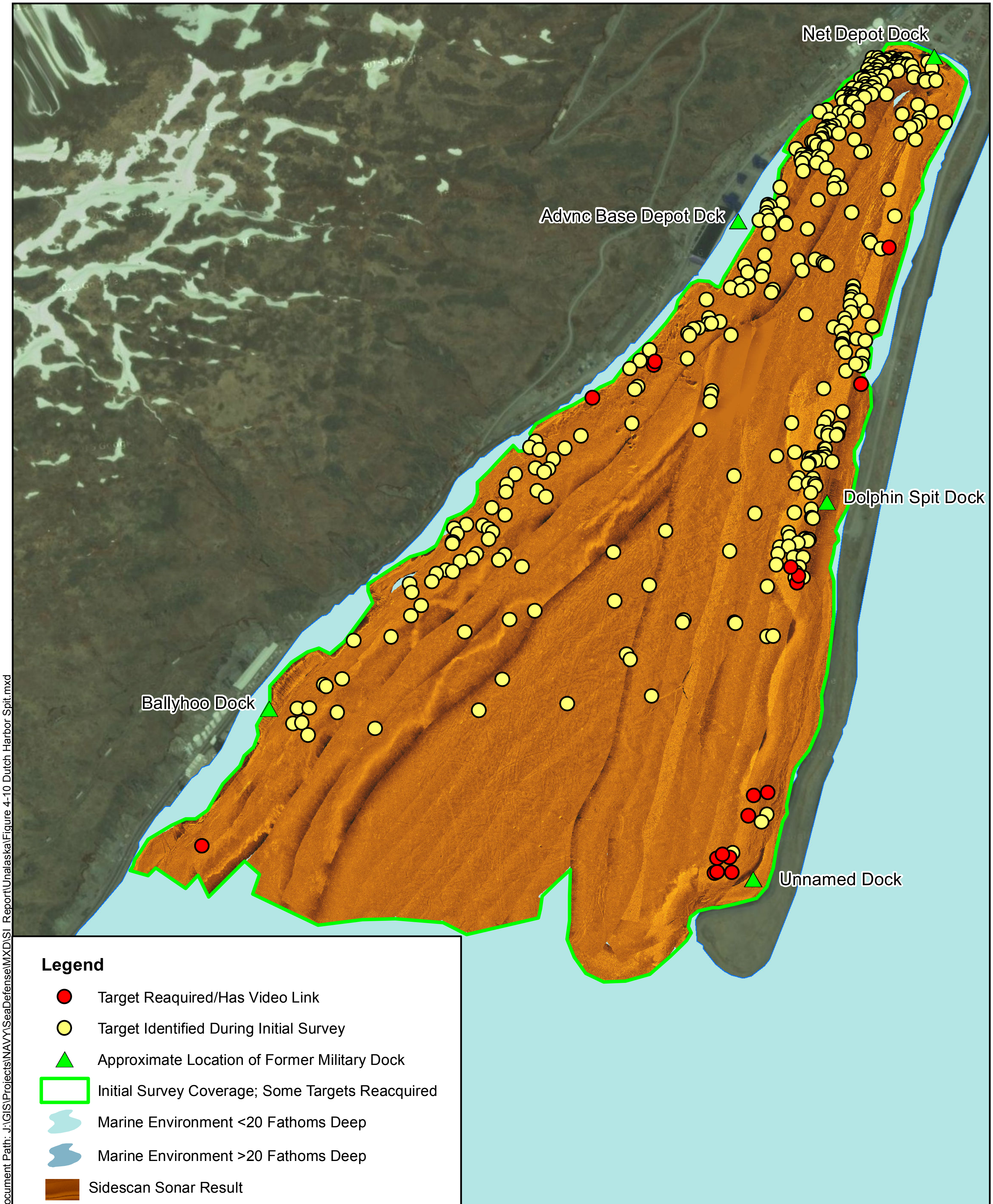
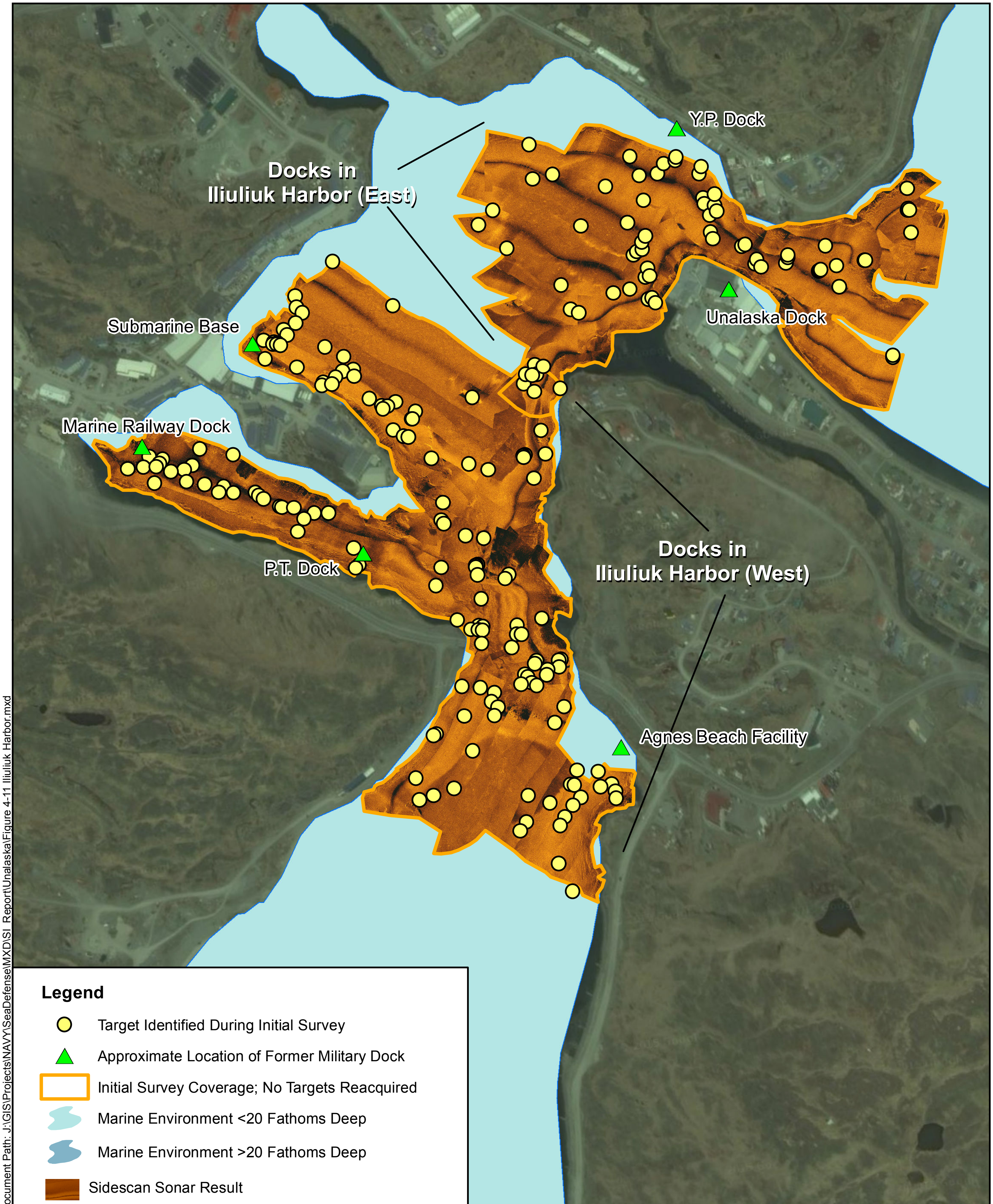
U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 4-9** **Possible Bomb or Tank at** **Dutch Harbor Dock Survey Area (Target 1)**



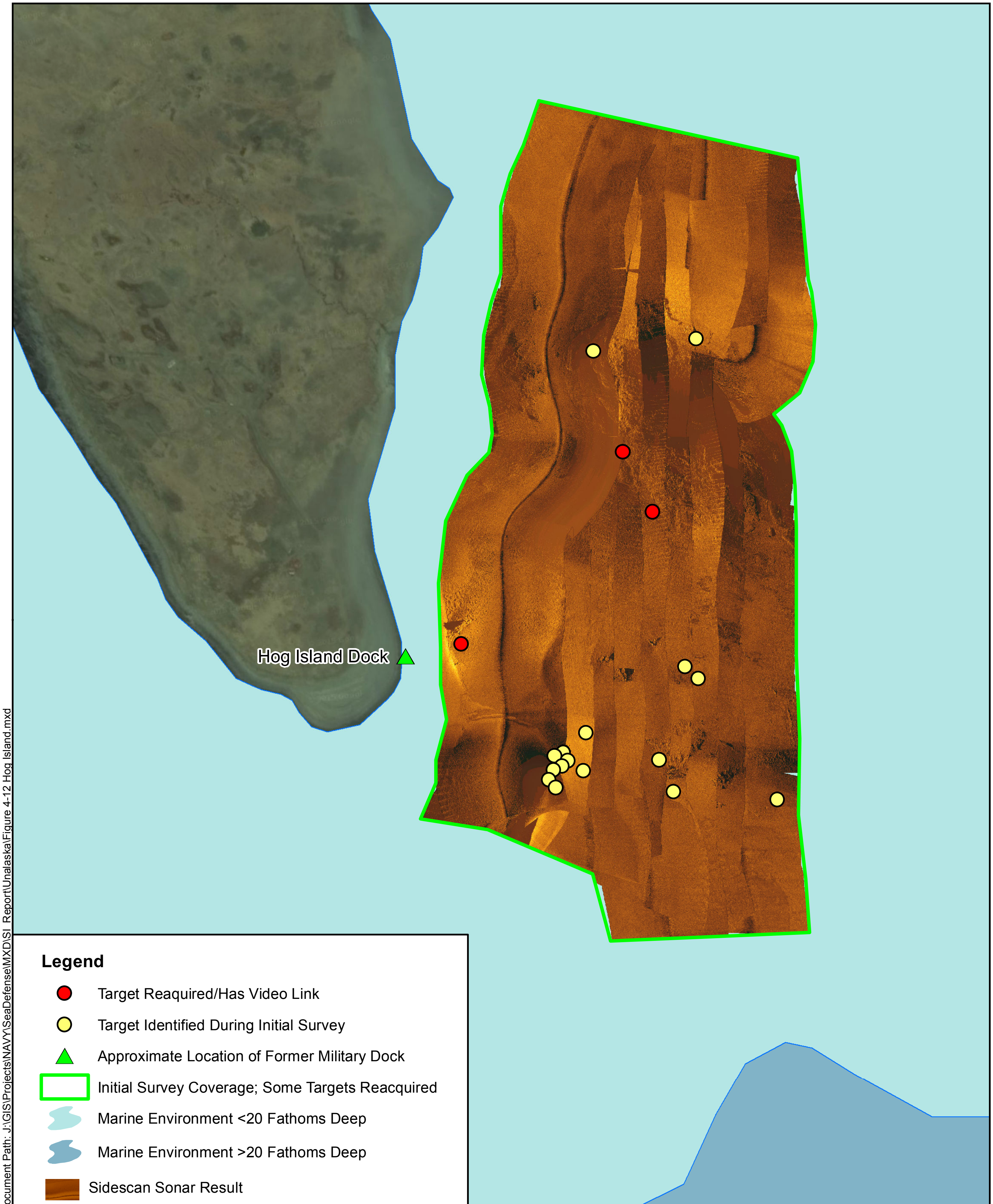
Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-10 Dutch Harbor Spit.mxd

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska		**Figure 4-10** **Additional Dock Areas Near Dutch Harbor Spit, Sidescan Sonar Results and Target Locations**



Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-11 Iliuliuk Harbor.mxd

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska		**Figure 4-11** **Docks in Iliuliuk Harbor (East and West),** **Sidescan Sonar Results and Target Locations**



Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-12 Hog Island.mxd

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Unalaska Island, Alaska

Figure 4-12
Hog Island Dock,
Sidescan Sonar Results and Target Locations

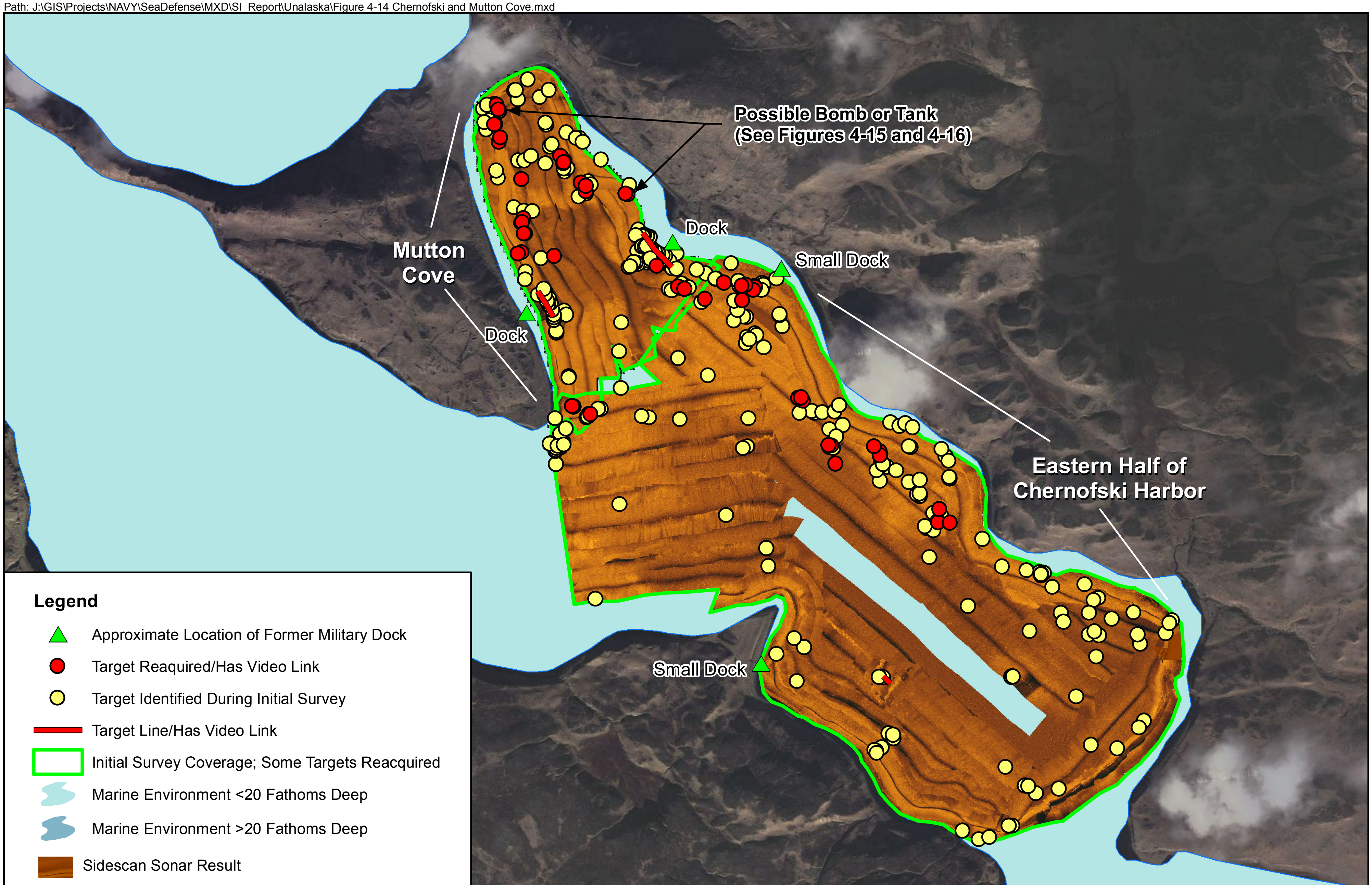
Legend

- Target Reaquired/Has Video Link
- Target Identified During Initial Survey
- Approximate Location of Former Military Dock
- Initial Survey Coverage; Some Targets Reacquired
- Marine Environment <20 Fathoms Deep
- Marine Environment >20 Fathoms Deep
- Sidescan Sonar Result

Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-13 Dutch Harboor Fuel Dock.mxd

U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	N 0 200 400 Scale In Feet	**Figure 4-13** **Fuel Oil Dock,** **Sidescan Sonar Results and Target Locations**

Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-14 Chernofski and Mutton Cove.mxd



U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	N 0 750 1,500 Scale In Feet	Figure 4-14 Mutton Cove and Eastern Half of Chernofski Harbor, Sidescan Sonar Results and Target Locations

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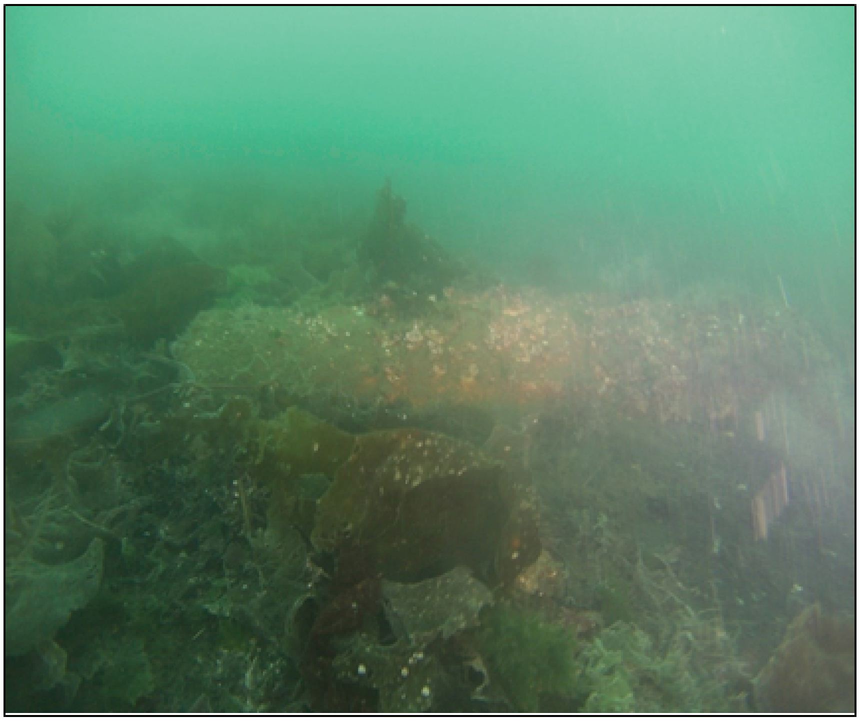
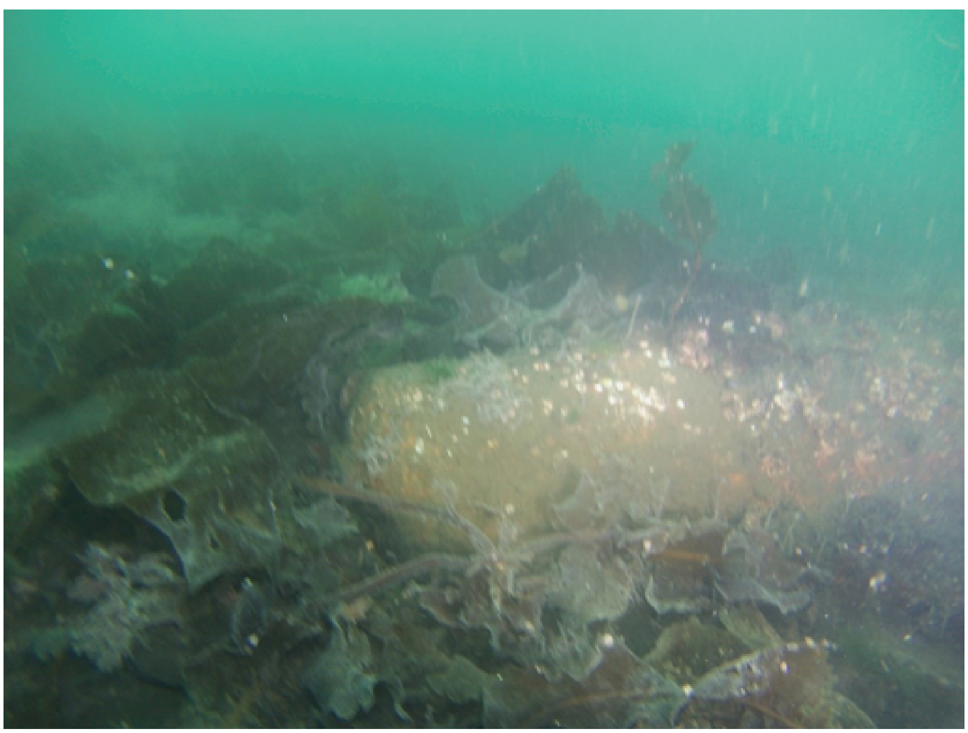
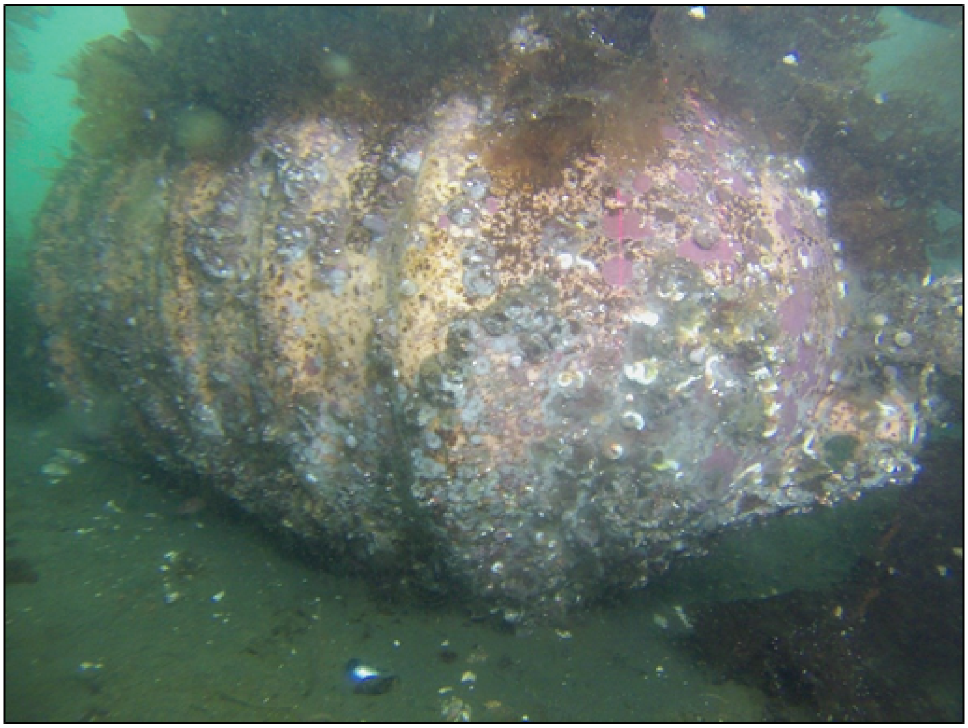


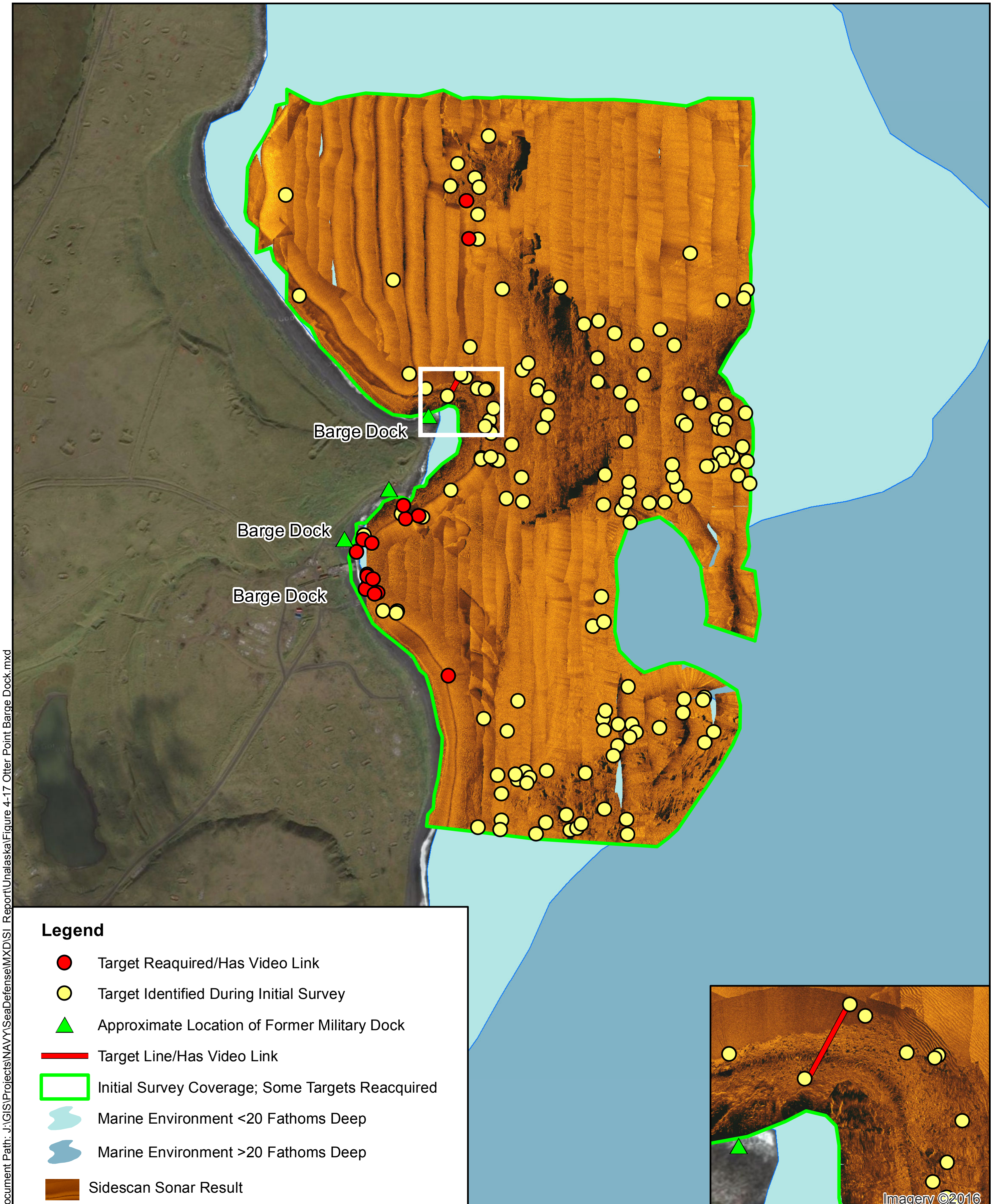


U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 4-15** **Possible Bomb or Tank in Mutton Cove, Target 4**

60413578_37.ai



U.S. NAVY	Delivery Order 0080 SI Report Naval Defensive Sea Area Unalaska Island, Alaska	**Figure 4-16** **Possible Bomb or Tank in Mutton Cove, Target 36**



Document Path: J:\GIS\Projects\NAVY\SeaDefense\MXD\SI_Report\Unalaska\Figure 4-17 Otter Point Barge Dock.mxd

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Naval Defensive
Sea Area
Unalaska Island, Alaska

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Scale In Feet

Figure 4-17
Former Barge Docks at Otter Point,
Sidescan Sonar Results and Target Locations

Table 4-1
Schedule of Survey Areas During Unalaska NDSA SI Surveys

Date	Vessel	Survey Area at Unalaska NDSA	Survey Type
5/27/2015	MV *Island C*	Army Dock in Captains Bay	sidescan sonar
	Blackfoot	Docks in the Iliuliuk Harbor Area (East) (start initial survey)	interferometric sonar
5/28/2015	MV *Island C*	Seafloor near Dutch Harbor Landfill Fuel Oil Dock	sidescan sonar
	Blackfoot	Docks in the Iliuliuk Harbor Area (East) (poor weather - short day finish initial survey)	interferometric sonar
5/29/2015 (day)	MV *Island C*	Hog Island Dock AATC on Amaknak Island (start initial survey)	sidescan sonar
	Blackfoot	Dutch Harbor Dock Docks in the Iliuliuk Harbor Area (West)	interferometric sonar
5/29/2015 (night)	MV *Island C and Blackfoot*	Motor to Chernofski Harbor	mobilize to remote area
5/30/2015	MV *Island C*	Otter Point	support
	Blackfoot	Otter Point	interferometric sonar
5/31/2015	MV *Island C*	Eastern Half of Chernofski Harbor (start initial survey)	sidescan sonar ROV
	Blackfoot	Mutton Cove	interferometric sonar
6/1/2015	MV *Island C*	Eastern Half of Chernofski Harbor\ Mutton Cove	ROV
	Blackfoot	Eastern Half of Chernofski Harbor (finish initial survey)	interferometric sonar
6/2/2015	MV *Island C*	Mutton Cove	ROV
	Blackfoot	Otter Point	ROV
6/2/2015 (night)	MV *Island C and Blackfoot*	Motor to Dutch Harbor	demobilize from remote area
6/3/2015	MV *Island C*	Additional Docks near Dutch Harbor Spit	sidescan sonar
	Blackfoot	Summer Bay Dock (attempted)	interferometric sonar
6/4/2015	MV *Island C*	Eider Point	support
	Blackfoot	Eider Point	interferometric sonar
6/5/2015	MV *Island C*	Eider Point Hog Island Dock Army Dock in Captains Bay	ROV
	Blackfoot	Eider Point	visual inspection at shoreline

Table 4-1 (Continued)
Schedule of Survey Areas During Unalaska NDSA SI Surveys

Date	Vessel	Survey Area at Unalaska NDSA	Survey Type
6/6/2015	MV *Island C*	Seafloor near Dutch Harbor Landfill Dutch Harbor Dock (start) Fuel Oil Dock	ROV
6/7/2015	MV *Island C*	Dutch Harbor Dock (finish) Additional Docks near Dutch Harbor Spit	ROV

Notes:
NSDA - Naval Defense Sea Area
ROV - remotely operated vehicle
MV - motor vessel

Table 4-2
Summary of Targets Identified and Reacquired During Unalaska NDSA WAA and RV Surveys

Survey Area[a]	WAA Survey Date	Targets Identified	RV Survey Date	Targets Reacquired
Dutch Harbor				
Army Dock in Captains Bay	5/27/15	65	6/5/15	5[b]
Eider Point	6/4/15	139	6/5/15	6[b]
Seafloor near Dutch Harbor Landfill	5/28/15	153	6/6/15	5
Dutch Harbor Dock	5/29/15	120	6/6/15	5[b]
Additional Docks near Dutch Harbor Spit	6/3/15	373	6/7/15	18
Docks in the Iliuliuk Harbor Area (East)	5/27/15–5/28/15	73	NA	NA
Docks in the Iliuliuk Harbor Area (West)	5/29/15	149	NA	NA
Hog Island Dock	5/29/15	19	6/5/15	3
Summer Bay Dock	NA	NA	NA	NA
Fuel Oil Dock	5/28/15	60	6/6/15	4
AATC on Amaknak Island	NA	NA	NA	NA
Chernofski Harbor and Otter Point				
Mutton Cove Docks	5/31/15	152	6/1/15–6/2/15	25[c]
Former Barge Docks at Otter Point	5/30/15	159	6/2/15	15[b]
Eastern Half of Chernofski Harbor	5/31/15–6/1/15	210	5/31/15–6/1/15	23[b]
Total		1,672		109

[a]The geophysical subcontractor (Gravity) used slightly different names for the survey areas.
[b]Includes one target line
[c]Includes two target lines

Notes:
NA - not applicable
NDSA - Naval Defensive Sea Area
RV - reacquisition and verification
WAA - Wide Area Assessment

Table 4-3
Summary of Initial Target Classification Based on WAA Survey

Survey Area[a]	Anchor (possible)	Anchor Block	Box or Crate	Buoy	Cylinder or Cylindrical Target	Debris, Debris Cluster, Debris Field	Fish Trap(s)	Kayak	Piling	Timber	Tires	Unknown, Blank, or Cluster of Targets	Wreck	Total
Dutch Harbor														
Army Dock in Captains Bay	0	0	5	0	1	28	8	0	17	0	0	6	0	65
Eider Point	0	0	21	0	3	7	4	0	15	0	0	87	2	139
Seafloor near Dutch Harbor Landfill	0	0	1	0	1	86	22	0	2	0	0	40	1	153
Dutch Harbor Dock	0	0	0	0	0	16	2	1	38	0	4	58	1	120
Additional Docks near Dutch Harbor Spit	0	0	0	0	0	176	36	0	63	2	1	94	1	373
Docks in the Iliuliuk Harbor Area (East)	0	0	0	0	0	5	8	0	15	0	0	43	2	73
Docks in the Iliuliuk Harbor Area (West)	0	0	0	0	0	104	10	0	31	0	1	0	3	149
Hog Island Dock	0	0	0	0	0	4	0	0	4	0	0	11	0	19
Summer Bay Dock	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fuel Oil Dock	0	0	1	0	0	7	12	0	9	0	0	31	0	60
AATC on Amaknak Island	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chernofski Harbor and Otter Point														
Mutton Cove Docks	0	4	0	1	0	16	2	0	67	0	0	62	0	152
Former Barge Docks at Otter Point	0	0	0	0	0	124	0	0	16	0	0	18	1	159
Eastern Half of Chernofski Harbor	2	0	2	0	0	3	8	0	33	0	0	161	1	210
Total	2	4	30	1	5	576	112	1	310	2	6	611	12	1,672

[a]The geophysical subcontractor (Gravity) used slightly different names for the survey areas.

Notes:
NA - not applicable
WAA - Wide Area Assessment

Table 4-4
Reacquired Targets and Related Characteristics

Survey Area[a]	WAA Target ID	RV Target ID	Easting[b]	Northing[b]	Height (feet)	Length (feet)	Width feet)	Classification
Dutch Harbor								
Army Dock in Captains Bay	WAA_SSS_400kHz_CaptainsBayArmyPier_2	RI_ROV_CaptainsBayArmyPier_Target_02	5310352	1174498	2.3	2.8	1.7	Heavily corroded rectangular object
	WAA_SSS_400kHz_CaptainsBayArmyPier_3	RI_ROV_CaptainsBayArmyPier_Target_03	5310151	1174421	0.9	3.6	1.8	Battery
	WAA_SSS_400kHz_CaptainsBayArmyPier_4	RI_ROV_CaptainsBayArmyPier_Target_04	5310317	1174422	1.9	3.1	1.9	Tire
	WAA_SSS_400kHz_CaptainsBayArmyPier_9	RI_ROV_CaptainsBayArmyPier_Target_09	5309781	1173387	2	4	1.3	Corroded 55-gallon drum
Eider Point	WAA_SSS_400kHz_EiderPointDock_4	RI_ROV_EiderPointDock_Target_04	5294791	1207229	0.3	4.4	3.4	Pipe driven into sediment
	WAA_SSS_400kHz_EiderPointDock_9	RI_ROV_EiderPointDock_Target_09	5295055	1208753	0.6	3.9	1.1	Timber piling
	WAA_SSS_400kHz_EiderPointDock_12	RI_ROV_EiderPointDock_Target_12	5295150	1208710	0.6	6	2.4	Timber piling
	WAA_SSS_400kHz_EiderPointDock_13	RI_ROV_EiderPointDock_Target_13	5295185	1208910	3.1	12.7	5.9	Fish Trap
	WAA_SSS_400kHz_EiderPointDock_14	RI_ROV_EiderPointDock_Target_14	5295210	1208758	1.1	6.4	2.1	Timber debris and fishing gear
Seafloor near Dutch Harbor Landfill	WAA_SSS_400kHz_DutchHarborLandFill_1	RI_ROV_DutchHarborLandFill_Target_01	5322191	1188323	0.6	2.8	1.3	Not observed
	WAA_SSS_400kHz_DutchHarborLandFill_2	RI_ROV_DutchHarborLandFill_Target_02	5322182	1188301	0.6	3.2	1.9	Timber with cable and heavy growth
	WAA_SSS_400kHz_DutchHarborLandFill_3	RI_ROV_DutchHarborLandFill_Target_03	5320927	1188042	1.4	6.8	1.9	Fishing Buoy
	WAA_SSS_400kHz_DutchHarborLandFill_5	RI_ROV_DutchHarborLandFill_Target_05	5320360	1187580	1.6	6.2	2.8	Unknown Target with Access Door
	WAA_SSS_400kHz_DutchHarborLandFill_7	RI_ROV_DutchHarborLandFill_Target_07	5321376	1187380	3.3	2.7	4.8	Fish Trap
	WAA_SSS_400kHz_DutchHarborLandFill_8	RI_ROV_DutchHarborLandFill_Target_08	5321423	1187336	1	8.1	4.2	Fish Trap
	WAA_SSS_400kHz_DutchHarborLandFill_9	RI_ROV_DutchHarborLandFill_Target_09	5321209	1186986	2	2.1	3.2	Not observed
Dutch Harbor Dock	WAA_SSS_400kHz_DutchHarborDock1_1	RI_ROV_DutchHarborDock1_Target_01	5315970	1191441	1.3	6.3	3.2	Possible Bomb
	WAA_SSS_400kHz_DutchHarborDock1_2	RI_ROV_DutchHarborDock1_Target_02	5316242	1190745	1.6	6	2.3	Tire
	WAA_SSS_400kHz_DutchHarborDock1_3	RI_ROV_DutchHarborDock1_Target_03	5316752	1189687	0.4	3.5	1.5	Rock
	WAA_SSS_400kHz_DutchHarborDock1_5	RI_ROV_DutchHarborDock1_Target_05	5317935	1189231	5.2	25	15.6	Crab Pot
Additional Docks near Dutch Harbor Spit	WAA_SSS_400kHz_DutchHarborSpit_1	RI_ROV_DutchHarborSpit_Target_01	5321337	1196905	1.3	4.4	1.1	Pyramid fish trap
	WAA_SSS_400kHz_DutchHarborSpit_2	RI_ROV_DutchHarborSpit_Target_02	5320356	1193002	1.4	6.1	3.5	Two pieces of timber
	WAA_SSS_400kHz_DutchHarborSpit_3	RI_ROV_DutchHarborSpit_Target_03	5320248	1192999	1.2	2.8	2	Rusted drum
	WAA_SSS_400kHz_DutchHarborSpit_4	RI_ROV_DutchHarborSpit_Target_04	5320263	1193005	0.2	3.3	3.4	Rock
	WAA_SSS_400kHz_DutchHarborSpit_5	RI_ROV_DutchHarborSpit_Target_05	5320339	1193094	0	7.7	5.1	Television
	WAA_SSS_400kHz_DutchHarborSpit_6	RI_ROV_DutchHarborSpit_Target_06	5320263	1193089	1.3	6.1	3.1	Heavily corroded rectangular object
	WAA_SSS_400kHz_DutchHarborSpit_7	RI_ROV_DutchHarborSpit_Target_07	5320297	1193115	0	5.1	4.2	Timber Debris
	WAA_SSS_400kHz_DutchHarborSpit_11	RI_ROV_DutchHarborSpit_Target_11	5320458	1193357	4.7	3.6	2.1	Tire
	WAA_SSS_400kHz_DutchHarborSpit_12	RI_ROV_DutchHarborSpit_Target_12	5320493	1193482	1.4	4	3.3	Tire
	WAA_SSS_400kHz_DutchHarborSpit_13	RI_ROV_DutchHarborSpit_Target_13	5320579	1193502	1.2	3.8	2.1	Derelict section of steel sheeting
	WAA_SSS_400kHz_DutchHarborSpit_14	RI_ROV_DutchHarborSpit_Target_14	5317047	1193167	1.8	12.8	2.4	Cut-off pipe piling
	WAA_SSS_400kHz_DutchHarborSpit_15	RI_ROV_DutchHarborSpit_Target_15	5320762	1194810	2.6	5	3.2	Section of cut of pipe
	WAA_SSS_400kHz_DutchHarborSpit_16	RI_ROV_DutchHarborSpit_Target_16	5320773	1194856	0.6	3.9	2.1	High Flyer from Fishing Gear

Table 4-4 (Continued)
Reacquired Targets and Related Characteristics

Survey Area[a]	WAA Target ID	RV Target ID	Easting[b]	Northing[b]	Height (feet)	Length (feet)	Width feet)	Classification
	WAA_SSS_400kHz_DutchHarborSpit_17	RI_ROV_DutchHarborSpit_Target_17	5320723	1194909	1.4	3.4	1.9	Rocks
	WAA_SSS_400kHz_DutchHarborSpit_18	RI_ROV_DutchHarborSpit_Target_18	5321162	1196054	1.5	2.3	1.7	Rocks
	WAA_SSS_400kHz_DutchHarborSpit_21	RI_ROV_DutchHarborSpit_Target_21	5319485	1195966	0.7	4.4	2	Rocks
	WAA_SSS_400kHz_DutchHarborSpit_22	RI_ROV_DutchHarborSpit_Target_22	5319869	1196170	2.1	3.8	1.5	Rocks
	WAA_SSS_400kHz_DutchHarborSpit_23	RI_ROV_DutchHarborSpit_Target_23	5319877	1196195	1	2.4	2.9	Timber fender panel
Hog Island Dock	WAA_SSS_400kHz_HogIsland-0003	RI_ROV_HogIsland_Target_03	5309470	1191592	1.1	6.1	3.2	Pipe (frame from old pier)
	WAA_SSS_400kHz_HogIsland-0004	RI_ROV_HogIsland_Target_04	5309586	1191358	0.6	10.4	8.4	Pipe (frame from old pier)
	WAA_SSS_400kHz_HogIsland-0005	RI_ROV_HogIsland_Target_05	5308840	1190842	8.3	109.2	34.7	Pipe (frame from old pier)
Fuel Oil Dock	WAA_SSS_400kHz_DutchHarborFuelDock_1	RI_ROV_DutchHarborFuelDock_Target_01	5318495	1187544	4.1	3.6	1.5	Rock
	WAA_SSS_400kHz_DutchHarborFuelDock_2	RI_ROV_DutchHarborFuelDock_Target_02	5318502	1187507	1.8	1.1	1.1	Rock
	WAA_SSS_400kHz_DutchHarborFuelDock_3	RI_ROV_DutchHarborFuelDock_Target_03	5318448	1187464	4.2	2	1	Rock
	WAA_SSS_400kHz_DutchHarborFuelDock_4	RI_ROV_DutchHarborFuelDock_Target_04	5318191	1187350	0	4.2	1.7	Block
Chernofski Harbor and Otter Point								
Mutton Cove Docks	WAA_SSS_400kHz_MuttonCove_MC-04	RI_ROV_MuttonCove_Target_MC-04	5126076	988476	0	5.3	1.2	Tank or possible bomb
	WAA_SSS_400kHz_MuttonCove_MC-05	RI_ROV_MuttonCove_Target_MC-05	5126093	988423	0.2	5.3	1.3	Timber Debris
	WAA_SSS_400kHz_MuttonCove_MC-06	RI_ROV_MuttonCove_Target_MC-06	5126044	988254	0.7	3.2	2.8	55-Gallon Drum - Full of Product
	WAA_SSS_400kHz_MuttonCove_MC-10	RI_ROV_MuttonCove_Target_MC-10	5126113	988103	0.4	5.7	1.2	Wood/timber beam
	WAA_SSS_400kHz_MuttonCove_MC-12	RI_ROV_MuttonCove_Target_MC-12	5126103	988055	0.6	6.1	0.6	Wood/timber beam
	WAA_SSS_400kHz_MuttonCove_MC-17	RI_ROV_MuttonCove_Target_MC-17	5126800	987892	0	0	0	Not observed
	WAA_SSS_400kHz_MuttonCove_MC-19	RI_ROV_MuttonCove_Target_MC-19	5126847	987842	0	0	0	Unknown. Heavy marine growth
	WAA_SSS_400kHz_MuttonCove_MC-21	RI_ROV_MuttonCove_Target_MC-21	5126839	987824	2.9	6.5	5	Unknown corroded object
	WAA_SSS_400kHz_MuttonCove_MC-23	RI_ROV_MuttonCove_Target_MC-23	5126835	987810	0	0	0	Concrete pyramid anchor
	WAA_SSS_400kHz_MuttonCove_MC-28	RI_ROV_MuttonCove_Target_MC-28	5126356	987626	1.2	7.4	9.5	Concrete anchor
	WAA_SSS_400kHz_MuttonCove_MC-30	RI_ROV_MuttonCove_Target_MC-30	5127035	987586	0.8	5.6	4.3	Anchor Block
	WAA_SSS_400kHz_MuttonCove_MC-33	RI_ROV_MuttonCove_Target_MC-33	5127089	987490	6.1	16.5	5.7	Anchor
	WAA_SSS_400kHz_MuttonCove_MC-35	RI_ROV_MuttonCove_Target_MC-35	5127544	987463	1.8	6.3	2.6	Rocks
	WAA_SSS_400kHz_MuttonCove_MC-36	RI_ROV_MuttonCove_Target_MC-36	5127572	987452	2	4.7	2.3	Possible Bomb
	WAA_SSS_400kHz_MuttonCove_MC-37	RI_ROV_MuttonCove_Target_MC-37	5126380	987185	2	8.6	7.9	Anchor Block
	WAA_SSS_400kHz_MuttonCove_MC-38	RI_ROV_MuttonCove_Target_MC-38	5126363	987137	4.1	6.6	7.2	Anchor Block and Sunken Buoy
	WAA_SSS_400kHz_MuttonCove_MC-40	RI_ROV_MuttonCove_Target_MC-40	5126387	987007	0	0	0	Concrete anchor
	WAA_SSS_400kHz_MuttonCove_MC-41	RI_ROV_MuttonCove_Target_MC-41	5126401	987009	0	0	0	Sunken buoy
	WAA_SSS_400kHz_MuttonCove_MC-45	RI_ROV_MuttonCove_Target_MC-45	5126357	986792	1.3	4	3.6	Cylindrical target
	WAA_SSS_400kHz_MuttonCove_MC-46	RI_ROV_MuttonCove_Target_MC-46	5126317	986777	1.4	3.3	1.4	Possible anchor
	WAA_SSS_400kHz_MuttonCove_MC-47	RI_ROV_MuttonCove_Target_MC-47	5126731	986751	0	0	0	Rock

Table 4-4 (Continued)
Reacquired Targets and Related Characteristics

Survey Area[a]	WAA Target ID	RV Target ID	Easting[b]	Northing[b]	Height (feet)	Length (feet)	Width feet)	Classification
	WAA_SSS_400kHz_MuttonCove_MC-57	RI_ROV_MuttonCove_Target_MC-57	5126937	985036	1.7	2.8	1.4	Unknown corroded object
	WAA_SSS_400kHz_MuttonCove_MC-58	RI_ROV_MuttonCove_Target_MC-58	5127144	984948	0	0	0	Unknown. Heavy marine growth
Former Barge Docks at Otter Point	WAA_SSS_400kHz_OtterPointBargeDock_1	RI_ROV_OtterPointBargeDock_Target_01	5057982	977539	0	8.1	3.6	Rock
	WAA_SSS_400kHz_OtterPointBargeDock_2	RI_ROV_OtterPointBargeDock_Target_02	5058003	977242	0	7.4	2.3	Rock
	WAA_SSS_400kHz_OtterPointBargeDock_4	RI_ROV_OtterPointBargeDock_Target_04	5057493	975157	3.4	5.1	5.9	Unknown / Covered with Kelp
	WAA_SSS_400kHz_OtterPointBargeDock_5	RI_ROV_OtterPointBargeDock_Target_05	5057611	975078	0.7	3	1.7	Pilings
	WAA_SSS_400kHz_OtterPointBargeDock_7	RI_ROV_OtterPointBargeDock_Target_07	5057509	975056	1	21.1	3	3 Pilings
	WAA_SSS_400kHz_OtterPointBargeDock_9	RI_ROV_OtterPointBargeDock_Target_09	5057177	974896	0.6	17.6	1.2	Fence Panel
	WAA_SSS_400kHz_OtterPointBargeDock_10	RI_ROV_OtterPointBargeDock_Target_10	5057248	974864	5.6	3.1	1.9	Rock
	WAA_SSS_400kHz_OtterPointBargeDock_11	RI_ROV_OtterPointBargeDock_Target_11	5057126	974798	0.3	6.5	1.9	Rock
	WAA_SSS_400kHz_OtterPointBargeDock_12	RI_ROV_OtterPointBargeDock_Target_12	5057212	974608	0.5	21.7	7.6	Metal frame
	WAA_SSS_400kHz_OtterPointBargeDock_13	RI_ROV_OtterPointBargeDock_Target_13	5057254	974587	0.7	5.1	1.6	Unknown / Covered with Kelp
	WAA_SSS_400kHz_OtterPointBargeDock_14	RI_ROV_OtterPointBargeDock_Target_14	5057196	974509	1	18.6	6.6	Metal frame/decking
	WAA_SSS_400kHz_OtterPointBargeDock_15	RI_ROV_OtterPointBargeDock_Target_15	5057289	974479	2.9	46.4	9	Metal frame / Possible dragger door
	WAA_SSS_400kHz_OtterPointBargeDock_16	RI_ROV_OtterPointBargeDock_Target_16	5057266	974469	0.8	11.7	7.7	Unknown / Covered with Kelp
	WAA_SSS_400kHz_OtterPointBargeDock_17	RI_ROV_OtterPointBargeDock_Target_17	5057843	973831	6	22.7	7.1	Metal Frame / Shipping Drawer
Eastern Half of Chernofski Harbor	WAA_SSS_400kHz_Chernofski-r0001	RI_ROV_Chernofski_Target_r0001	5127902	986639	1.2	2.6	2.8	Piling
	WAA_SSS_400kHz_Chernofski-r0005	RI_ROV_Chernofski_Target_r0005	5128144	986404	2.4	4.2	1.9	Crab Pot
	WAA_SSS_400kHz_Chernofski-r0006	RI_ROV_Chernofski_Target_r0006	5128667	986449	2.4	2.5	1.5	Drum
	WAA_SSS_400kHz_Chernofski-r0007	RI_ROV_Chernofski_Target_r0007	5128213	986376	1.9	11.8	3.1	Anchor
	WAA_SSS_400kHz_Chernofski-r0008	RI_ROV_Chernofski_Target_r0008	5128915	986421	0.7	10.4	1.3	Hollow timber
	WAA_SSS_400kHz_Chernofski-r0009	RI_ROV_Chernofski_Target_r0009	5128871	986411	0.7	13.7	1.5	Deteriorated timber beam
	WAA_SSS_400kHz_Chernofski-r0010	RI_ROV_Chernofski_Target_r0010	5129023	986399	0.5	13.4	2	Piling
	WAA_SSS_400kHz_Chernofski-r0012	RI_ROV_Chernofski_Target_r0012	5128999	986362	0.5	14.9	1.6	Piling
	WAA_SSS_400kHz_Chernofski-r0013	RI_ROV_Chernofski_Target_r0013	5128448	986264	1	4.1	3.2	Drum
	WAA_SSS_400kHz_Chernofski-r0014	RI_ROV_Chernofski_Target_r0014	5128874	986250	0.9	5.8	1.8	Timber debris
	WAA_SSS_400kHz_Chernofski-r0016	RI_ROV_Chernofski_Target_r0016	5129547	985139	2.1	4.8	3.9	Angle iron
	WAA_SSS_400kHz_Chernofski-r0017	RI_ROV_Chernofski_Target_r0017	5129515	985133	2.5	24.1	3.5	Tank/Fuel Tank
	WAA_SSS_400kHz_Chernofski-r0018	RI_ROV_Chernofski_Target_r0018	5129537	985131	2.9	8.3	2.1	15K Navy Anchor
	WAA_SSS_400kHz_Chernofski-r0019	RI_ROV_Chernofski_Target_r0019	5129566	985099	1.4	10.7	4.2	15K Navy Anchor
	WAA_SSS_400kHz_Chernofski-r0022	RI_ROV_Chernofski_Target_r0022	5129860	984592	4.6	23.9	4.7	Sunken buoy
	WAA_SSS_400kHz_Chernofski-r0023	RI_ROV_Chernofski_Target_r0023	5129891	984589	3.6	6.5	4.8	Unknown debris
	WAA_SSS_400kHz_Chernofski-r0024	RI_ROV_Chernofski_Target_r0024	5130382	984579	1.1	6.4	4.3	15K Navy Anchor
	WAA_SSS_400kHz_Chernofski-r0025	RI_ROV_Chernofski_Target_r0025	5130440	984524	5.4	30.5	5.7	Sunken buoy

Table 4-4 (Continued)
Reacquired Targets and Related Characteristics

Survey Area[a]	WAA Target ID	RV Target ID	Easting[b]	Northing[b]	Height (feet)	Length (feet)	Width feet)	Classification
	WAA_SSS_400kHz_Chernofski-r0026	RI_ROV_Chernofski_Target_r0026	5130443	984480	3.4	8.3	7.1	15K Navy Anchor
	WAA_SSS_400kHz_Chernofski-r0027	RI_ROV_Chernofski_Target_r0027	5129939	984384	4.5	8.5	7.6	Partially Buried Anchor
	WAA_SSS_400kHz_Chernofski-r0031	RI_ROV_Chernofski_Target_r0031	5131125	983863	1.2	56.2	1.3	Timber piling
	WAA_SSS_400kHz_Chernofski-r0033	RI_ROV_Chernofski_Target_r0033	5131247	983708	1.7	3.5	2.5	Anchor

[a]The geophysical subcontractor (Gravity) used slightly different names for the survey areas.
[b]North American Datum of 1983, Alaska (Zone 10) State Plane in feet

Notes:
ID - identification
RV - reacquisition and verification
WAA - wide area assessment

Table 4-5
Summary of Targets Initially Classified as "Unknown", "Box", or “Cylinder” That Were Reacquired

Survey Area[a]	All Targets Identified	Targets Initially Classified as Other than Unknown, Box, or Cylinder (Likely Inert)	Targets Initially Classified as Unknown, Box, or Cylinder	Total Targets Reacquired	Reacquired Targets Initially Classified as Unknown, Box, or Cylinder	Percent of All Targets That Were Reacquired	Percent of Targets Initially Classified as Unknown, Box, or Cylinder That Were Reacquired	Targets Initially Classified Unknown, Box, or Cylinder That Were Not Reacquired and Less Than 5 Feet in All Direction (Section 3.3)
Dutch Harbor								
Army Dock in Captains Bay	65	53	12	5[b]	4	8%	33%	4
Eider Point	139	28	111	6[b]	5	4%	5%	22
Seafloor near Dutch Harbor Landfill	153	111	42	5	5	3%	12%	4
Dutch Harbor Dock	120	62	58	5[b]	4	4%	7%	20
Additional Docks near Dutch Harbor Spit	373	279	94	18	18	5%	19%	15
Docks in the Iliuliuk Harbor Area (East)	73	30	43	NA	0	NA	NA	7
Docks in the Iliuliuk Harbor Area (West)	149	149	0	NA	0	NA	NA	0
Hog Island Dock	19	8	11	3	2	16%	18%	1
Summer Bay Dock	0	0	0	NA	0	NA	NA	NA
Fuel Oil Dock	60	28	32	4	4	7%	13%	9
AATC on Amaknak Island	0	0	0	NA	0	NA	NA	NA
Chernofski Harbor and Otter Point								
Mutton Cove Docks	152	90	62	25[c]	20	16%	32%	12
Former Barge Docks at Otter Point	159	141	18	15[b]	12	9%	67%	1
Eastern Half of Chernofski Harbor	210	47	163	23[b]	18	11%	11%	41
Total	1,672	1,026	646	109	92	7%	14	136

[a]The geophysical subcontractor (Gravity) used slightly different names for the survey areas.
[b]Includes one target line
[c]Includes two target lines

Note: NA - not applicable

5.0 CONCEPTUAL SITE MODEL

The releases of MEC into marine surface water at Unalaska Island resulted from the following activities:

- Ordnance fired over water from CDA and AAA gun batteries during target training and gun function testing
- Ordnance lost into the water during transfer from transport ships to the shore, either at a fixed dock or at anchorage in Chernofski Harbor
- DMM deliberately disposed of into the marine environment at the conclusion of hostilities
- In the case of Dutch Harbor, ordnance deliberately dropped by the Empire of Japan on U.S. forces during two consecutive days in June 1942

The field effort identified possible MEC on the seafloor in Mutton Cove (Chernofski Harbor) and in the Dutch Harbor Dock area. MEC was observed on the shoreline of Eider Point and subsequently reported to the Navy. Of the 1,672 targets identified, the survey team reacquired 111 targets in 10 survey areas (Table 4-2). Some of the targets that were not reacquired may have been MEC items. MEC items have been pulled up in fishing gear as recent as 2012 in locations outside the Unalaska NDSA boundary, as reported in the PA for the NDSA at Unalaska Island (U.S. Navy 2013).

Currents and the type of depositional environment may affect the transport and burial of the MEC items that have been deposited of the seafloor. Studies of MEC on the seafloor confirm the movement and burial of MEC under certain conditions (Wilson et al. 2008).

A number of complex factors affect the fate and transport of MCs released in the underwater environment. These factors include the nature of the delivery of the ordnance item to the underwater environment, its potential for corrosion, and associated release of MCs.

Underwater releases of MCs can occur when casings deteriorate (most notably from corrosion), rupture upon impact, or undergo a low-order detonation. MCs may be released immediately after impact, or may be only partially contained within the remains of the delivery system. When ordnance undergoes a low-order detonation or breaks apart upon impact, the MC, such as bulk explosives, can be scattered over the impact area (USEPA 2003).

The conceptual site model of the Unalaska Island NDSA is presented as Figure 5-1. There has been no new information found during the field effort that would suggest revision to the CSM that was presented in the SI Work Plan (U.S. Navy 2014). The populations of potential exposure to MEC are discussed in the following sections.

5.1 HUMAN EXPOSURE PATHWAYS AND RECEPTORS

The physical explosive hazard is a complete pathway for fishers (commercial or recreational), divers (commercial or recreational), and beach users (recreational) who may accidently detonate MEC.

Commercial fishers could potentially bring up MEC in their fishing gear. An incident occurred as recently as June 2012 north of Dutch Harbor when a land mine and projectile were caught in fishing gear that was temporarily placed on the seafloor (U.S. Navy 2013). However, that incident occurred beyond the 3-mile boundary of the Unalaska NDSA. In addition, a vessel's anchor could potentially detonate or get caught on MEC on the seafloor. Therefore, potential physical explosive hazards for recreational beach users and commercial fishers are considered complete.

Recreational or commercial divers could come into direct contact with MEC during an underwater dive. Recreational or commercial divers will usually descend to a maximum of 20 fathoms (120 feet). Divers could encounter MEC in these shallow waters. There is a reasonable likelihood that a diver could come into physical contact with MEC in the Unalaska area. Currently, active diving occurs around the Unalaska area by the local diving community. Therefore, potential physical explosive hazards for recreational and commercial divers are considered complete.

Recreational beach users could come into direct contact with MEC. MEC was observed and reported at Eider Point in 2015. Although EOD inspected and conducted a removal action along the shoreline at the Eider Point area (U.S. Navy 2013), MEC was found on the shoreline in 2015. EOD inspected and conducted a removal action of the shoreline again in 2015. However, MEC could possibly wash up on shore or could be uncovered if buried in the beach material. DMM or UXO could possibly wash ashore onto other recreational beachcombing or tide-pooling areas of Unalaska Island. The physical explosive hazard is considered an complete pathway for recreational beach users who might encounter and accidently detonate MEC.

Initial munitions hazard screening may be completed for MEC sites on land where MEC is identified, and soil and sediment samples can be collected for analysis so that results may be evaluated against screening criteria. Because this project was performed for in-water areas and no samples were collected, evaluating analytical values against screening criteria is not feasible for this project.

Another type of evaluation to address human health and safety concerns at munitions response sites on land is referred to as MEC hazard assessment, which has been presented in interim guidance (USEPA and USDoD 2008). The MEC hazard assessment is used to assess acute MEC explosive hazards and not chronic environmental contaminant exposure risk. This methodology is primarily designed to be used at two points in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process: at the end of a removal investigation to assess baseline explosive hazards and relative hazard reductions associated with removal alternatives in an engineering evaluation/cost analysis report, or at the end of a remedial investigation to assess baseline explosive hazards and relative hazard reductions associated with remedial alternatives in the remedial investigation/feasibility study report. Because the MEC hazard assessment was designed for land sites, and this project is in the SI phase (has not progressed to an engineering evaluation/cost analysis or remedial investigation/feasibility study), the MEC hazard assessment is not applicable to this project.

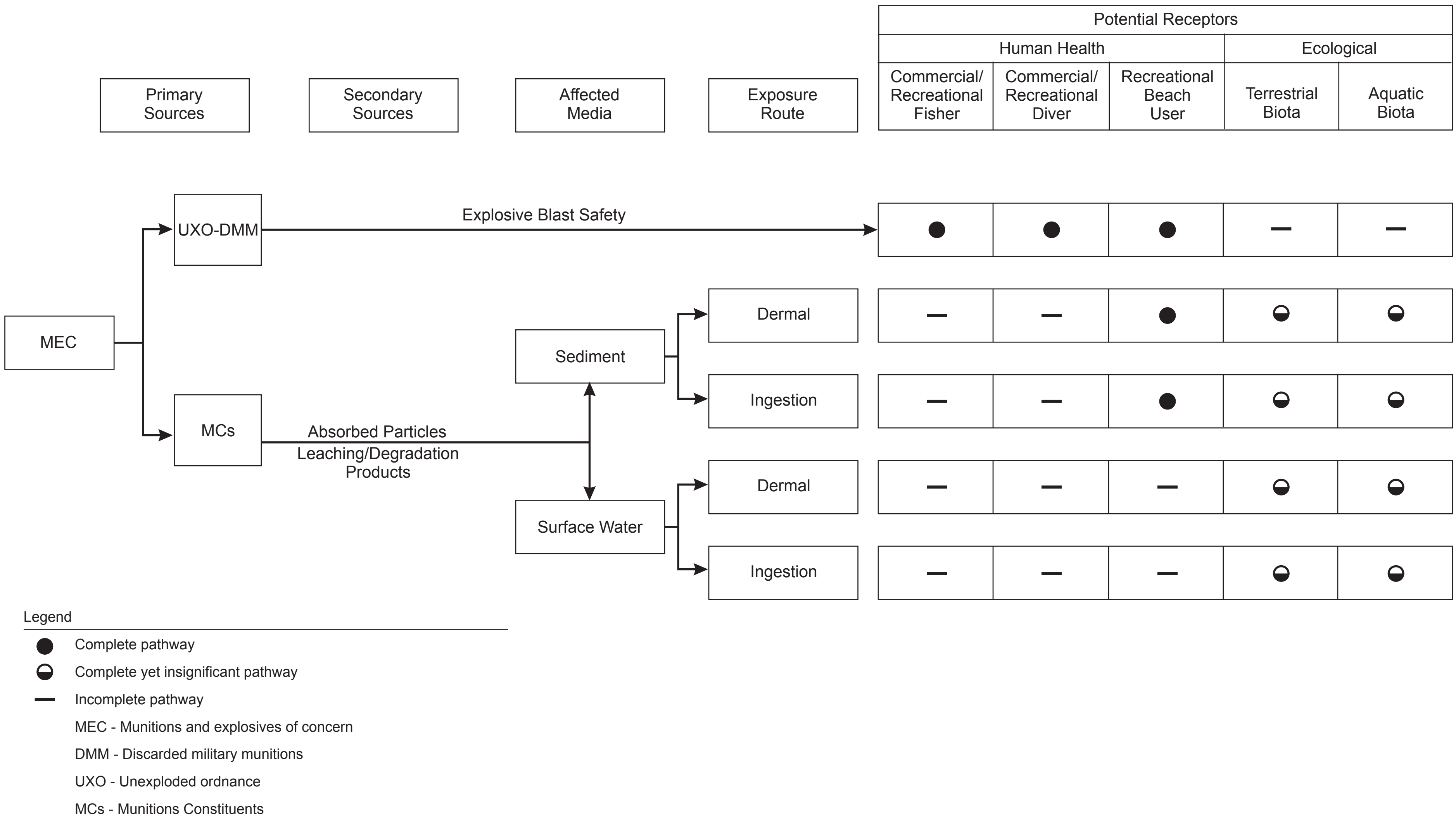
In the 10 areas where RV surveys were performed in 2015, possible MEC was identified on the seafloor in two areas, and MEC was observed on the shoreline of one area. Although only three possible MEC items were encountered during the geophysical survey of 2,150 acres, it is possible for divers or fishers to encounter MEC. Additionally, it is also possible for a recreational beach user to encounter MEC, especially at Eider Point where MEC was observed on the beach. It is possible that some MEC items that are smaller and relatively heavy may have been buried in the sediment over the past several decades. If burial of MEC has occurred, it would not be accessible on the surface of the seafloor for human exposure.

5.2 MARINE EXPOSURE PATHWAYS AND RECEPTORS

Exposure to MEC in the surface water of the Unalaska Island NDSA is limited to mammals, birds, fish, and benthic creatures found in the marine environment, which could have potential daily exposure to any MEC lost or discarded there. The risk to these creatures from detonation of the ordnance is remote and considered incomplete for the purposes of this evaluation. However, release of the constituents contained in the munitions could potentially impact the quality of the surface water and sediments and present a potential hazard to the marine environment. Direct exposure of munitions constituents by marine receptors could occur wherever munitions exist in the marine environment: washed up onto beaches, on the surface of the seafloor, or buried in sediment. Therefore, exposure to chemical constituents of the explosives within the ordnance can be considered a potentially complete pathway as the marine environment slowly corrodes the metal casings.

The MCs (including the most common ones, trinitrotoluene, cyclotrimethylene trinitramine [RDX], and cyclotetramethylene tetranitramine) are likely to present low ecological risk under expected exposure scenarios in the marine environment. Although there is not extensive research on the toxicological effects of munitions in the marine environment, a study in 2005 concluded that exposure to RDX did not cause toxicity in amphipods (U.S. Navy 2013). Furthermore, MCs typically undergo extensive transformation upon contact with marine sediment and have low potential for bioaccumulation in aquatic organisms. Therefore, the exposures of terrestrial and aquatic populations to MCs via sediment and surface water at Unalaska Island are considered complete yet insignificant.

Possible MEC was positively identified in the marine environment. However, there was no visible sign of contamination on the surrounding sediment. Healthy biological growth was observed around the possible MEC items. Based on the observations to date, the risk to the biota in the marine environment appears negligible.



U.S. NAVY

Delivery Order 0080
SI Report
Naval Defensive Sea Area
Unalaska Island, Alaska

Figure 5-1
Conceptual Site Model

6.0 CONCLUSIONS AND RECOMMENDATIONS

In May 2015, a survey team performed the SI field work at the NDSA at Unalaska Island. The planned field work consisted of geophysical surveying at 14 in-water areas. The first phase of surveying that included WAA surveying using sidescan sonar was conducted at 12 of the areas that covered 2,150 acres. A total of 1,672 targets were identified.

No WAA survey was conducted at the following two areas that were originally planned to be surveyed:

- Summer Bay Dock
- AATC on Amaknak Island

The surveys in these two areas were not performed for two different reasons. The survey crew attempted to conduct a WAA survey in Summer Bay using *Blackfoot* which had a very shallow draft; however, the prolific presence of kelp in the bay prevented the survey from being conducted. The AATC fired smaller rounds (i.e., 40-mm anti-aircraft rounds). The two smaller QA/QC test shapes, the mock .50-calber round and the 25-pound mortar shell, were not observed during QA/QC testing of the sidescan sonar and marine magnetometer. Therefore, WAA surveying would not have been helpful in detecting the smaller size projectiles in the AATC in-water range area.

No RV surveying was performed at 2 of the 12 areas where WAA surveys were performed. The survey team was unable to perform more RV surveying because the 14-day period allotted for the field work had expired. The survey team on the *Island C* had no stand-down days resulting from poor weather and was able to survey on all 14 days.

The survey team performed RV surveying at 10 areas, and reacquired 109 targets (102 discrete targets plus 7 target lines). Of the 102 targets reacquired (not including the target lines), 92 were initially classified as “unknown,” “box,” or “cylinder” as summarized for each survey area in Table 4-5. Therefore, 14% of the 646 targets that were initially classified as “unknown,” “box,” or “cylinder” were reacquired, reducing the number of targets initially classified as “unknown,” “box,” or “cylinder” to 554. Of those 554 targets, 136 met the size criterion (smaller than 5 feet in all directions) specified in Section 3.3.

Possible MEC items were identified at three survey areas: Eider Point, Dutch Harbor Dock, and Mutton Cove Docks. At Eider Point, two MEC items were observed on the shoreline of Eider Point during an inspection of the intertidal area along the beach. The Navy led the effort to have these MEC items removed. By the beginning of July 2015, explosive ordnance disposal team had removed the two identified MEC items plus two additional MEC items found during a more thorough inspection of the area. At Dutch Harbor Dock survey area, one possible MEC item (possible bomb or tank) was identified and is located at a depth of less than 20 feet near the southeast end of the airport runway and approximately 125 feet from shore. At the Mutton Cove Docks survey area, two targets were identified as possible MEC items. One was classified as a possible bomb or tank. The other possible MEC item was classified as a possible bomb.

No target was positively identified as a MEC item in the remaining seven areas where RV surveys were conducted. However, that does not discount the presence of MEC.

Additional MEC items may not have been positively identified for four reasons. First, the equipment deployed was not able to identify smaller items on the seafloor, such as the two smaller QA/QC test shapes (the mock 50-caliber round and 25-pound mortar shell). Secondly, it is possible that some MEC items that are smaller with a greater mass (i.e., smaller projectiles) may have been buried in the sediment over the past several decades. Thirdly, there may not be MEC on the surface to be detected. Lastly, the MEC could have been identified as a target, but was not reacquired and verified during the RV survey phase.

Although only three possible MEC items were encountered during the geophysical survey of 2,150 acres, it is possible for divers and fishers to encounter MEC. Additionally, it is also possible for a recreational beach user to encounter MEC, especially at Eider Point where MEC was observed on the beach. It is possible that some MEC items that are smaller and relatively heavy may have been buried in the sediment over the past several decades. If burial of MEC has occurred, it would not be accessible on the surface of the seafloor for human exposure.

Based on the results of the 2015 SI surveys at the Unalaska Island NDSA, recommendations for each individual survey area are summarized on Table 6-1. In summary, no further action is recommended at one area, further RV surveying or an electromagnetic survey is recommended at 10 areas to reacquire and verify targets identified during the WAA phase, and a remedial investigation using additional geophysical such as a marine metal detector and magnetometer to concentrate on smaller areas is recommended at three areas where MEC was observed or possible MEC was identified. For the sites where RV surveying is recommended, the surveying will be limited to targets that meet the size criterion (less than 5 feet in all directions) and were initially classified as Unknown, Box or Cylinder. RV surveying goals for targets at a site that meet these two criteria are as follows:

0 – 10 targets: reacquire 100%
11 – 30 targets: reacquire 80%
31 – 50 targets: reacquire 60%

Details regarding the scope of work for the five areas where remedial investigations are recommended are summarized in Table 6-3.

The estimated cost to perform the remedial investigation and additional RV surveying is approximately $925,000 (Table 6-3).

Table 6-1
Summary of Recommendations for Each Survey Area

Survey Area	Recommendation	Rationale
Dutch Harbor		
Army Dock in Captains Bay	Additional RV surveying	• No possible MEC item was identified. • 53 of the 65 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 12 targets initially classified as unknown, box, or cylinder, 4 (33 percent) were reacquired, and the seafloor along the face of the dock was inspected. Of those 8 remaining targets that were not reacquired, 4 met the size criterion of interest. • RV surveying should be conducted to reacquire the 4 remaining targets (100%) that meet the size criterion.
Eider Point	Remedial Investigation	• Although no possible MEC item was identified in the water, MEC was present on the beach. MEC may also be present in the shallow water based on past history at that location. • 28 of the 139 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 111 targets initially classified as unknown, box, or cylinder, only 5 (5 percent) were reacquired, and the seafloor along the face of the former dock was inspected. • Of those 106 remaining targets that were not reacquired, 22 met the size criterion of interest. • This area has been investigated previously; however, there has not been a study using specialized geophysical equipment (i.e., marine metal detector or magnetometer in addition to an ROV and high resolution sidescan sonar) suited for a remedial investigation in the water. It should be noted that geophysical surveying may not be possible in some areas where bull kelp is abundant or where the water is very shallow, and the seafloor is rocky.

Table 6-1 (Continued)
Summary of Recommendations for Each Survey Area

Survey Area	Recommendation	Rationale
Seafloor near Dutch Harbor Landfill	Additional RV surveying	• No possible MEC item was identified. • 111 of the 153 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 42 targets initially classified as unknown, box, or cylinder, 5 (12 percent) were reacquired. Of those 37 remaining targets that were not reacquired, only 4 met the size criterion of interest. • RV surveying should be conducted to reacquire the 4 remaining targets (100%) that meet the size criterion.
Dutch Harbor Dock	Remedial Investigation	• One target was identified as a possible MEC item. • 62 of the 120 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 58 targets initially classified as unknown, box, or cylinder, only 4 (7 percent) were reacquired, and the seafloor along a portion of the face of the dock was inspected. Of those 54 remaining targets that were not reacquired, 20 met the size criterion of interest. • Further investigation is needed to determine if the possible MEC item is an actual MEC item and to evaluate the area with geophysical equipment to enhance detection and resolution commensurate with RI-level investigations, including surveys using a marine metal detector, magnetometer, and high resolution sidescan sonar (i.e. 1,600 kHz), and ROV.
Additional Docks near Dutch Harbor Spit	Additional RV surveying	• No possible MEC item was identified. • 279 of the 373 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 94 targets initially classified as unknown, box, or cylinder, 18 (19 percent) were reacquired. Of those 76 remaining targets that were not reacquired, 15 met the size criterion of interest.

Table 6-1 (Continued)
Summary of Recommendations for Each Survey Area

Survey Area	Recommendation	Rationale
Additional Docks near Dutch Harbor Spit (Con't)		• RV surveying should be conducted to reacquire the 12 of the 15 remaining targets (80%) that meet the size criterion.
Docks in the Iliuliuk Harbor Area (East)	Additional RV surveying	• No RV survey was performed. • Of the 73 targets identified during the WAA survey, 30 appeared inert, and 43 were classified as unknown, box, or cylinder. Of those 43 targets, 7 met the size criterion. • RV surveying should be conducted to reacquire the 7 remaining targets (100%) that meet the size criterion.
Docks in the Iliuliuk Harbor Area (West)	No further action	• No RV survey was performed. • Of the 149 targets identified during the WAA survey, 149 appeared inert (mostly debris), and none were classified as unknown, box, or cylinder. • No further action is recommended because none of the targets were classified as unknown, box or cylinder.
Hog Island Dock	Additional RV surveying	• No possible MEC item was identified. • 8 of the 19 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 11 targets initially classified as unknown, box, or cylinder, 2 (18 percent) were reacquired and the seafloor along the face of the dock was inspected. Of those 8 remaining targets that were not reacquired, only 1 met the size criterion of interest. • RV surveying should be conducted to reacquire the 1 remaining target (100%) that met the size criterion.
Summer Bay Dock	Sidescan sonar and RV surveying	• A geophysical survey of this area was not conducted because of thick kelp present through the water column in this area. • A sidescan sonar will be used to identify targets. An ROV can then be used to reacquire targets that meet the size criteria.

Table 6-1 (Continued)
Summary of Recommendations for Each Survey Area

Survey Area	Recommendation	Rationale
Fuel Oil Dock	Additional RV surveying	• No possible MEC item was identified. • 28 of the 60 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 32 targets initially classified as unknown, box, or cylinder, 4 (13 percent) were reacquired. Of those 28 remaining targets that were not reacquired, 9 met the size criterion of interest. • Further RV surveying should be conducted to reacquire at the 9 remaining targets that meet the size criterion of interest and inspect the seafloor along the face of the dock. • RV surveying should be conducted to reacquire the 9 remaining targets (100%) that meet the size criterion.
AATC on Amaknak Island	Electromagnetic Survey	• Small projectiles (i.e., .30-caliber, .50-caliber, 20-mm, and 40-mm) used during AATC exercises were not detected and projectiles may have become buried in the sediment. • An electromagnetic survey is recommended to determine whether magnetic anomalies can be detected.
Chernofski Harbor and Otter Point		
Mutton Cove Docks	Remedial Investigation	• Two targets were identified as possible MEC items. • 90 of the 152 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 62 targets initially classified as unknown, box, or cylinder, 20 (32 percent) were reacquired, and the seafloor along the faces of the two main docks were inspected. Of those 42 remaining targets that were not reacquired, 12 met the size criterion of interest. • Further investigation is needed to determine if the possible MEC items are actual MEC items

Table 6-1 (Continued)
Summary of Recommendations for Each Survey Area

Survey Area	Recommendation	Rationale
Mutton Cove Docks (Con't)		and to evaluate the area with geophysical equipment to enhance detection and resolution commensurate with RI-level investigations, including surveys using a marine metal detector, magnetometer, and high resolution sidescan sonar (i.e. 1,600 kHz), and ROV.
Former Barge Docks at Otter Point	Additional RV surveying	• No possible MEC item was identified. • 141 of the 159 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 18 targets initially classified as unknown, box, or cylinder, 12 (67 percent) were reacquired, and the seafloor along the face of the dock was inspected. Of those 6 remaining targets that were not reacquired, only 1 met the size criterion of interest. • RV surveying should be conducted to reacquire the 1 remaining target (100%) that met the size criterion.
Eastern Half of Chernofski Harbor	Additional RV surveying	• No possible MEC item was identified. • 47 of the 210 targets appeared inert based on the initial classification from the WAA survey characteristics. • Of the 163 targets initially classified as unknown, box, or cylinder, 18 (11 percent) were reacquired. Of those 145 remaining targets that were not reacquired, 41 met the size criterion of interest. • Further RV surveying should be conducted to reacquire 25 of the 41 remaining targets (60%) that meet the size criterion.

Notes:
AATC - anti-aircraft training center
MEC - munitions and explosives of concern
mm - millimeter
RV - reacquisition and verification
ROV - remotely operated vehicle
WAA - wide-area assessment

Table 6-2
Recommended Scope of Work for Remedial Investigations

Survey Area		Applicable Recommendation Scope
Dutch Harbor	Eider Point	A combination of a triple array magnetometer towed behind a vessel and an AUV system with both sidescan sonar and magnetometer sensors should be used to identify magnetic anomalies. Higher frequency sidescan (up to 1600 KHz) should be used to provide greater detail of the seafloor. All magnetic anomalies that meet the size criterion could then be reacquired during a RV survey.
	Dutch Harbor Dock	
	AATC on Amaknak Island	
Chernofski Harbor and Otter Point	Mutton Cove Docks	
Dutch Harbor	Summer Bay Dock	A small support vessel with minimal draft and an inboard jet should be used in this area so that it will not become entangled with bull kelp in the vicinity of the dock. A hard-mounted sidescan sonar should be used to identify targets. An ROV could then be used off the small vessel to observe the seafloor near the former dock and to reacquire targets that meet the size criteria.

Notes:
AUV - autonomous underwater vehicle
AATC - anti-aircraft training center
RV - reacquisition and verification
ROV - remotely operated vehicle

Table 6-3
Cost Estimate for Additional Recommended Action at Nine Survey Areas

Item	Unit Cost	Units	Quantity	Cost (rounded to nearest $1,000)
Project management (assumes 24 months)	$125	HR	730	$91,000
Remedial investigations of three survey areas				
Prepare work plans/meetings	$125	HR	208	$26,000
Coordinate and supervise RV survey	$140	HR	328	$46,000
Travel costs for prime contractor	$6,850	LS	1	$7,000
Vessel service (21 days)[a]	$7,600	DY	21	$160,000
Vessel mob/demob to and from Unalaska	$50,000	LS	1	$50,000
Geophysical subcontractor planning, surveying (35 days)[a] and reporting	$218,000	LS	1	$218,000
NIRIS/GIS Support and Updates	$85	HR	207	$18,000
Reporting	$125	HR	470	$59,000
Additional sidescan sonar, electromagnetic and/or RV surveying for 10 survey areas				
Update to existing work plans/ meetings	$125	HR	260	$33,000
Coordinate and supervise RV survey[b]	$140	HR	144	$20,000
Travel costs for prime contractor[b]	$2,400	LS	1	$2,000
Vessel service (12 days)[b,c]	$7,600	DY	12	$91,0000
Geophysical subcontractor surveying (12 days)[b,c] and reporting	$56,000	LS	1	$56,000
NIRIS/GIS Support and Updates	$85	HR	208	$18,000
Reporting[b]	$125	HR	240	$30,000
Total				**$925,000**

[a]21 days of remedial investigation surveying based on detailed surveying and inspection of targets for a period of 1 week at each of the 3 survey areas
[b]Assumes remedial investigation planning, field work, and reporting will occur at the same time as the additional sidescan sonar, electromagnetic and/or RV surveying. No labor or costs are included here for mobilization/demobilization, meetings because these costs are included under the remedial investigation costs.
[c]Additional survey days based on 12 days total, which includes an average of one day per survey area except for the Summer Bay Dock and Eastern Half of Chernofski Harbor which includes two days of surveying each.

Table 6-3 (Continued)
Cost Estimate for Additional Recommended Action at Nine Survey Areas

Notes:
DY - day
NIRIS/GIS - Navy Installation Restoration Information Solution/geographic information system
HR - hour
LS - lump sum
RV - reacquisition and verification
WAA - wide-area assessment

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APPENDIX A

Field Notes

Tom Abbott
DO 80
May 2015

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Reference Page Index

Location Dutch Harbor Date 5-17-15

Project / Client DO 80 - SI Fieldwork
NAVFAC NW

≈1340 I booked flight back home to Seattle. Leave Dutch at 1615 and arrive Seattle ≈ 0130 on 5-18-15. Home at 0300 5-18-15

T. Abbott 5-18-15

Location Unalaska/Dutch Harbor Date 5/26/15

Project / Client DO 80 - Unalaska SI Field Work
NAVFAC NW

Mobilization day to Unalaska

MV Island C (hired by Gravity) arrival at noon and moored at Carl Moses docks

1530 AECOM and Gravity/SeaVision arrived on island - went to hotel then boat

AECOM set up equipment on boat

T. Abbott 5/26/15

Location Unalaska / Dutch Harbor Date 5/27/15
Project / Client DO 80 - SI Field Work
NAVFAC NW

weather: cloudy, 45°, ~~SE~~ S 10 mph
0700 arrived on ship (Tom)
others buying supplies at ship supply store
0755 Gravity / SeaVision arrive on board
crew getting boat ready
Gravity setting up equipment
0910 Go to harbor master office to
drop off float plan. Spoke
with John Days. He said
to radio in to the harbor master
on channel 16. He made +
kept copy of float plan.
0955 Arrived back at boat
Team set up equipment. Headed to
Safeway to get a few items + return.
1255 Vessel Orientation by Andy
Drills
Other safety issues
introductions
Tom Abbott - PM
Rene - captain - skiff
Jeff Carr Engineer
~~Jeff~~ Andy - deck hand
Jeff W - Gravity

Location Unalaska / Dutch Harbor Date 5/27/15
Project / Client DO 80 - SI Field Work
NAVFAC NW

John Schaefer - assist w/ survey
Brandon - deck hand
Jeff S. - geophysical equipment + processing
Andy - captain of Island C
donned immersion suits
1405 completed safety meeting
finish setting up monitors + wires
1500 skiff leaves to survey nearby
"Additional dock areas in Dutch Harbor"
skiff will use interferometric sonar
echosounder combo (like Kodiak)
and magnetometer. Skiff will use
magnetometer because it may be
affected by large steel hull of the
Island C.
1605 Leave dock for Key Island Dock
1630 Rig up crane to hold pulley for
sidescan sonar and deploy
1650 Begin track lines at Captain Bay dock
1915 Pull sonar out of water
1945 Arrive back to dock

Tom Abbott 5/27/15

Location Unalaska/Dutch Harbor Date 5/28/15

Project / Client DO 80 – SI field Work NAVFAC NW

Weather: cloudy, 50°F, winds building, rainy

0715 arrive on vessel | to 50 mph SE 2' seas

0750 Start daily tailgate meeting

0810 End meeting

Plan today - Blackfoot skiff finish "additional dock area in Dutch Harbor"

Plan - Island C Motor around to Landfill area. Will moor at spit tonight.

Leave for Chernofski tomorrow night.

~~Tea~~ Jeff W. + Tom take vehicle to spit area

0845 Return to boat – warm Engines

0910 Blackfoot left dock to start surveying

0917 Leave dock to survey "Sea Floor near Dutch Harbor Landfill"

1025 Island C reached survey area and deployed sidescan sonar fish (with depressor)

Several objects observed on display. Many crab pots + many small objects even at the outermost survey tracks

Location Unalaska/ Dutch Harbor Date 5/28/15

Project / Client DO 80 – SI Field Work NAVFAC NW

at the landfill area.

1250 Blackfoot looking for place to for protection

1600 Completed the landfill survey area and moved to the Fuel Oil Dock across the bay.

1720 Complete the Fuel oil Dock area and motor to Carl Moses Area, because we could not dock at spit area for lack of space.

1840 Arrive + tie up at Carl Moses dock

1910 Went to spit to get car

Tom Abbott 2/28/15

Location Unalaska Date 5/28/15 29
Project / Client DO 80 - SI fieldwork
NAVFAC NW

0730 Arrive on boat
0800 Safety meeting / Planning meeting
Blackfoot - Dutch Harbor Dock, maybe Summer Bay dock
Island C - Hog Island initial survey, then possibly Captains Bay Dock for ROV, Then head up tonight for Chernofski
0812 Warm up engines as meeting ended
0830 Leave dock for Hog Island dock
0900 Arrive at Hog Island
0910 Drop fish in water, prepare to survey
1115 Completed Hog Island Dock Area
Prep to survey anti aircraft training center on Amaknak Island (west of runway). Saw some targets in the Hog Island dock area. Mostly smooth bottom with some rocks
1220 Start AATC survey Initially appears to be cobbly sandy bottom near shore.
1445 Stopped survey AATC - likely would not see 20 to 40 mm unexploded shells. Go back to dock to tie up and get ready for going to Chernofski

Location Unalaska Date 5/28/15 29
Project / Client DO 80 - SI fieldwork
NAVFAC NW

15:25 arrive at dock
Return rental cars after taking Jeff to clinic & checking e-mails
1805 Leave dock for Chernofski
~~for~~ Motored through the night

[signature]
5/28/15 29

Location Unalaska Date 5/30/15
Project / Client DO 80 - SI Field Work
NAVFAC NW

0330 Arrived at Chernofski Harbor
Weather - calm, 45°F, cloudy, variable [illegible]
0730 Tailgate + planning meeting
Blackfoot - ~~Blackfoot~~ Otter Point
Island C - Otter Point
Island C will wait for Blackfoot at shallow otter Point while Blackfoot performs survey for safety. Distance between Chernofski + otter Point is 11 miles or 1.5 hours of travel.
0740 Start/warm engines
0755 Leave Chernofski for Otter Point
0935 Anchor Island C at otter Point to unload Blackfoot to begin surveying
1900 Blackfoot returned to Island Thunder
2030 Head back to Chernofski Harbor for the night
Otter Point area had several underwater pinnacles. Sand on ~~and~~ near shore both sides of barge docks (2 docks still exist). Most of area was rocky on seafloor. Crew noticed rectangular

Location Unalaska Date 5/30/15
Project / Client DO 80 - SI Field Work
NAVFAC NW

items near the barge docks.
2200 Anchored in Chernofski Harbor after arriving there

[signature] 5/30/15

Location Unalaska Date 5/31/15

Project / Client DO 80-51 Field Work
NAVFAC NW

Weather: calm, 45°F, cloudy
0730 Tailgate meeting
0740 Meeting over, warm engines
Plan: Blackfoot - N part of Chernofski
Island C - S part of Chernofski
0840 Blackfoot leaves Island C for
survey in north part of Chernofski
0850 Island C starts survey through
center of south Chernofski
south end of Chernofski does not
appear to have crater or significant
swampy area. Cattle seen along
shoreline, Ranchers live in
house on the west shoreline
near entrance of Chernofski
1515 Halt initial survey so that
we can visit some targets
1520 Deploy ROV
1545 Target 14 - ~~uncertain~~ relook - Timber
cylindrical - heavily covered
with biological growth
approx 6"-8" diameter
Low energy environment, much
biological life in water column (krill)

Location Unalaska Date 5/31/15

Project / Client DO 80-51 Field Work
NAVFAC NW

1600 Target 12 ~ timber (piling likely)
1603 ~~Target 10~~ not target - timber
1606 ~~Target 8~~ not target 2 timber
1611 Target 10 - timber
1619 Target 8 - timber
1621 Target 9 - timber
Target 13 - cylindrical metal
about 2' diam. x 3' long. Maybe a
drum but metal appears thick
Target 6 - cylindrical metal object
- maybe empty drum
Target 4 - rock
All items have significant growth
~~13~~ 1715 Pull up ROV, pick Blackfoot
onto top deck while engine
warms so that we can move
to another location
1748 Arrive at new anchor point a
little further south.
Target 19 - anchor
Target 18 - anchor
Target 17 - large cylinder 20' long,
rusted holes; tank?
1810 Target 16 - steel angle iron

52

Location Unalaska Date 5/31/15

Project / Client DO 80 - SI Field Work
NAVFAC NW

1815 Pull up ROV + anchor ; move
to new location
1825 Deploy ROV
1834 ~~Target~~ Target 24 - anchor
1839 Target 25 - 20' cone-shaped
1858 Target 26 - concrete anchor ?
1912 Pull out cord to loosen slack
19:23 Target ~~23~~ 27 - steel item - anchor? with line
19:32 Target 23 - another steel anchor
1940 Target 22 - cylindrical 20' long
2' large end

Jeff S. continued using ROV
to inspect Target 25
~2030 Pull out ROV -

Tom Abbott 5/31/15

Location Unalaska Date 6/1/15 53

Project / Client DO 80 - SI Field Work
NAVFAC NW

Weather: 45°F, Calm, mostly cloudy
0800 Tailgate + planning meeting
0805 End meeting, warm engines
Plan: Blackfoot finish survey lines
in south/east Charnofski
Island C - use ROV + process data
0810 Ranchers from Charnofski came
aboard to talk
0850 Ranchers left boat; Motor to
0910 Arrived at survey area and unloaded
skiff
0946 Skiff shoves off
1005 ROV in water
1015 Problem with anchor, will not
pull up
1034 Target ~~*5~~ 5 crab pot
1038 Target 7 - anchor
1045 Retrieved anchor
1115 Move further south
1120 Target 31 very large piling
1123 Target 32 - anchor
1128 Target 33 - anchor
1145 Replaced tether because ROV had
trouble pulling it.

Location Unalaska Date 6/1/15

Project / Client NAVFAC NW

DO 80-SI Field Work

1227 Target 30 - rocks
1330 Replaced computer for better video
1345 Target 30 closer look - rocks
1345 Blackfoot completed survey and
Came aboard
1405 Load Blackfoot
Blackfoot crew found sunken boat
We will inspect it to see if any
ordnance may be aboard if it
is military
1430 Inspected sunken ship; no ordnance
1525 Leave to use ROV at large
dock in Mutton Cove
~~1345~~ 1545 Anchor near large dock
Release ROV in water
Inspected along edge of pier, saw
old radiator, crab pot, pilings, timbers
~1730 Move to new location - N area of Chernofski
various targets
33 Anchor block
30 Anchor block
Anchor (80-90% buried as other
anchors are)
1845 Removed ROV out of the water.

Location Unalaska Date 6/1/15

Project / Client NAVFAC NW

DO 80-SI Field Work

1900 - Moved to far north Mutton Cove
A dock (former) that was not
on plans is located there
1905 - Anchor down and place
ROV in water
1910 Target 5 - piling
1920 Target 4 - flat & circular one
end + rounded other end, cylindrical
tank? ≈ 18" diameter
hole ~~in~~ corroded in side, also apparent
crack in side. Heavy growth on Target
Pulled up ROV to install high definition
camera on it.
Target 6 - 55 gallon drum
fresh drum can read
label: Resolve Marine
Has no growth; painted drum
~~no~~ corrosion, no holes, possibly
corroded at bottom
2040 ROV out of water, pull anchor
move few hundred feet south
and anchor for the night

J. Abbott 6/1/15

Location Unalaska Date 6/2/15
Project / Client ~~DO~~ DO 80 - S1 Field Work
NAVFAC NW

weather: Cloudy, calm, 45°F
0800 Tailgate meeting + planning meeting
Blackfoot: Stay on board until we get to Otter Point. Offload + use ~~boat~~ ROV to look for targets
Island C: use ROV in Chernofski Harbor. Motor to Dutch Harbor tonight.
0810 End meeting, start engines.
0840 Move to first target in North Mutton Cove
0850 ROV launched
0855 Target 10 - timber
0857 Target 12 - timber
0900 Anchor up + move to new location
0908 Anchor down
0938 Target 22 - covered w/ kelp - obscured
0943 Target 26 - covered w/ kelp
0947 Target 28 - appears to be concrete, covered with shell hash and bio growth
0953 Recover ROV
0955 Move to new location
Working on ROV - cable splice causing issue
1021 Target 37 - anchor block

Location Unalaska Date 6/2/15
Project / Client DO 80 S1 Field Work
NAVFAC NW

1025 Target 35 - similar to buoys cone-shaped ≈20' long
1030 Pull anchor, move to west dock in Mutton Cove
1052 Place ROV in water after anchoring at dock face - saw: tires, fishing net, crab pot, piles, timber, wire cable,
1125 Pull ROV out, pull anchor for new location
1140 Target 45 - rusted hollow steel rounded end other end crushed up ≈ 2.5' long ≈ 18" dia.
1148 Target 46 - growth encrusted, possibly an anchor
1200 Target 40 - covered w/ bio growth another anchor
1204 Target 41 - shackel w/ swivel
1210 Target 47 - rock
Cable stuck on props - retreived all OK
1243 Anchor up. Move to new location
1310 Target 36 - bulbous one end and tapered other end ≈ 18" dia. No corrosion holes noted ridging near domed top

Location Unalaska Date 6/2/15

Project / Client DO 80-SI Field Work NAVFAC NW

similar to 650-lb bomb in Kodiak PA report - (N of large Mutton Bay dock)

1340 Anchor up + move to new location

1350 Lay anchor at new location several hundred yards south of Mutton Cove pier.

1358 unnumbered target - tank

Moved to new location; fixing small sub video ray.

1513 Target 58 - encrusted over

1520 Pull anchor and head to Otter Point

1720 Arrive and anchor at Otter Point

Unload skiff ~~to~~ motor to look at targets near ~~the~~ old dock area.

1900 Take off - skiff to island dock

2145 Blackfoot arrived back to boat, Island C loaded Blackfoot.

2200 Warm up engines

2208 Head back to Dutch Harbor

Jeff Snyder said that many of the targets were obstructed by kelp. Everything that they were able to see were not MEC.

Day 9 - travel through night

Tom Abbott 6/2/15

Location Unalask Date 6/3/15

Project / Client DO 80-SI Field Work NAVFAC NW

Weather: Calm, 50°F, Cloudy - Day 10

0740 - Arrive at fuel dock after motoring through the night from Otter Point (counts as survey day)

0830 Pick up vehicles + get gas

~~0930~~ 0950 ~~Go~~ Return to vessel

1002 Planning + safety meeting

1035 Leave dock to drop skiff off near Summer Bay Dock area

1105 Drop off Blackfoot near mouth of Summer Bay + return to start sidescan tracks in Spit area

1130 Put sidescan in water

1700 Finished surveying spit area with help of Blackfoot

Blackfoot had hard time surveying in Summer Bay because of ~~heavy~~ heavy kelp.

1710 Blackfoot arrived on board + skiff loaded

1720 Head back to Carl Moses dock

1835 Arrived into Carl Moses dock

Tom Abbott 6/3/15

Location Unalaska Date 6/4/15

Project / Client DO 80 SI Field Work NAVFAC NW

Weather: 50°F, Cloudy, calm, expected increase to 20 mph

0750 Planning and Safety meeting
Plan: Island C drop off skiff to Eider Point and will stand by to confirm that skiff can do work & conditions there
Island C to use ROV at Captains Bay & Hog Island

0810 Leave dock for Eider Point

0905 Arrive at Eider Point to unload skiff

1330 Blackfoot brings data aboard from survey.

1400 ROV to be placed in water after Island C moves and anchors near shoreline close to Eider Point dock. Delayed ROV work to troubleshoot sonar

1516 Blackfoot came aboard.
We need to go to electronic store to get part for sonar that is not working. 2nd ROV sonar is not working either.

1620 Arrive to dock. Jeff got supplies & work on ROV

1900 Leave boat

Jen Abbott 6/4/15

Location Unalaska Date 6/5/15

Project / Client DO 80 SI Field Work NAVFAC NW

Weather: 45°F, cloudy, breezy NW 15 seas 5'

0715 Arrive on boat (Gravity staying aboard and Jeff S. staying in hotel)
Jeff working on ROV

0955 Safety and planning meeting

1038 Leave dock

1125 Arrive at Eider Pt. dock
Unload Blackfoot
Jeff W., Rene, & Tom to go aboard Blackfoot to inspect shoreline & shallow water near Eider Point. Using an older sonar, Jeff S. to use ROV near dock.

- Photos taken of potential ordnance item on spit (within extreme high water)
- Photos of shrapnel pieces on spit further East. Jeff Wilson has coordinates
- Photo of lone shard (shrapnel)
- Photo of 2nd lone shard near exploded bunker
- UXO near water line (within extreme high water)

lat. 53.95258
long -166.59087 WGS 84 (Incorrect GPS fix 6-12-15)

kelp present along shore ≈ 50-100'

Location Unalaska Date 6/5/15
Project / Client DO 80 SI Field Work
NAVFAC NW

1345 Arrived back on boat
Jeff Snyder observed targets:
Target 13 - map
Target 14 - timber
Target 9 timber - piling
Target 12 timber - piling
Target 2 - small fishing gear
Target 4 - pipe, vertical driven into sediment
1450 Move to area near Eider Point
1504 Located unnumbered targets near location of ~~exutto~~ ordnance detonations on wall breaker where we found UXO.
All four were crab pots
1520 Move to Hog Island
Jeff S. got new sonar + ROV working
First ordnance location on spit
lat 53.95809399 WGS 84
long -166.5900262
First pile of shrapnel
lat 53.91446 WGS 84
long -166.59860

Location Unalaska Date 6/5/15
Project / Client DO 80 SI Field Work
NAVFAC NW

~~2nd shrapnel location~~
~~lat 53.91446~~
~~long~~
1558 Arrive at Hog Island location and drop anchor
1610 Target 5 - pipes w/ 90° bends with adjacent rock
seafloor has significant amount of krill
1622 Target 4 - long section of pipe
1628 Target 3 - I-beam
seafloor becomes rockier towards island
1638 Target 2 not found, but in a boulder field, so it is likely a boulder
1649 Anchor up & move to Captains Bay Dock
1716 Arrive Captains Bay Dock (south of dock)
Target 9 - rusted drum ≈ 35 gal
1741 move to dock
1808 Drop ROV in water near center of pier
1820 Target 3 - welders shield helmet + debris
Target ~~3/4~~ between 3 + 4 rectangular box - covered with bio growth 2'x6'x2'
seafloor contains much debris, shell hash covers seafloor

Location Unalaska Date 6/5/15

Project / Client DO 80 SI Field Work

NAVFAC NW

Target 4 - tire

1845 Target 2 - steel wire, tires,
working seafloor along face of pier

1904 Recover ROV

1918 Target 3 - battery
going Target 3 to 5 - air conditioner
Deck still operating, lots of debris
along dock face

1932 Remove ROV from water and haul to dock

1955 Tie up at dock

2015 Leave dock

Tom [signature] 6/5/15

Location Unalaska Date 6/6/15

Project / Client DO 80 SI Field Work

NAVFAC NW

Weather: Sunny, 45°F, calm

0910 Arrive on boat.
Jeff W. + Rene leaving for airport
Island C working on mechanical issue

1048 Update - crew continues to work on
one of the engines. The starter may
be siezed

≈ ~~1215~~ 1115 Crew left to get a starter at local
diesel shop as ~~temp~~ fix

≈1245 Crew arrived back with temp engine
starter & began to install

1320 Fixed engine & started it

1355 Leave dock - (new sonar did not arrive,
so Brandon left behind to pick up at airport
later today.)

1455 Arrive at landfill area.

1506 Drop ROV into water
~~Target 1~~ - 4'-dia. corrigated piping

1530 Target 2 - timber with cable
wrapped around it

1540 Targets 1 and 4 not observed

1600 Target 3 - mound of cable
Bottom is somewhat cloudy, krill present

1635 Target 5 - ~~fish pot~~ + possible boiler from

Location Unalaska Date 6/6/15
Project / Client DO 80 SI Field Work
NAVFAC NW

ship!
1700 Anchor at new location at landfill
1710 Target 7 - ~~5-gallon bucket~~ fish pot
1712 Target 8 - fish trap
continue checking seafloor around selected targets for other targets - finding old debris
1335 Anchor at another location
Target 6 - not located - in an area of many cobbles near shoreline south of landfill
1820 Target 9 - not located, weak target
Pull anchor and move to Delta Western Fuel dock / City Dock (Dutch Harbor Dock)
1840 Tied up to dock
1845 ROV in water, water shallow + clear gravelly bottom
1850 Target 3 - old pipe
various debris
South side of dock land side of pier
Added additional tether so that another target can be reach while docked
2020 Untie from dock + anchor SE ~ 400'
It appears that the seafloor

Location Unalaska Date 6/6/15
Project / Client DO 80 SI Field Work
NAVFAC NW

near dock may have been placed because bio growth is minimal and gravelly bottom was fairly uniform and clean
SE of dock, seafloor ~~is~~ ~~has~~ has heavy bio growth and shell hash
Water is ~~more~~ cloudier
2053 Drop ROV in water
Target 5 - rocks
significant cover of kelp and sea anemones on seafloor
2103 Up anchor to hit targets at
~~2103~~ Fuel Oil Dock (now APL dock)
1120 Targets 1 - rock
Target 2 - rock
Target 3 - rock
Tether wrapped around propeller again
Jeff connects mechanical arm to ROV
2220 Unhooked tether from prop
2225 Target 5 - crab pot
2233 Up anchor move to other location at Fuel Oil Dock (APL dock). Tie up to N end of dock

Location Unalaska Date 6/6/15
Project / Client DO 80 SI Field Work
NAVFAC NW

Target 4 - concrete block or rock
2300 skipped remaining target because large container vessel coming to dock
2215 Dock at Dutch Harbor Dock so that we can start here in the morning
2230 Leave boat

Tom Abbott 6/6/15

Location Unalaska Date 6/7/15
Project / Client DO 80 SI Field Work
NAVFAC NW

Weather - 45°F, calm, mostly cloudy
0700 Arrive on boat
0735 Safety & Planning meeting
0750 Warm engine
0810 Leave dock
0815 Anchor west of pier just at South end of runway
0820 Target 2 - tire
water fairly clear
0828 Move to nearby location
0832 Drop anchor (still in Dutch Harbor Dock area, but near S end of runway)
Target 1 - possible bomb
- highly vegetated on target itself
- appears very rounded like the top of bomb, appears very cylindrical w/ sonar, appears to be rust stains, size 2' dia x 6' long
no rusted holes observed
0859 Anchor up and move to spit area
0910 Set Anchor near inside end of spit ("Additional Dock Areas in Dutch Harbor")
Depth is about 100' even though

Location Unalaska Date 6/7/15

Project / Client DO 80 SI Field work
NAVFAC NW

vessel is close to shoreline (≈ 150')
bottom appears to be soft sediment
small sonar blips are crabs
0430 Target ~~2~~ – boxlike objects, growth
≈ 10" x 18"
silty area w/ moss-like growth
(possibly rocks, but unlikely based on environment)
Target 2 –
enveloped w/ growth barnicles
poor visibility
945 Target ~~8~~ 6 – rusted drum
950 Target ~~5~~ 5 – pyramidal-like structure
bottom – holes + slots
-old TV screen side down
or similar device
Abandoned dock area near end of spit
timber debris, tires,
1015 Reposition to get closer to former dock
piling, tires, cobbly bottom, concrete
block, fish trap, anchor
1100 Reset at boat
1110 Target 7 – piece of wood
1112 Target 4 – rock or wood

Location Unalaska Date 6/7/15

Project / Client DO 80 SI Field Work
NAVFAC NW

1114 Target 6 – rusted drum
1120 Target ~~8~~ 1 – fish trap
1125 Target 2 – timber
1127 Target 3 – tire
1132 Up anchor, move to new location
1158 Target 11 – tire few hundred feet
1202 Target 12 – tire north along spit
Could not locate Targets 8, 9, 10
1245 Anchor near large dock on inside
spit (also historical dock)
1300 Target ~~14~~ – cable – fishing gear
1317 Target ~~15~~ 14 – section of pipe
1322 Target 15 – section of pipe (top of car)
1325 Target 16 – piece of gear (high flier) or piling) pipe
lots of debris along face of dock
1338 Move to new location
1352 ROV in water near u-section of spit
1401 Target 17 – rock
1408 Targets 18 + 19 pieces of debris or rocks
significant amount of debris + rock
along pier face
1418 Move to area on Amaknak Island side of spit area
1425 Drop anchor
1430 Target 21 – rock

Location Unalaska Date 6/7/15

Project / Client DO 80 SI Field Work

1434	Target 22 - rock
1445	Anchor at new location + drop anchor
1450	Target 23 - boulder, other object
	timber fender is likely Target 23
1500	Up anchor to move to new location
1523	ROV deployed at last target in spit area
1527	Target 13 - pipe (piling)
1540	Head to "Dutch Harbor Dock" to
	start packing up and unloading
1730	Unloaded equipment, Lorie dock

[signature] 6/7/15

Location Date

Project / Client

APPENDIX B

Ammunition Data Sheets for Ordnance Used at Unalaska NDSA

Appendix B Introduction

According to the historical documents reviewed during the preliminary assessment, the following types of weapons/ammunition were used within the Unalaska Island NDSA:

- 20-mm AA guns
- 37-mm AA guns
- 40-mm AA guns
- 60-mm mortars
- 3-inch AA guns
- 81-mm mortars
- 90-mm projectiles
- 105-mm howitzers
- 155-mm coastal defense artillery guns
- 6-inch coastal defense artillery guns
- 8-inch coastal defense artillery guns
- .30-caliber machine guns
- .50-caliber machine guns
- Bombs (unknown type)

This appendix includes ammunition data sheets (in the order listed above) that that provide details about the related ammunition. Information comes primarily from *War Department Technical Manual 9-1901 Artillery Ammunition* dated June 29, 1944. Information for 6-inch rounds is from *Archive Search Report, Findings, Ft. Leonard, Eider Point, Alaska* (USACE 2003). General information about bombs used during the early 1940s is also included from *War Department Technical Manual 9-1900 Ammunition General* dated June 1945.

CHAPTER 2

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

Section I

AMMUNITION FOR 20-MM GUNS

18. GENERAL.

a. **General Discussion.** The present 20-mm Guns M1, AN-M2, M3, and Br. H.S./A/ (British Hispano-Suiza, Aircraft) are automatic aircraft cannon for use against ground targets and other aircraft. There are several types of these guns, dependent upon the type of adapter used. However, since they are similarly chambered it is possible to use the same ammunition. Ammunition manufactured in the U.S. must be proof-fired in British guns to determine whether the lot develops sufficiently low chamber pressure for acceptance for firing in British weapons. If the ammunition is accepted by both U.S. and British services, the words "COMMON AMMN" are marked or printed on the packing boxes. The ammunition is fed into the guns by means of link belts (fig. 23) or a 60-round drum-type magazine. High explosive-incendiary (HE-I), armor-piercing with tracer (AP-T), incendiary, practice, ball, and drill ammunition types are provided for the guns, all issued in the form of fixed complete rounds known as cartridges. There are two sets of 20-mm rounds. Rounds of older manufacture are the HE-I Mk. I, w/FUZE, P.D., 253 Mk. II-III; AP-T, M75; and ball (figs. 24, 25, and 26). The exterior ballistics of the projectiles of these rounds differ from each other because of differences in weight and shape. The recent rounds, developed to have matched ballistics, are the AP-T, T9E5 (M95); incendiary, T18 (M96); HE-I, T23 (M97), w/FUZE, P.D., T71E4 (M75); and practice, T24 (M99) (figs. 27, 28, 29, and 30). The shape, length, and weight of these rounds are approximately the same, and all have a purple annulus about the primer at the head of the cartridge case. The trajectories of these new rounds cross at 1,000 yards, at which range the time of flight for each projectile is approximately 1.66 seconds when fired from a stationary weapon with a muzzle velocity of 2,800 feet per second. The incendiary cartridge is slightly lighter in weight than the other projectiles, hence has a muzzle velocity of 2,840 feet per second.

b. **Identification.** Painting and marking of 20-mm cartridges for purposes of identification differ from the basic color scheme prescribed in TM 9-1900 but all essential information is provided. The HE-I projectile has a yellow ogive and a red body; the AP-T, ball, and practice projectiles are painted black; the incendiary projectile is painted gray with the tip painted blue. See figures 24 to 31, inclusive.

c. **Fuzes.** The HE-I round, Mk. I, is fitted with FUZE, P. D., 253 Mk. III or Mk. II. These point detonating fuzes of British origin are direct-action superquick types and are not boresafe. The HE-I round, T23 (M97) is fitted with FUZE, P.D., T71E4 (M75), similar in internal details, but not in shape, to the Mk. III Fuze. See chapter 3, section I, for a complete description of these fuzes.

d. **Cartridge Cases.** The standard cartridge case is the M21A1, weighing approximately 0.205 pound; the substitute standard is the M21A1B1. The M21A1B1 is a steel case with a deeper extracting groove machined in the head, and is about 0.017 pound lighter than the standard M21A1 Brass Case. Rounds assembled with steel cases are only for ground and target use within continental U.S. The earlier standard M21 Case is no longer manufactured. It differs from the M21A1 in that the primer recess is adapted to hold the M37 (Berdan) Primer. The anvil is not present in this type of primer but is instead a component of the cartridge case. Also, the M21 has several flash vents instead of the single vent found in the M21A1 Case.

e. **Primers.** The M36-type Primer, containing a 2.1-grain charge of primer mixture, is standard for the 20-mm ammunition (ch. 3, sec. III).

f. **Disintegrating Belt Links.** These links, center and end, are considered as ammunition components similar to small-arms ammunition links (fig. 23). They are stored, issued, and reviewed in ORD 11 SNL R-1. They are issued when right- or left-hand Feed Mechanisms M1, M1A1, and T15 are required, except the M7 Link which is issued for the M2 Feed Mechanism. Their nomenclatures and piece marks are as follows:

LINK, disintegrating belt, 20-mm, M7
LINK, disintegrating belt, 20-mm, M3, C70661
LINK, end, disintegrating belt, 20-mm, M4, B163774
LINK, end, disintegrating belt, 20-mm, M5 (alternative), B163775

19. COMPLETE ROUND TABLE.

a. Data concerning the 20-mm complete rounds and components therefor are given in table 8, chapter 5.

20. PACKING AND SHIPPING DATA.

a. Data concerning 20-mm rounds are given in ORD 11 SNL's R-1 and R-6.

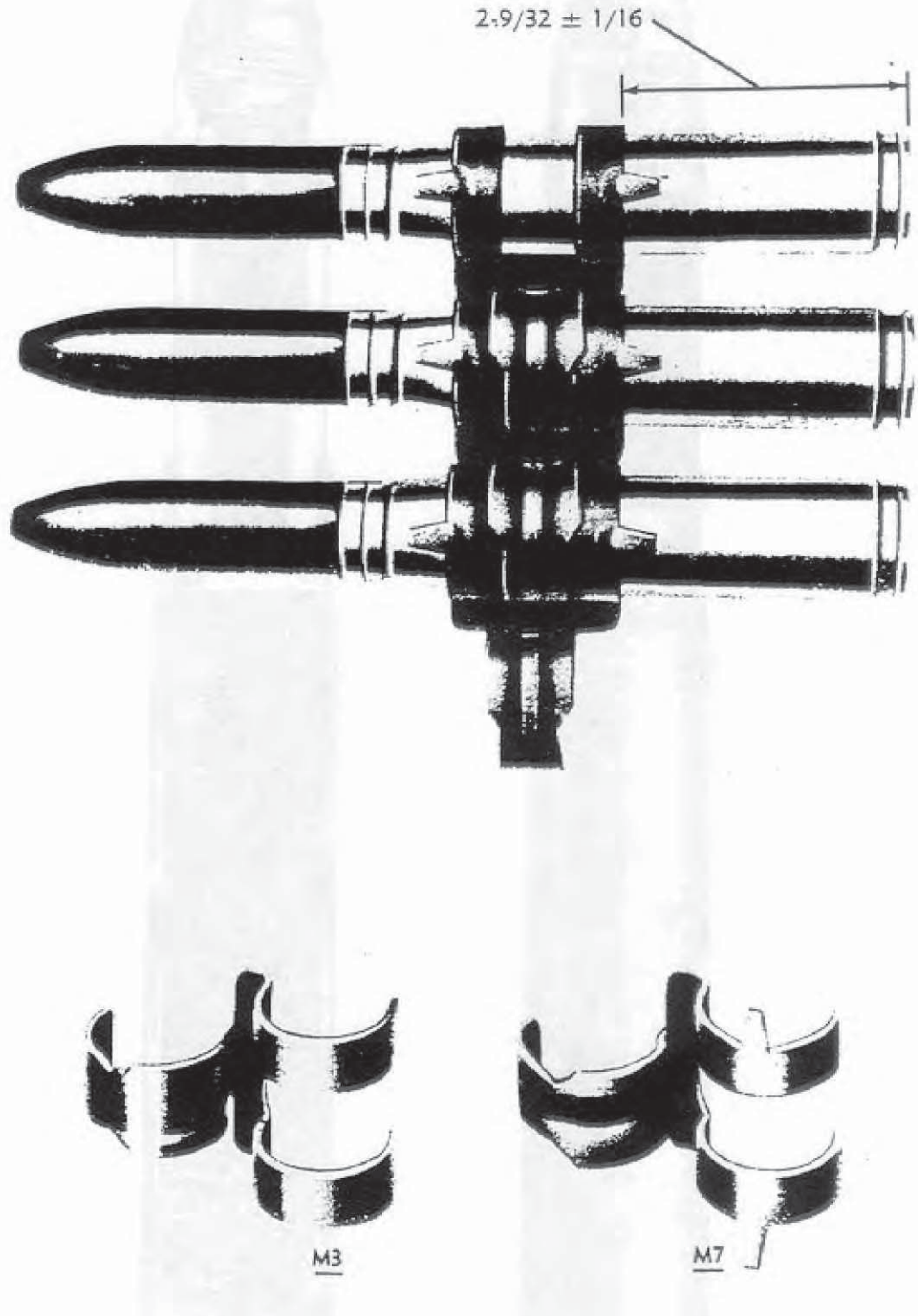

Figure 23 — 20-mm Cartridges in Link Belt and 20-mm Links

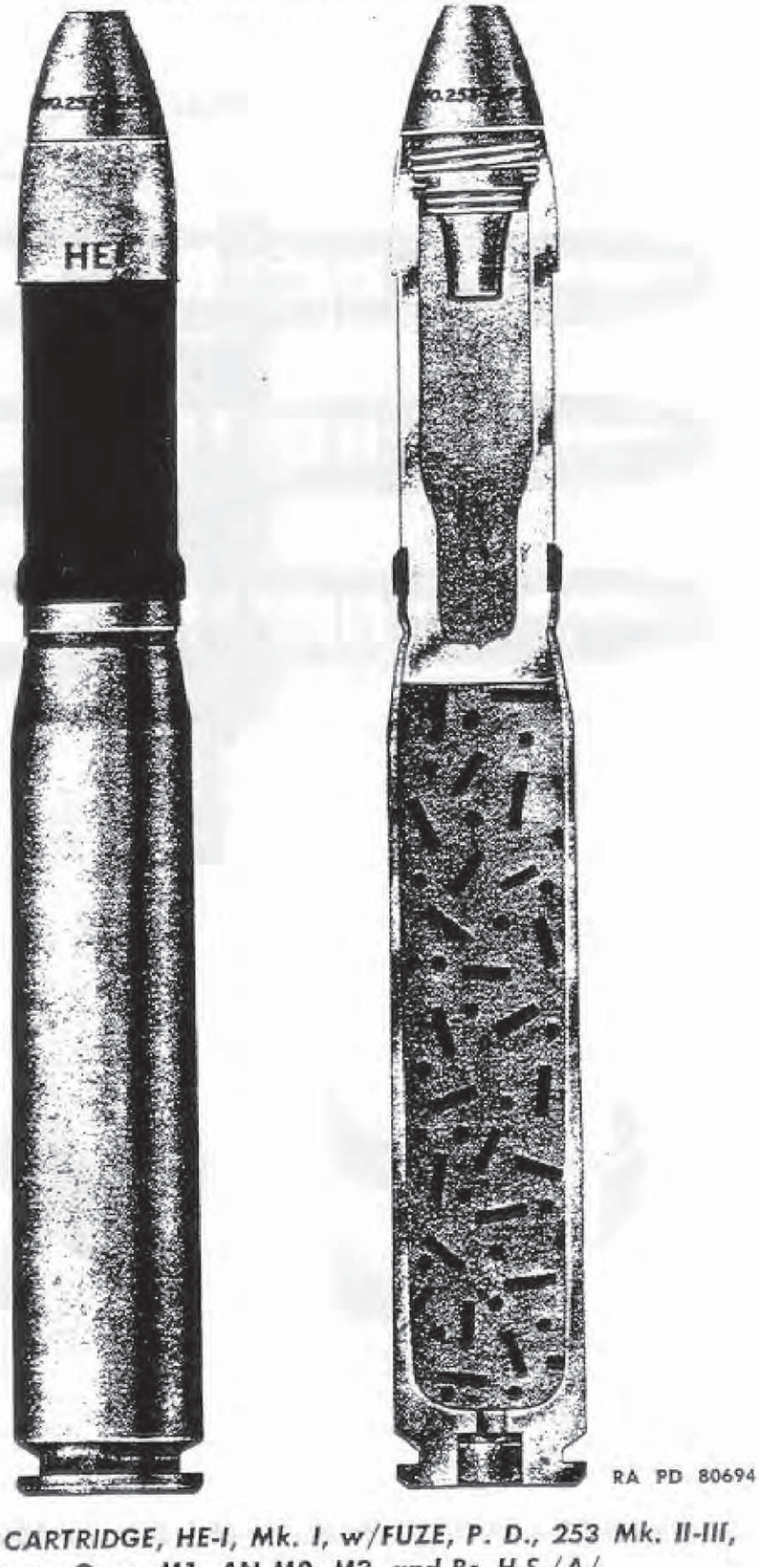

Figure 24 — CARTRIDGE, HE-I, Mk. I, w/FUZE, P. D., 253 Mk. II-III, 20-mm Guns, M1, AN-M2, M3, and Br. H.S./A/

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

21. **CARTRIDGE, HE-I, MK. I, W/FUZE, P. D., 253 MK. II-III, 20-MM GUNS, M1, AN-M2, M3, AND BR. H.S./A/** (fig. 24), is for use against aircraft and light materiel targets, functioning with both explosive and incendiary effect. The explosive filler is tetryl and the incendiary mixture is located in the base of the shell. After the shell penetrates the target, the high-explosive filler is detonated, the shell is shattered, and the incendiary composition is ignited. Its fuze is an instantaneous percussion fuze of the impact type. The thickness of the base is only 0.15 inch and a base cover is present for additional protection.

DATA

Weight of complete round........ 0.57 lb	Width of rotating band.......... 0.203 in.
Length of complete round...... 7.19 in.	Type of base........................ Square
Length of fuzed projectile...... 3.22 in.	Radius of ogive........................ 3.27 cal.
Length of cartridge case.......... 4.34 in.	Muzzle velocity............ 2,800 ft per sec

Maximum range........................ 5,100 yd

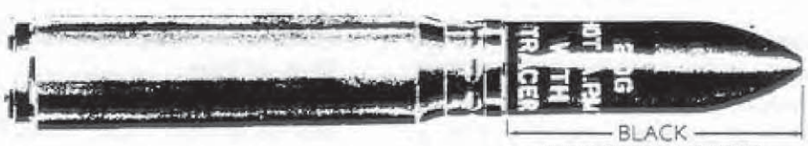

Figure 25 — CARTRIDGE, AP-T, M75, 20-mm Guns, M1, AN-M2, M3, and Br. H.S./A/

22. **CARTRIDGE, AP-T, M75, 20-MM GUNS, M1, AN-M2, M3, AND BR. H.S./A/** (fig. 25), is for use against armored targets. The projectile is a solid steel shot, turned from cold-drawn steel bar stock. The base of the projectile contains a red tracer composition which is sealed in by means of a metal closing cup. When ignited, the tracer burns for about 4 seconds, equivalent to a range of about 3,000 yards.

DATA

Weight of complete round...... 0.639 lb	Radius of ogive........................ 2.39 cal.
Length of complete round...... 7.22 in.	Muzzle velocity............ 2,615 ft per sec
Length of projectile................. 3.25 in.	Maximum range...................... 6,300 yd
Length of cartridge case.......... 4.34 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)........................ 0.6
Width of rotating band.......... 0.203 in.	
Type of base.............................. Square	

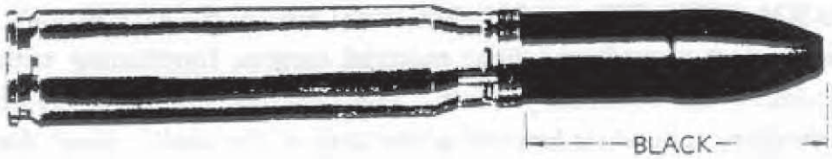

Figure 26 — CARTRIDGE, Ball, 20-mm Guns, M1, AN-M2, M3, and Br. H.S./A/

23. **CARTRIDGE, BALL, 20-MM GUNS, M1, AN-M2, M3, AND BR. H.S./A/** (fig. 26), is for service firing against personnel and light materiel targets, for practice, and for proof-firing. The projectile is similar in shape and ballistic properties to the HE-I projectile, but is hollow and contains no explosive or tracer. It is rolled from steel bar stock. A steel closing disk with a 45-degree chamfer is fitted into the recesses in the base of projectile.

DATA

Weight of complete round........ 0.56 lb	Width of rotating band.......... 0.203 in.
Length of complete round...... 7.23 in.	Type of base.............................. Square
Length of projectile.................. 3.31 in.	Radius of ogive........................ 3.27 cal.
Length of cartridge case.......... 4.34 in.	Muzzle velocity .... 2,850 ft per sec
Maximum range........................ 6,000 yd	

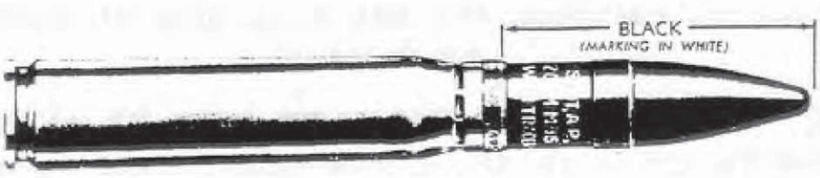

Figure 27 — CARTRIDGE, AP-T, T9E5 (M95), 20-mm Guns, M1, AN-M2, M3, and Br. H.S./A/

24. **CARTRIDGE, AP-T, T9E5 (M95), 20-MM GUNS, M1, AN-M2, M3, AND BR. H.S./A/** (fig. 27), is for use against armored targets. The projectile is a solid shot made from bar or forged steel. A drawn steel windshield is crimped into rolled or stamped grooves in the projectile body, the portion of the windshield over the crimping acting as the bourrelet of the projectile. The base of the projectile contains a red tracer composition, sealed in by means of a

metal closing cup. The tracer burns for about 2.25 seconds, equivalent to a range of about 1,400 yards.

DATA

Weight of complete round........ 0.57 lb	Muzzle velocity .... 2,800 ft per sec
Length of complete round...... 7.22 in.	Maximum range .... 5,900 yd
Length of projectile................. 3.27 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 400 yd)........................... ¾
Length of cartridge case.......... 4.34 in.	Penetration (in. at 0-deg obliquity of homogeneous plate at 400 yd)........................... ⅞
Width of rotating band.......... 0.203 in.	
Type of base............................ Square	
Radius of ogive......................... 2.3 cal.	

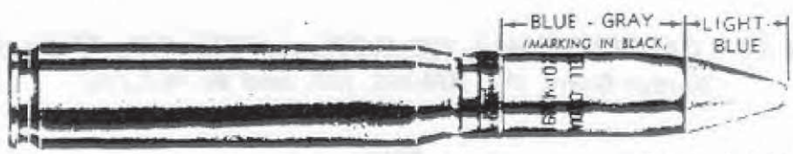

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Figure 28 — CARTRIDGE, Incendiary, T18 (M96), 20-mm Guns, M1, AN-M2, M3, and Br. H.S./A/

25. CARTRIDGE, INCENDIARY, T18 (M96), 20-MM GUNS, M1, AN-M2, M3, AND BR. H.S./A/ (fig. 28), is for use against aircraft, functioning with incendiary effect, similar to cal. .50 incendiary cartridges. The body is made of cold-drawn steel. The nose, threaded to screw into body, is made of a die-cast zinc alloy; it is painted light blue for identification similar to small-arms cartridges. Both the body and nose are filled with incendiary materiel. This round does not require a fuze, as functioning is initiated by impact of nose upon target.

DATA

Weight of complete round........ 0.55 lb	Width of rotating band.......... 0.203 in.
Length of complete round...... 7.20 in.	Type of base............................ Square
Length of projectile................ 3.245 in.	Radius of ogive......................... 2.54 cal.
Length of cartridge case.......... 4.34 in.	Muzzle velocity .... 2,840 ft per sec

Maximum range .... 5,700 yd

26. CARTRIDGE, HE-I, T23 (M97), W/FUZE, P. D., T71E4 (M95), 20-MM GUNS, M1, AN-M2, M3, AND BR. H.S./A/ (fig. 29), is for use against aircraft and light materiel targets, functioning with both explosive and incendiary effect. The explosive filler is tetryl and the incendiary mixture is located in the base of the shell. After the shell penetrates the target, its filler is detonated, the shell shattered, and the incendiary composition ignited. Its fuze is an instantaneous

percussion fuze of the impact type. The thickness of the base is approximately 0.2 inch, and a base cover is welded thereon for additional protection. This cartridge differs basically from the HE-I cartridge, described in paragraph 21, by having a pointed fuze.

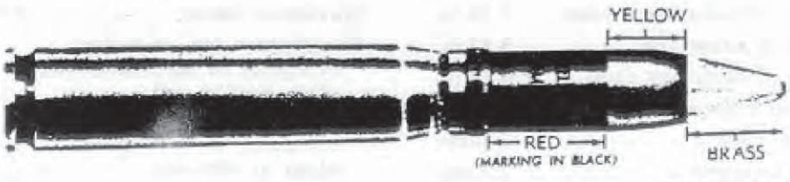

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Figure 29 — CARTRIDGE, HE-I, T23 (M97), w/FUZE, P.D., T71E4 (M75), 20-mm Guns, M1, AN-M2, M3, and Br. H.S./A/

DATA

Weight of complete round........ 0.57 lb	Width of rotating band.......... 0.203 in.
Length of complete round...... 7.22 in.	Type of base.......... Square
Length of fuzed projectile...... 3.28 in.	Radius of ogive.......... 2.54 cal.
Length of cartridge case.......... 4.34 in.	Muzzle velocity .... 2,800 ft per sec

Maximum range .... 5,750 yd

RA PD 65136

Figure 30 — CARTRIDGE, Practice, T24 (M99), 20-mm Guns, M1, AN-M2, M3, and Br. H.S./A/

27. CARTRIDGE, PRACTICE, T24 (M99), 20-MM GUNS, M1, AN-M2, M3, AND BR. H.S./A/ (fig. 30), is for practice firing. The projectile is similar in shape and ballistic properties to the T18 (M96) Incendiary Projectile but is hollow and contains no explosive. The nose consists of a zinc die casting as in the T18 (M96) Incendiary but its weight is adjusted to give the projectile a weight of 2,000 grains (0.29 lb). The projectile body is made of cold-drawn steel.

DATA

Weight of complete round........ 0.57 lb	Width of rotating band.......... 0.203 in.
Length of complete round...... 7.22 in.	Type of base.......... Square
Length of projectile.......... 3.27 in.	Radius of ogive.......... 2.54 cal.
Length of cartridge case.......... 4.34 in.	Muzzle velocity .... 2,800 ft per sec

Maximum range .... 5,750 yd

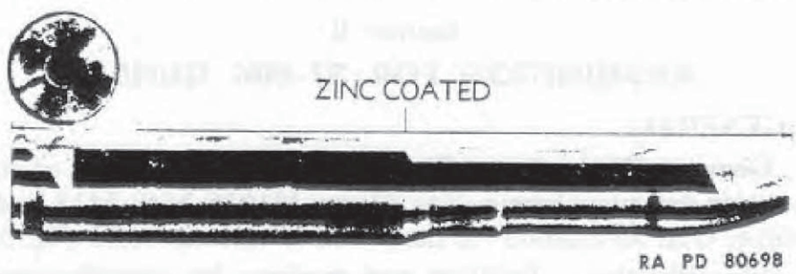


Figure 31 — CARTRIDGE, Drill, M18A1, 20-mm Auto. Guns, M1, AN-M2, and Br. H.S./A/

28. CARTRIDGE, DRILL, M18A1, 20-MM GUNS, M1, AN-M2, AND BR. H.S./A/ (fig. 25), is a completely inert assembly intended to provide a simulated service cartridge for drill purposes and for testing feed mechanism of the weapon. The service projectile and cartridge case are simulated by a 1-piece casing made of steel, cold-drawn to size, shape, and weight. The base is threaded to hold a steel base plug, flanged to provide an extractor groove like that on service ammunition. Alternative manufacturing designs for this drill cartridge have a steel body plug secured in the nose of the cartridge. Weight is 0.57 pound; length is 7.20 inches.

29. CARTRIDGE, DRILL, M18, 20-MM GUNS, M1, AN-M2, AND BR. H.S./A/, differs from the M18A1 Drill Cartridge (par. 28) in minor internal details of the body and the base plug.

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

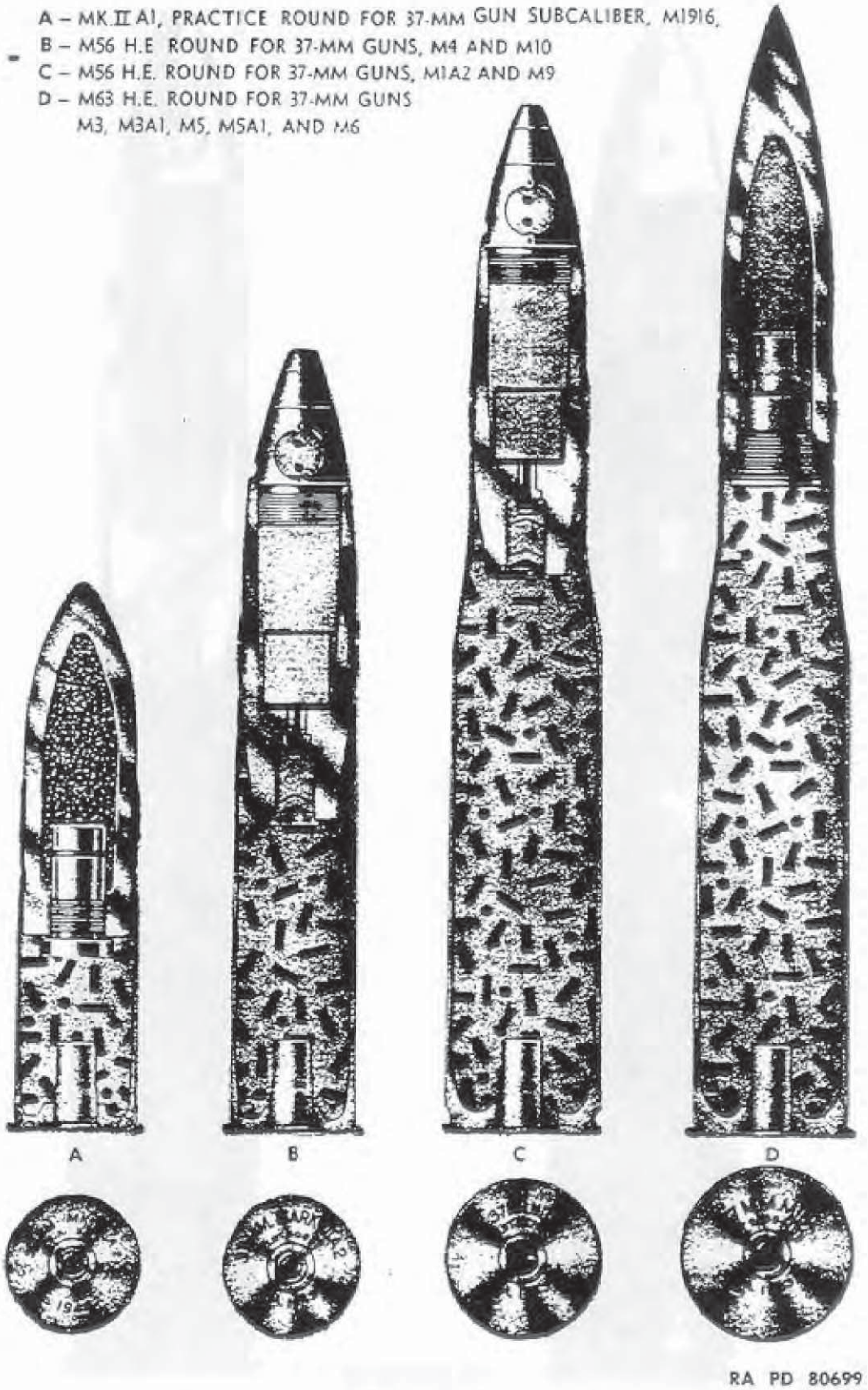


Figure 32 — Comparison of 37-mm Ammunition

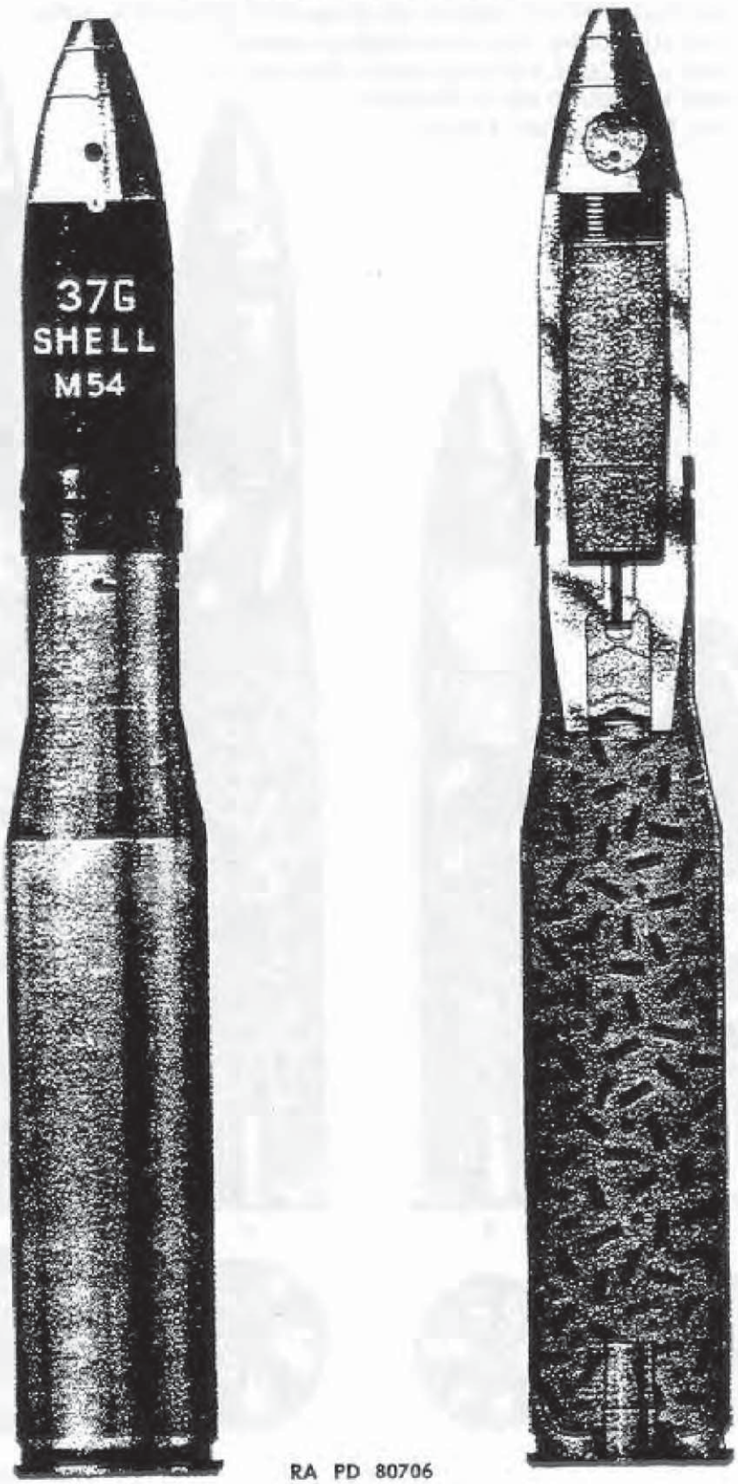


Figure 33 — SHELL, Fixed, H.E., M54, w/TRACER, SD, and FUZE, P.D., M56, 37-mm Auto. Guns, M1A2 and AN-M9

33. SHELL, FIXED, H. E., M54, W/TRACER, SD, AND FUZE, P. D., M56, 37-MM AUTO. GUNS, M1A2 AND AN-M9 (fig. 33), is provided for use in the M1A2 and AN-M9 Guns for firing against aircraft, hence is fitted with a supersensitive type fuze. The same shell and fuze are also used with the AN-M4 and M10 Aircraft Guns. However, when fired from the M1A2 and AN-M9 Guns, the round is assembled with the M17 Cartridge Case, or for the M1A2 Gun only, with the M17B1 (steel) Cartridge Case. The projectile consists of a relatively thin-welded shell body, a tetryl bursting charge, FUZE, P.D., M56, and a shell-destroying tracer. The nose is threaded to receive the fuze and the "boat-tailed" base is threaded to receive a tracer assembly containing a relay housing, an igniter charge, and a relay igniting charge. These charges connect the tracer with a black powder pellet in the base end of the bursting charge cavity. The tracer burns for about 8 seconds, equivalent to about 3,500 yards, whereupon the relay pellet is ignited and causes the bursting charge to detonate if prior functioning has not been caused by impact.

DATA

Weight of complete round	2.62 lb	Type of base	Boat-tailed
Length of complete round	12.81 in.	Degree of taper base	9 deg 15 min
Length of fuzed projectile	5.87 in.	Radius of ogive	4.34 cal.
Length of cartridge case	8.75 in.	Muzzle velocity	2,600 ft per sec
Width of rotating band	0.74 in.	Maximum range	3,500 yd*

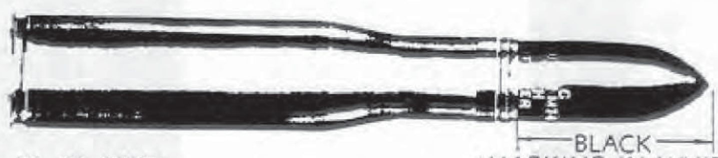


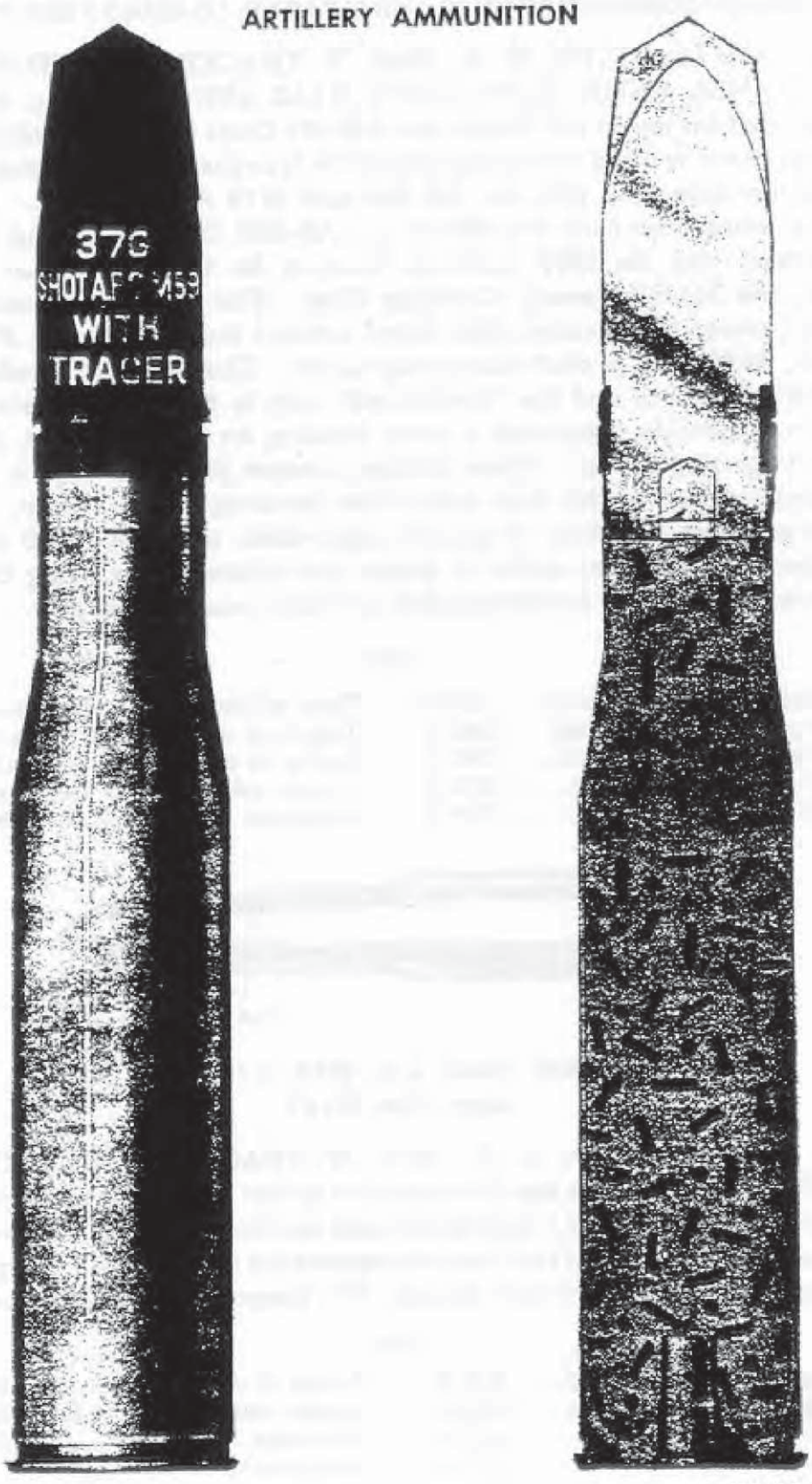
Figure 34 — SHOT, Fixed, A.P., M74, w/TRACER, 37-mm Auto. Gun, M1A2

34. SHOT, FIXED, A. P., M74, W/TRACER, 37-MM AUTO. GUN, M1A2 (fig. 34), has the same shot as that used in the corresponding round for M3, M3A1, M5, M5A1, and M6 Guns (par. 43). However, when fired from the M1A2 Gun, it is assembled with the M17 Cartridge Case, which has an extractor groove. The tracer burns for 2,000 yards.

DATA

Weight of complete round	3.07 lb	Radius of ogive	1.52 cal.
Length of complete round	13.01 in.	Muzzle velocity	2,050 ft per sec
Length of projectile	4.84 in.	Maximum range	7,290 yd
Length of cartridge case	8.75 in.	Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd)	1.2
Width of rotating band	0.74 in.		
Type of base	Square		

*—Limited by shell-destroying tracer. Theoretical maximum is 8,875 yards, horizontal, and 6,200 yards, vertical.



RA PD 80707

Figure 35 — SHOT, Fixed, A.P.C., M59, w/TRACER, 37-mm Auto. Gun, M1A2

35. SHOT, FIXED, A.P.C., M59, W/TRACER, 37-MM AUTO. GUN, M1A2 (fig. 35), has been adapted from the M51 Projectile (par. 42) to provide armor-piercing ammunition for the 37-mm Automatic Gun M1A2, and more recently for the AN-M9 Gun. The projectile body, armor-piercing cap, and tracer are similar to the corresponding parts of the M51 Armor-piercing Projectile, but the windshield is omitted. This gives the M59 Shot a blunt flat-nosed appearance, in contrast to the long tapered shape of the M51 Shot. Penetrating qualities are not affected, so that both projectiles are about equally effective against the same types of armor plate. However, the effective range is less than that of the M51 Shot.

DATA

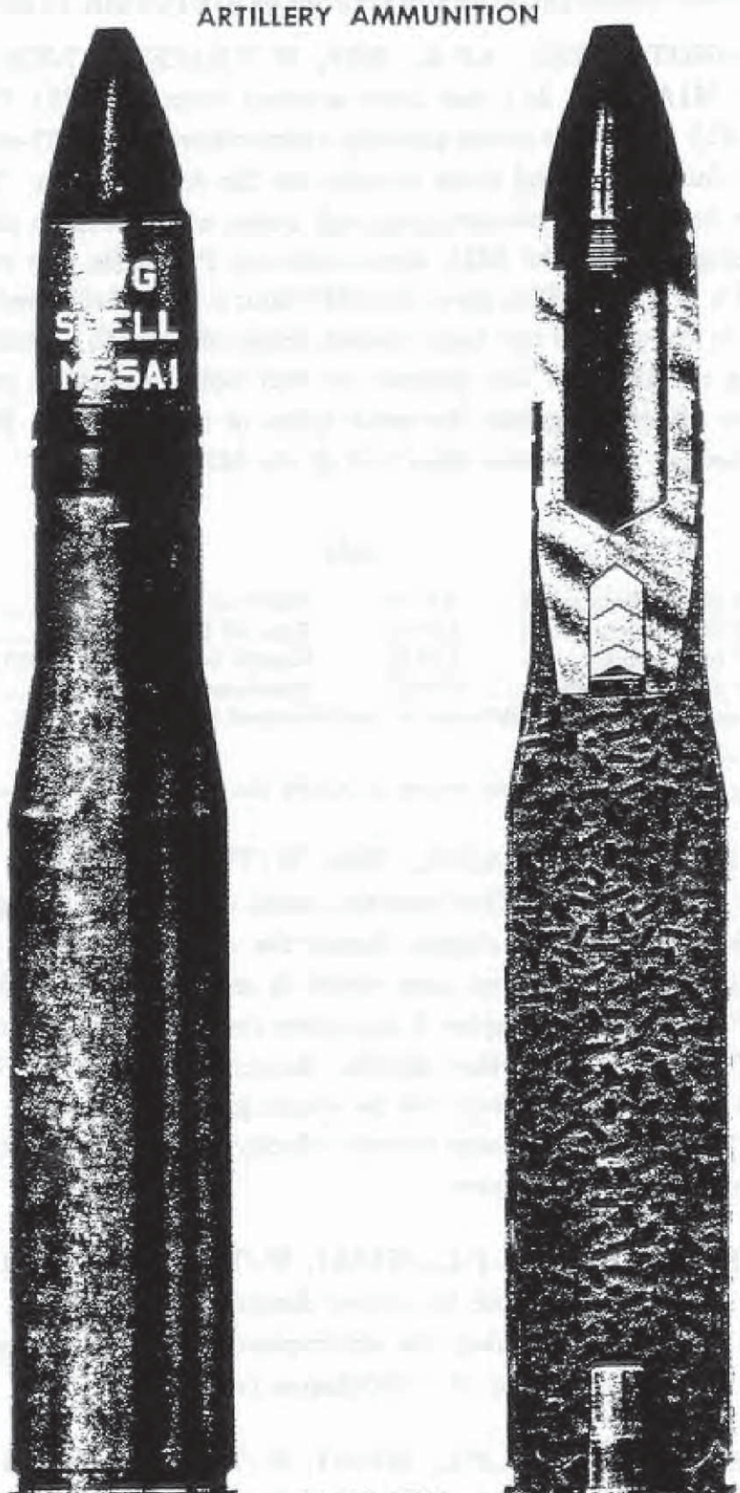
Weight of complete round	3.12 lb	Width of rotating band	0.74 in.
Length of complete round	12.76 in.	Type of base	Square
Length of projectile	4.59 in.	Muzzle velocity	2,050 ft per sec*
Length of cartridge case	8.75 in.	Maximum range	5,790 yd*
Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	0.7*		

*Data for M1A2 Gun. Muzzle velocity for AN-M9 Gun is 2,800 feet per second.

36. SHOT, FIXED, A.P.C., M59, W/TRACER, 37-MM AUTO. GUN, M9 (fig. 35), differs from the round described in paragraph 35 only in the propelling charge (hence the muzzle velocity) and the marking on the cartridge case, which is as follow: "37G, M9, MV 2800." See table 8, chapter 5, complete round table for ammunition for 37-mm guns, for further details. Armor penetration for this projectile in the AN-M9 Gun will be much greater than when fired in the M1A2 due to the greater muzzle velocity to which should be added the velocity of the airplane.

37. SHOT, FIXED, A.P.C., M59A1, W/TRACER, 37-MM AUTO. GUN, M1A2, differs from the round described in paragraph 35 only in the method of attaching the armor-piercing cap to the propectile body, which is by means of a 360-degree crimp.

38. SHOT, FIXED, A.P.C., M59A1, W/TRACER, 37-MM AUTO. GUN, M9, differs from the round described in paragraph 36 only in the method of attaching the armor-piercing cap to the projectile body, which is by means of a 360-degree crimp.



RA PD 80708

Figure 36 — SHELL, Fixed, Practice, M55A1, w/TRACER, and FUZE, Dummy, M50, 37-mm Auto. Guns, M1A2 and AN-M9

39. SHELL, FIXED, PRACTICE, M55A1, W/TRACER, AND FUZE, DUMMY, M50, 37-MM AUTO. GUNS, M1A2 AND AN-M9 (fig. 36), provides practice ammunition for the M1A2 and AN-M9 Guns with about the same ballistic characteristics as the high-explosive Service Round M54 (par. 33). The M17 Cartridge Case and a service primer and propelling charge are used. The projectile is similar in contour to, and of the same weight as the M54 Shell, but has no bursting charge and is fitted with a dummy fuze. In addition, the shell-destroying tracer of the service round is replaced by a composition for tracing purposes only. The tracer, consisting of a red tracer composition and an igniter composition, burns for about 8 seconds, or 3,500 yards. FUZE, dummy, M50, simulates the M56 Service Fuze but has no explosive elements.

DATA

Weight of complete round........ 2.63 lb	Width of rotating band............ 0.74 in.
Length of complete round .... 12.81 in.	Type of base .... Boat-tailed
Length of fuzed projectile ...... 5.87 in.	Degree of taper of base.. 9 deg 15 min
Length of cartridge case.......... 8.75 in.	Muzzle velocity .... 2,600 ft per sec
Maximum range .... 8,875 yd	(Horizontal; vertical range is 6,200 yd)

Figure 37 — SHOT, Fixed, A.P., M80, w/TRACER, 37-mm Auto. Gun, AN-M9

40. SHOT, FIXED, A.P., M80, W/TRACER, 37-MM AUTO. GUN, AN-M9 (fig. 37), is used in rounds to be fired from the AN-M4 as well as the AN-M9 Aircraft Gun. When to be fired from the AN-M9 Gun, the round is assembled with the grooved M17 Brass Cartridge Case. The shot is of the same general design as the M74 Shot used with the M1A2 Gun (par. 34) but is shorter and lighter. The body is of the uncapped monobloc type, with the nose formed to a relatively short ogive. The base contains a tracer composition for observation purposes which burns for 2,000 yards of flight.

DATA

Weight of complete round........ 3.15 lb	Width of rotating band............ 0.74 in.
Length of complete round .... 12.40 in.	Type of base.............................. Square
Length of projectile.................. 4.23 in.	Radius of ogive........................ 1.62 cal.
Length of cartridge case.......... 8.75 in.	Muzzle velocity .... 3,050 ft per sec

Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd).............. 2.1

RA PD 80711

Figure 38 — SHELL, Fixed, H.E., M63, w/FUZE, B.D., M58, 37-mm Guns, M3, M3A1, M5, M5A1, and M6

41. **SHELL, FIXED, H.E., M63, W/FUZE, B.D., M58, 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6** (fig. 38), is for use with 37-mm tank and antitank guns when fragmentation and blast effect are desired. The shell body is a relatively heavy steel casing. The nose is solid and formed to a long ogive. The base is "square" and threaded to receive the M58 Base Fuze which functions with nondelay action. This construction provides a maximum distribution of metal forward of the TNT bursting charge and for some penetration before detonation, increasing the effectiveness against targets such as sheltered or entrenched personnel, trucks, and light-armored vehicles. The round is assembled with both brass and steel cartridge cases. Present muzzle velocity is 2,600 feet per second, but rounds of earlier manufacture may be found which are loaded to give 2,700 feet per second muzzle velocity.

DATA

Weight of complete round........ 3.08 lb	Muzzle velocity:
Length of complete round ....14.09 in.	In M3, M3A1, and M6 Guns .... 2,600 ft per sec
Length of fuzed projectile...... 6.02 in.	In M5 and M5A1 Guns .... 2,565 ft per sec
Length of cartridge case.......... 8.75 in.	Approximate maximum range:
Width of rotating band........... 0.74 in.	In M3, M3A1, and M6 Guns .... 9,500 yd
Type of base............................ Square	In M5 and M5A1 Guns..... 9,425 yd
Radius of ogive....................... 8.97 cal	

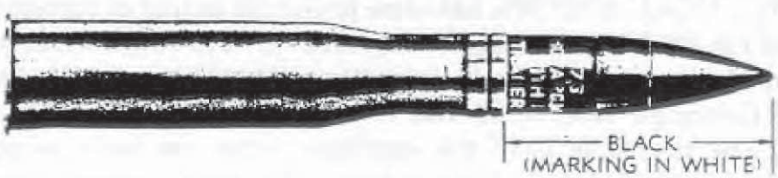


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Figure 39 — SHOT, Fixed, A.P.C., M51, w/TRACER, 37-mm Guns, M3, M3A1, M5, M5A1, and M6

42. **SHOT, FIXED, A.P.C., M51, W/TRACER, 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6** (fig. 39), is provided for use in 37-mm tank and antitank guns against light armor and similar materiel targets. The shot depends for its effect upon the force of its impact and penetration; the use of an armor-piercing cap especially adapts it for combating face-hardened plate. Three types of projectile—M51, M51B1 and M51B2—have been manufactured for the round. The M51B1 differs from the alternative M51B2 in that the armor-piercing cap is pointed, whereas the cap of the M51B2 is rounded at the front end. The M51, an earlier design, has a pointed cap, but differs from both the M51B1 and M51B2 in that the tracer cavity is closed by a steel washer crimped to the base of the projectile. The tracer cavities of the M51B1 and M51B2 are closed by a metal

disk. In other respects, construction is similar, the projectile being made up of a hard steel core or body, the softer steel armor-piercing cap, and a light-weight windshield or false ogive which is crimped or screwed onto the armor-piercing cap. There is no bursting charge, the projectile being solid except for the small cavity in the base. This holds a red tracer composition which burns for approximately 3 seconds, equivalent to about 2,300 yards.

DATA

Weight of complete round	3.41 lb	Maximum range (at 45 deg elevation):	
Length of complete round	14.53 in.	In M3, M3A1, and M6 Guns	12,850 yd
Length of projectile	6.36 in.	In M5 and M5A1 Guns	12,725 yd
Length of cartridge case	8.75 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	2.1
Width of rotating band	0.74 in.	Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd)	2.3
Type of base	Square		
Radius of ogive (false ogive)	8.96 cal.		
Muzzle velocity:			
In M3, M3A1, and M6 Guns	2,900 ft per sec*		
In M5 and M5A1 Guns	2,855 ft per sec*		

*—For rounds with brass cartridge cases; 2.800 feet per second for rounds with steel cases. Rounds of earlier manufacture have muzzle velocity of 2,600 feet per second. Identification provided by marking on packing boxes.

43. SHOT, FIXED, A.P., M74, W/TRACER, 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6, has same projectile as that of corresponding round for M1A2 Automatic Gun (par. 34). However, when to be fired from the tank and antitank guns, the projectile is assembled with the M16 Cartridge Case, which has extractor rim instead of extractor groove. The projectile is of the monobloc type, the body being of solid steel except for tracer cavity in base. Like most uncapped armor-piercing projectiles, the nose is formed to a relatively blunt point. While capable of adequate performance against homogeneous plate, this shot has been found to be less effective than the capped projectile against face-hardened plate of the type now being encountered in the field and is now used for service firing only in certain theaters of operation. The tracer burns for 2,000 yards.

DATA

Weight of complete round	3.07 lb	Maximum range (at 45 deg):	
Length of complete round	13.01 in.	In M3, M3A1, and M6 Guns	8,725 yd
Length of projectile	4.84 in.	In M5 and M5A1 Guns	8,625 yd
Length of cartridge case	8.75 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	1.5
Width of rotating band	0.74 in.	Penetration (in. at 0-deg obliquity of homogeneous Plate at 1,000 yd)	2.0
Type of base	Square		
Radius of ogive	1.52 cal.		
Muzzle velocity:			
In M3, M3A1, and M6 Guns	2,900 ft per sec		
In M5 and M5A1 Guns	2,855 ft per sec		

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

Figure 40 — CANISTER, Fixed, M2, 37-mm Guns, M3, M3A1, M5, M5A1, and M6

44. CANISTER, FIXED, M2, 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6 (fig. 40), is provided for 37-mm tank and antitank guns for effect against personnel. It is assembled with the M16 Cartridge Case. The canister consists of a terneplate cylinder sealed by a metal disk at each end and beaded near the base to insure firm seating in the cartridge case. The filler consists of 122 steel balls, each about 3/8-inch diameter, imbedded in a resinous matrix or binding material. There is no bursting charge or fuze. The case is ruptured by the shock of discharge and bursts within 100 feet of the muzzle of the gun, projecting the balls forward in a cone-shaped pattern at a velocity closely equal to that at the muzzle. This canister ammunition is effective against unsheltered personnel up to around 150 to 200 yards. Ability to penetrate materiel is limited.

DATA

Weight of complete round	3.31 lb	Length of canister	6.36 in.
Length of complete round	14.53 in.	Length of cartridge case	8.75 in.

Muzzle velocity .... 2,500 ft per sec

45. SHOT, FIXED, T.P., M51A1, W/TRACER, 37-MM GUNS, M3, M3A1, M5, AND M6, has the same components as used for the M51A2 Target-practice Round described in paragraph 46, except that the windshield is omitted. As a result, the projectile has a blunt flat-nosed appearance, in contract to the long ogival nose of the M51A2.

DATA

Weight of complete round	3.34 lb	Muzzle velocity:	
Length of complete round	12.62 in.	In M3, M3A1, and M6 Guns	2,600 ft per sec†
Length of projectile	4.45 in.	In M5 and M5A1 Guns	2,550 ft per sec
Length of cartridge case	8.75 in.	Maximum range:	
Width of rotating band	0.74 in.	In M3, M3A1, and M6 Guns	5,525 yd
Type of base	Square		
Radius of ogive	8.96 cal.*		

*—For approximately 1.57 inches forward of the bourrelet, at which point the nose ends in a flat fronted surface approximately 1.1 inches in diameter.

†—Authorized velocity is 2,450 feet per second, but no rounds have been manufactured with this velocity.

Figure 41 — SHOT, Fixed, T.P., M51A2, w/TRACER, 37-mm Guns, M3, M3A1, M5, M5A1, and M6

46. **SHOT, FIXED, T.P., M51A2, W/TRACER, 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6** (fig. 41), simulates SHOT, fixed, A.P.C., M51, w/TRACER, for practice firing from tank and antitank guns. Components are the same as for the service round (par. 42), except that the projectile body is a solid slug having the same over-all dimensions as combined body and armor-piercing cap of service shot.

DATA

Weight of complete round	3.39 lb	Muzzle velocity:	
Length of complete round	14.53 in.	In M3, M3A1, and M6 Guns	2,600 ft per sec
Length of projectile	6.21 in.	In M5 and M5A1 Guns	2,550 ft per sec
Length of cartridge case	8.75 in.	Maximum range (at 45 deg):	
Width of rotating band	0.74 in.	In M3, M3A1, and M6 Guns	12,050 yd
Type of base	Square	In M5 and M5A1 Guns	11,900 yd
Radius of ogive (false ogive)	8.96 cal.		

Figure 42 — SHELL, Fixed, H.E., M54, w/TRACER, SD, and FUZE, P.D., M56, 37-mm Auto. Guns, AN-M4 and M10 (Aircraft)

47. **SHELL, FIXED, H.E., M54, W/TRACER, SD., AND FUZE, P.D., M56, 37-MM AUTO. GUNS, AN-M4 AND M10 (AIRCRAFT)** (fig. 42), has the same shell as used in rounds for M1A2 and AN-M9 Automatic Guns described (par. 33), and is adapted for use in the AN-M4 Aircraft Gun by assembling it with the Mk. IIIA2 (brass), or Mk. IIIA2B1 (steel) Cartridge Case. Because of lower muzzle velocity, the shell-destroying element operates at about 2,000 yards.

DATA

Weight of complete round	1.93 lb	Width of rotating band	0.74 in.
Length of complete round	9.75 in.	Type of base	Bob-tailed
Length of fuzed projectile	5.87 in.	Degree of taper	9 deg 15 min
Length of cartridge case	5.69 in.	Radius of ogive	4.34 cal.

Muzzle velocity .... 2,000 ft per sec

Figure 43 — SHOT, Fixed, A.P., M80, w/TRACER, 37-mm Auto. Guns, AN-M4 and M10 (Aircraft)

48. **SHOT, FIXED, A.P., M80, W/TRACER, 37-MM AUTO. GUNS, AN-M4 AND M10 (AIRCRAFT)** (fig. 43), is the same as that for the Automatic Gun AN-M9, except for the cartridge case. For the AN-M4 and M10 Guns the Mk. IIIA2, or alternative Steel Case Mk. IIIA2B1, loaded with a smaller propelling charge, is used in the round.

DATA

Weight of complete round	2.25 lb
Length of complete round	9.34 in.
Length of projectile	4.23 in.
Length of cartridge case	5.69 in.
Width of rotating band	0.74 in.
Type of base	Square
Radius of ogive	1.62 cal.
Muzzle velocity	1,825 ft per sec*
Maximum range	6,700 yd
Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	0.6
Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd)	0.8

*—Rounds of older manufacture have muzzle velocity of 1,650 feet per second.

Figure 44 — SHELL, Fixed, Practice, M55A1, w/TRACER and FUZE, Dummy, M50, 37-mm Auto. Guns, AN-M4 and M10 (Aircraft)

49. **SHELL, FIXED, PRACTICE, M55A1, W/TRACER, AND FUZE, DUMMY, M50, 37-MM AUTO. GUNS, AN-M4 AND M10 (AIRCRAFT)** (fig. 44), differs from that described in paragraph 39 only in that the Mk. IIIA2 or alternative steel Cartridge Case Mk. IIIA2B1, and a smaller propelling charge are used. It provides practice ammunition for the AN-M4 and M10 Guns with ballistic properties similar to those of the M54 H.E. Round.

DATA

Weight of complete round	1.93 lb
Length of complete round	9.75 in.
Length of fuzed projectile	5.87 in.
Length of cartridge case	5.69 in.
Width of rotating band	0.74 in.
Type of base	Boat-tailed
Degree of taper	9 deg 15 min
Radius of ogive	4.34 cal.
Muzzle velocity	2,000 ft per sec

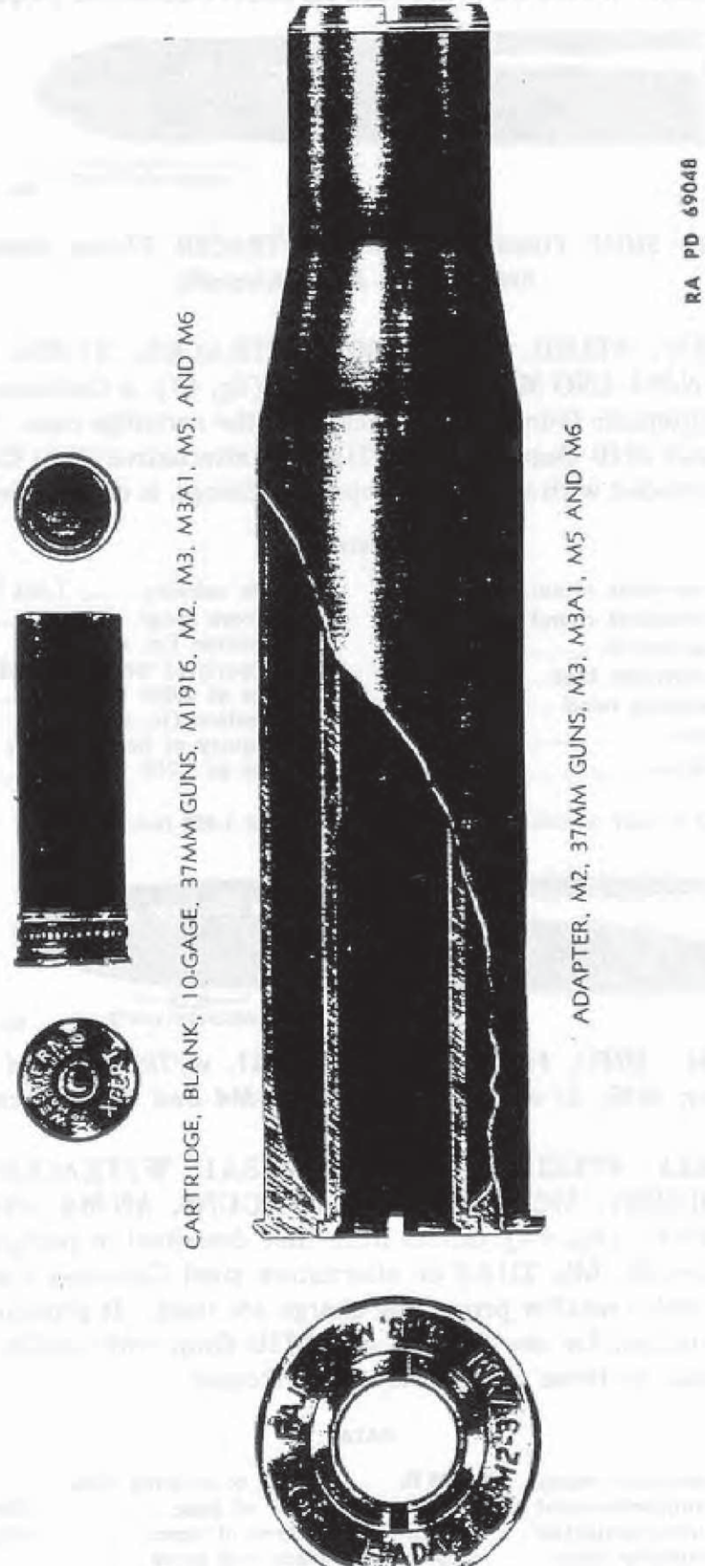

Figure 45 — Adapter and Blank Cartridge for 37-mm Gun

50. CARTRIDGE, BLANK, 10-GAGE, 37-MM GUNS, M1916, M3, M3A1, M5, AND M6 (fig. 45), consists of a commercial 10-gage blank shotgun shell loaded with 8 grains of black powder and containing dry felt wads. For firing with the M1916 Gun, the blank cartridge is used with ADAPTER, M1; in the M3, M3A1, M5, M5A1, and M6 Guns, the cartridge is used with ADAPTER, M2.

a. Both adapters are made up of three parts—a modified service cartridge case; a liner of steel tubing which extends through the cartridge case and acts as a seat for the blank cartridge; and an aluminum or steel bushing. The bushing serves to seat the liner firmly in position and to protect the neck of the cartridge case during handling and loading into the gun as well as to protect gun parts from damage during firing.

b. The M16 Cartridge Case is used to make up ADAPTER, M2, the primer hole being enlarged to seat the liner. This liner extends through the cartridge to a distance just short of the mouth of the case. The front end is threaded and screws into the steel bushing. When fully seated, this bushing protrudes approximately one-quarter inch beyond the cartridge case mouth.

c. A modified Mk. IA2 Cartridge Case is used to make up the M1 Adapter. In this adapter, the bushing extends approximately 1¾ inches beyond the cartridge case mouth, hence, when this ammunition is loaded into the gun, it extends into the bore of the gun for approximately that distance. In firing with either the M1 or the M2 Adapter, the percussion element of the blank shotgun cartridge serves as the primer.

DATA

	M1916 Gun	M3, M3A1, M5 and M5A1, and M6 Guns
Weight of adapter, w/o cartridge	0.87 lb	2.00 lb
Weight of adapter, w/ cartridge	0.91 lb	2.04 lb
Length of adapter	6.00 in.	9.00 in.
Length of cartridge case	3.64 in.	8.75 in.
Length of blank cartridge	2.85 in.	2.85 in.

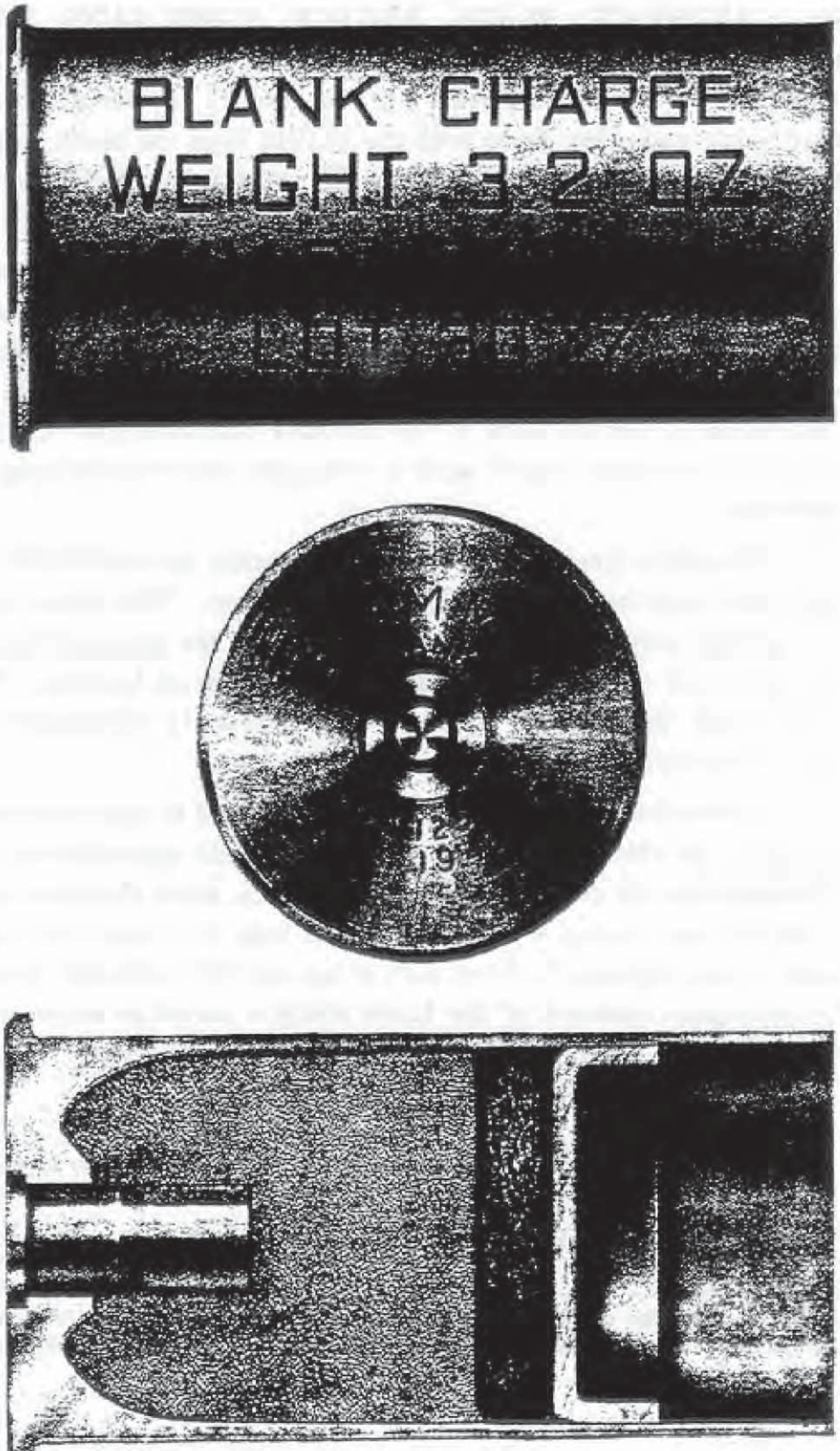

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Figure 46 — AMMUNITION, Blank, 37-mm Guns, M3, M3A1, M5, M5A1, and M6

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

51. AMMUNITION, BLANK, 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6 (fig. 46), is for simulated fire and for saluting purposes. It consists of a brass or steel cartridge case, 4 inches long, which contains a service primer and a 3.2-ounce charge of loose black powder. The powder charge is held in position around the primer by a closing cup made up of a felt inner padding and a thin pulp-board front surface. The closing cup is sealed in position with Pettman cement about five-eighths inch from the front of the cartridge case.

52. CARTRIDGE, DRILL, M21, W/FUZE, DUMMY, M50B2, 37-MM AUTO. GUNS, M1A2 AND AN-M9, simulates the M54 H.E. Round for M1A2 and AN-M9 Guns. It consists of the steel Cartridge Case M17B1, assembled with an M54 Shell and an M50B2 (1-piece, steel) Dummy Fuze. The shell and case are held together by means of a steel retaining rod, one end of which is inserted into the enlarged tracer cavity in the base of the shell. The other end is screwed into a cartridge case plug assembly which takes the place of the primer. This plug assembly is inserted with a force fit in the primer hole. A copper plug is assembled in the base of the plug assembly so that the firing pin of the weapon will not be injured in simulated firings.

DATA

Weight of complete round	2.67 lb	Width of rotating band	0.74 in.
Length of complete round	12.81 in.	Type of base	Boat-tailed
Length of fuzed projectile	5.87 in.	Degree of taper of base	9 deg 15 min
Length of cartridge case	8.75 in.	Radius of ogive	4.34 cal.

53. CARTRIDGE, DRILL, M23 (T31), 37-MM AUTO. GUNS, AN-M4 AND M10 (AIRCRAFT), simulates the M54 H.E. Round for the 37-mm AN-M4 and M10 Guns. It consists of a 1-piece malleable iron body which simulates the fuze, shell, and cartridge case of the M54 Round and a steel base which is screwed into the body. The base contains a copper plug held therein by a steel spring, steel washer, and cotter pin. The plug is made of copper so that the firing pin of the weapon will not be injured during simulated firings. Weight of complete round is 1.93 pounds; length of complete round is 9.75 inches.

54. CARTRIDGE, DRILL, M13, 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6 (fig. 47), is a completely inert cartridge which simulates the M51 Service Round for use in drill. It consists of a modified M51 or M51A2 Target-practice Projectile (which in turn closely resembles the M51 A.P.C. Service Projectile for these guns), an M16 Cartridge Case, and a steel retaining bar with a nail-like head and a threaded forepart. The retaining bar extends the length of the car-

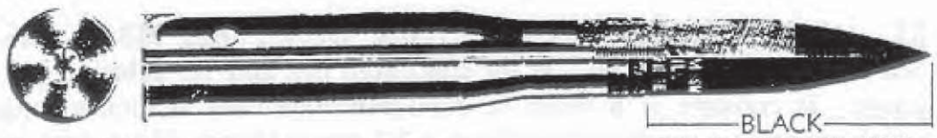

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Figure 47 — CARTRIDGE, Drill, M13, 37-mm Guns, M3, M3A1, M5, M5A1, and M6

tridge case and screws into the base of the projectile when the drill cartridge is assembled. The projectile is modified for this purpose by lengthening the tracer cavity of the target-practice projectile to approximately 2 inches and threading the drilled hole.

DATA

Weight of complete round	3.20 lb	Length of cartridge case	8.75 in.
Length of complete round	14.54 in.	Width of rotating band	0.74 in.
Length of projectile	6.21 in.	Type of base	Square

Radius of ogive (false ogive)........ 8.96 cal.

55. CARTRIDGE, DRILL, M—, (T5), 37-MM GUNS, M3, M3A1, M5, M5A1, AND M6, simulates the M63 H.E. Round. It consists of the M63 Shell with an adapter screwed into its base, the M16 Cartridge Case, and a steel retaining rod. The retaining rod has a rim at one end to seat it in the primer hole of the case, and is threaded at the other end to be screwed into the adapter of the shell. A copper plug is held in place in the base of the retaining rod by a plug pin so that the firing pin of the weapon will not be injured in simulated firings. A half-inch hole is drilled into the side of the cartridge case for purposes of identification.

DATA

Weight of complete round	3.20 lb	Length of cartridge case	8.75 in.
Length of complete round	14.09 in.	Width of rotating band	0.74 in.
Length of projectile	6.02 in.	Type of base	Square

Radius of ogive........................ 8.97 cal.

Section III

AMMUNITION FOR 40-MM GUNS

56. GENERAL.

a. **General Discussion.** Sometimes referred to as the "Bofors" gun, GUN, automatic, 40-mm, M1, is primarily a rapid-fire automatic gun for antiaircraft defense, but can be set for a single shot. The gun is fed by an automatic mechanism into which 4-round charger clips are loaded by hand. Use of the word "cartridge" to indicate a complete round of 40-mm fixed ammunition resulted from a joint agreement of the U.S. Army, the U.S. Navy and the British.

b. **Interchangeability.** Since the M1 Gun is basically the same as Navy and British 40-mm guns, the ammunition may be interchanged.

c. **Identification.** Rounds of Army procurement are painted and marked for identification in accordance with basic color scheme prescribed in TM 9-1900 and in figures 48, 49, and 50. In other cases, painting and marking may follow practices of other services.

d. **Fuzes.** Four models of supersensitive point-detonating fuzes have been used with 40-mm high-explosive shell—FUZE, P. D., Mk. 27 (Navy), FUZE, P.D., M71, FUZE, P.D., M64A1, and FUZE, P. D., 251, Mk. I (ch. 3, sec. I, and par. 61).

e. **Cartridge Cases.** CASE, cartridge, 40-mm, M25, or M25B1, is used with 40-mm ammunition of Army procurement. The M25B1 Case, made of steel, differs from the M25 in having a thinner head and primer seat, and weighs approximately 0.31 pound less. Ammunition of Navy design will have the Mk. 2 or Mk. 2-Mod. 1 Brass Case or the Mk. 3 Steel Case; the brass case weighs 1.89 pounds and the steel case weighs 0.36 pound less. Ammunition of British design will have the M22 Case, which differs from the American standard case in that the primer hole is threaded to fit the British primer.

f. **Primers.** PRIMER, percussion, 55-grain, M38A1, is standard for rounds of Army procurement, but the earlier standard 20-grain M23A1 Primer may still be found in rounds of less recent manufacture. Alternative primers are the Mk. 22 Navy Primer and the M38B2 Percussion Primer. Rounds with CASE, cartridge, 40-mm, M22, and those manufactured according to British design, will have PRIMER, percussion, Q.F. cartridges, No. 12, Mk. II/L. For descriptions of these primers see chapter 3, section III.

57. COMPLETE ROUND TABLE.

a. Data concerning the 40-mm complete rounds and components thereof are given in table 10, chapter 5.

58. PACKING AND SHIPPING DATA.

a. Packing and shipping data are given in ORD 11 SNL's P-5 and P-8.

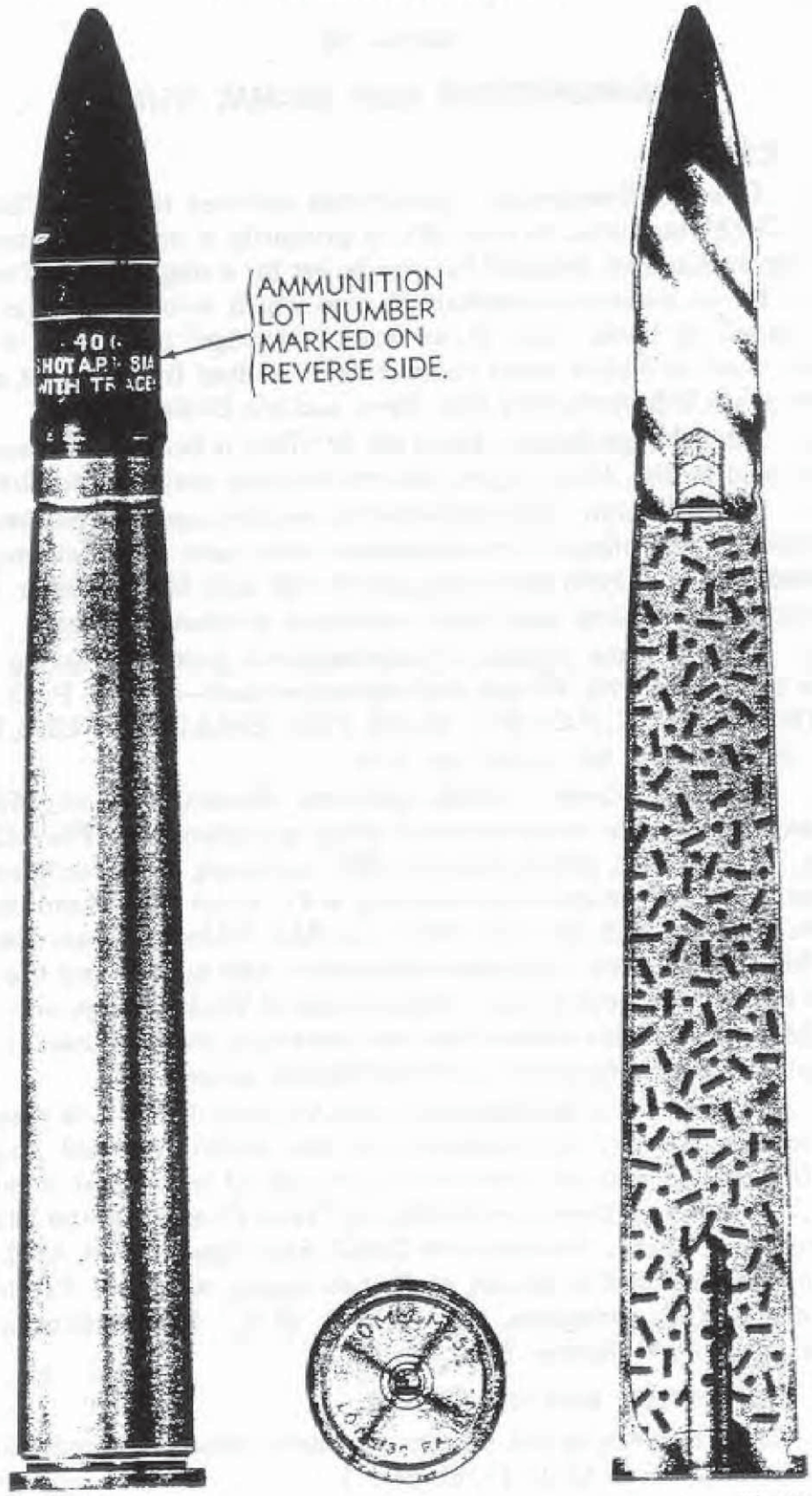

Figure 48 — CARTRIDGE, AP-T, M81A1, 40-mm AA. Guns

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

59. CARTRIDGE, AP-T, M81A1, 40-MM AA. GUNS (fig. 48), is provided for the 40-mm guns for firing against armored targets. The projectile is a monobloc type, of solid steel. A tracer cavity in the base holds a red tracer composition. The nose of the body proper is shaped to a relatively blunt ogive. However, a long false ogive is provided, for better ballistics, by securing a light-weight windshield or false ogive to the shot body by a 360-degree crimp just forward of the bourrelet. The M81A1 Shot has no armor-piercing cap. The length of trace is 12 seconds.

DATA

Weight of complete round	4.57 lb
Length of complete round	17.62 in.
Length of projectile	6.19 in.
Length of cartridge case	12.24 in.
Width of rotating band	0.64 in.
Type of base	Square
Radius of ogive	5.78 cal.
Muzzle velocity	2,870 ft per sec
Maximum range	9,475 yd
Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd	1.7
Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd	1.8

60. CARTRIDGE, AP-T, M81, 40-MM AA. GUNS, is an earlier design of armor-piercing shot which is identical with that described in paragraph 59 except that the windshield is secured to the body of the shot by means of an adapter. For data refer to paragraph 59.

61. CARTRIDGE, H.E., MK. I (NAVY), W/FUZE, MK. 27 (NAVY), 40-MM AA. GUNS, has a shell very similar to the Mk. II Shell (described in par. 62) used with rounds of Army manufacture, and functions like it. For Navy procurement, the shell is fuzed with the Mk. 27 Navy Fuze and Cartridge Case Mk. 1 or Mk. 2. Standard Navy primer is the Mk. 22, a press-in type; earlier standard was the Mk. 21* which screwed into the base of the cartridge case. The Shell-destroying Tracer Mk. 8 or Mk. 10 may be assembled in the base of the shell.

DATA

Weight of complete round	4.60 lb
Length of complete round	17.60 in.
Length of fuzed projectile	7.10 in.
Length of cartridge case	12.24 in.
Width of rotating band	0.60 in.
Type of base	Boat-tailed
Muzzle velocity	2,800 ft per sec
Maximum range	10,800 yd

*—Rounds assembled with the Mk. 21 Primer have been declared unsafe to fire.

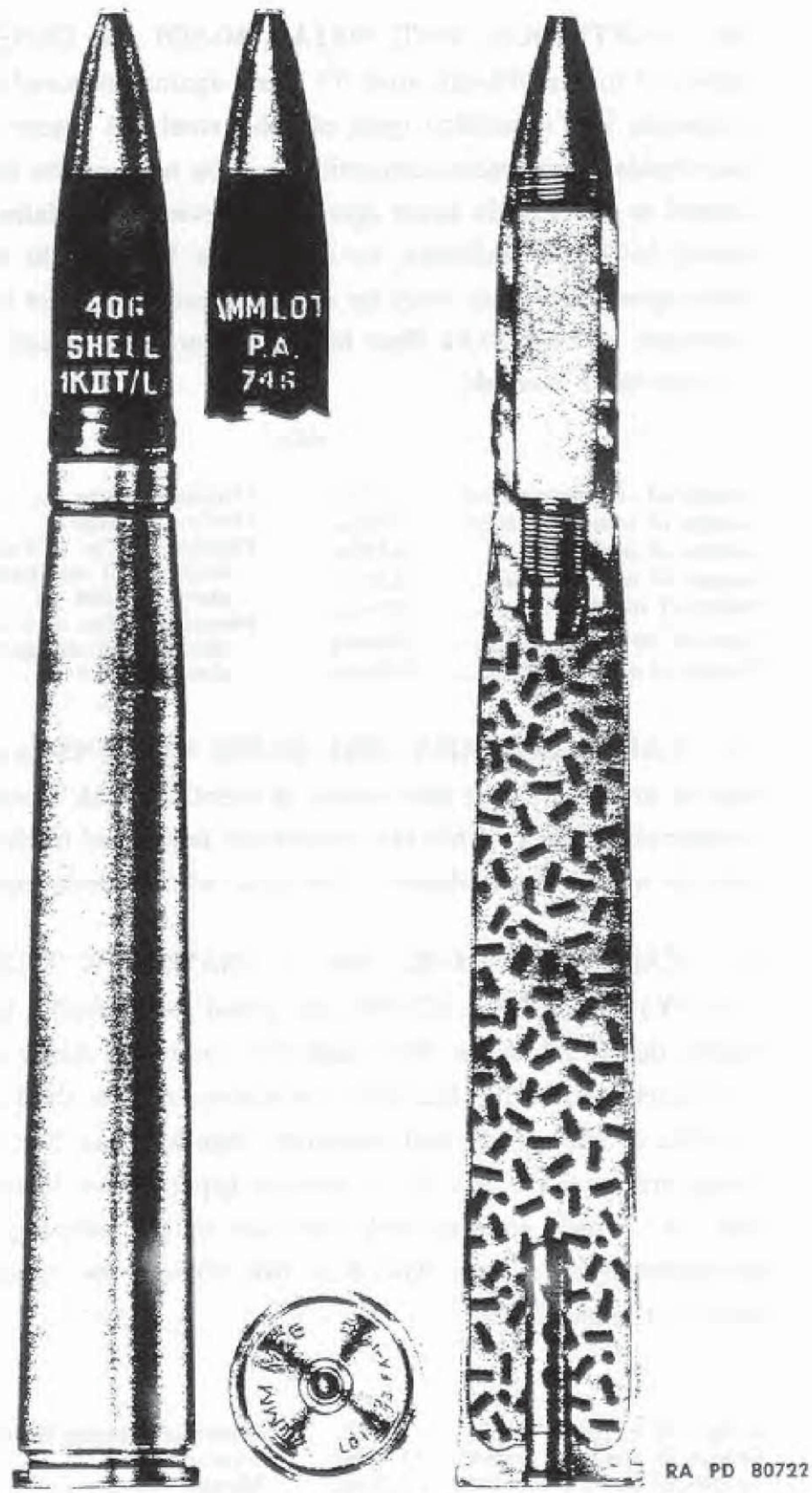

Figure 49 — CARTRIDGE, HE-T (SD, Mk. 11 or Mk. 11-Mod. 2), Mk. II, w/FUZE, P.D., Mk. 27 (Navy), 40-mm AA. Guns

62. **CARTRIDGE, HE-T (SD, MK. 11 OR MK. 11-MOD. 2), MK. II, W/FUZE, P.D., MK. 27 (NAVY), 40-MM AA. GUNS** (fig. 49), consists of the M25 brass or M25B1 alternative steel Cartridge Case with the M38A1 Primer and an FNH powder charge crimped rigidly to a Mk. II High-explosive Shell fitted with the Mk. 27 supersensitive Fuze. The Mk. II Shell consists of three principal parts—a hollow steel casing containing a high-explosive bursting charge of pressed TNT, the point-detonating fuze, and a shell-destroying (SD) tracer. The nose of the shell is conical, with a 7-degree 45-minute taper, and is cut and threaded internally to receive the fuze. The base is boat-tailed (conical) with an 8-degree 15-minute taper, and is threaded internally to accommodate the shell-destroying Tracer Assembly Mk. 11 or Mk. 11-Mod. 2, of Navy origin, which protrudes beyond the base of the shell for approximately 0.56 inch. The tracer consists of an igniting charge, a red tracer composition, and a relay igniting charge of black powder. The red tracer composition burns with a visible trace for 9 to 12 seconds, equivalent to a range of 4,300 to 5,200 yards. As the tracer burns out, the relay igniting charge is ignited, detonating the bursting charge of the shell unless prior detonation has been caused by functioning of the fuze. The Mk. 11 and Mk. 11-Mod. 2 Tracers are similar to the M3 Tracer except for details of the relay igniting assembly.

DATA

Weight of complete round	4.70 lb	Type of base	Boat-tailed
Length of complete round	17.60 in.	Degree of taper	8 deg 15 min
Length of fuzed projectile	7.64 in.	Muzzle velocity	2,870 ft per sec
Length of cartridge case	12.24 in.	Maximum range, horizontal	5,200 yd*
Width of rotating band	0.64 in.	Maximum range, vertical	5,100 yd*

*—Limited by shell-destroying tracer. Theoretical maximum: 10,850 yards, horizontal, and 7,625 yards, vertical.

63. **CARTRIDGE, HE-T (SD), MK. II, OF EARLIER MANUFACTURE** are listed in ORD 11 SNL P-5 and their data presented in table 9, chapter 5, and the subparagraphs below. The standard Mk. II HE-T Round is described in paragraph 62.

a. The first rounds used in 40-mm guns were adapted from British ammunition. These Mk. II Shell are loaded with TNT and fitted with the TRACER and IGNITER, shell, No. 12, Mk. I/L/, internal. The fuze used is the No. 251 Mk. I, which was replaced by the

M64A1, this fuze in turn being replaced by the Mk. 27 (Navy) Fuze. The muzzle velocity of these rounds is 2,870 feet per second. The No. 12 tracer, of British origin, consists of a primer, an igniting charge, a red tracer composition, and a relay igniting charge. The primer strikes a firing pin by set-back upon firing, igniting the red tracer composition. This burns for about 9 seconds, equivalent to a range of about 3,500 to 4,000 yards. As the tracer burns out, the relay igniting charge is ignited, detonating the bursting charge of the shell unless prior detonation has been caused by functioning of the fuze. Weights of these complete rounds are approximately 4.82 pounds. Length of the projectile with the No. 12 tracer is 7.08 inches.

b. The muzzle velocity of the Mk. II HE-T Rounds was reduced from 2,870 feet per second to 2,700 feet per second. Rounds manufactured with this velocity contained the No. 12 tracer and the M64A1, Mk. 27, and M71 Fuzes.

c. An improved tracer, TRACER, SD, M3, of American manufacture was adopted to replace the No. 12 tracer. The M3 Tracer differs from the No. 12 in that the primer and firing pin are omitted, the powder train consisting of an igniter charge, three charges of red tracer composition pressed at various loads in a steel body, and a relay igniting charge. The body is threaded externally to screw into the base of the shell. Unlike the tracer No. 12, which is flush with the rear surface of the shell when fully inserted, the M3 Tracer protrudes for about 0.75 inch. The bursting charge used in shell with the M3 Tracer is tetryl in preliminary design shell, and explosive D in the base and tetryl in the rest of shell of subsequent manufacture. A black powder wafer is also loaded in the base of the shell adjacent to the tracer relay charge to cause detonation of the bursting charge. The M3 Tracer has a burning time of 12 to 14 seconds, corresponding to a maximum horizontal range of 6,000 yards and a maximum vertical range of 5,750 yards (based on 2,870 ft per sec muzzle velocity). Rounds manufactured with the M3 Tracer have the Mk. 27 and M64A1 Fuzes. The Mk. 27 fuzed shell have a muzzle velocity of 2,700 feet per second, but shell fuzed with the M64A1 have been manufactured with both the 2,700 and 2,870 feet per second muzzle velocity. Weights of these complete rounds are approximately 4.82 pounds. Length of the fuzed projectile with the M3 Tracer is 7.88 inches. Maximum horizontal range is 6,000 yards and maximum vertical range is 5,750.

d. The next development was an improved tracer, the M3A1. Details of these rounds with the M3A1 are the same as described in subparagraph c, above, except that only the muzzle velocity of 2,700 feet per second is applicable. Rounds with the M3A1 Tracer are also assembled with the Mk. 27 and M64A1 Fuzes. The TRACER, SD, M3A1, differs from the M3 in having an initiator and the same tracer and igniter composition as in the Mk. 11 Navy tracer.

e. The earlier types described in subparagraphs a to d, above, are superseded by the present standard round, described in paragraph 62, which has the Mk. 11 or Mk. 11-Mod. 2 tracer and the muzzle velocity of 2,870 feet per second. Rounds with these tracers are assembled with the Mk. 27 and M71 Fuzes, and the bursting charge is pressed TNT.

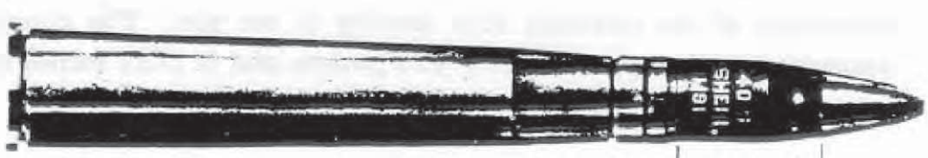

Figure 50 – CARTRIDGE, TP-T, M91, w/FUZE, Dummy or Inert, M__, 40-mm AA. Guns

64. **CARTRIDGE, TP-T, M91, W/FUZE, DUMMY OR INERT, M__, 40-MM AA. GUNS** (fig. 50), has a projectile which resembles the high-explosive shell in the Mk. II Cartridge but has a solid base except for a small tracer cavity. The shell-destroying tracer is replaced in the practice projectile by a burning composition for observation only, and the bursting charge cavity is empty. The shell may be fitted with FUZE, dummy, M69, or M69B1, which simulates the supersensitive point-detonating fuzes or may be an inert service fuze unserviceable for high-explosive loading.

DATA

Weight of complete round........ 4.72 lb	Type of base...................... Boat-tailed
Length of complete round .... 17.60 in.	Degree of taper................ 8 deg 15 min
Length of fuzed projectile ...... 7.08 in.	Muzzle velocity .... 2,870 ft per sec
Length of cartridge case........ 12.24 in.	Maximum range, horizontal 10,850 yd
Width of rotating band........... 0.64 in.	Maximum range, vertical...... 7,625 yd

65. CARTRIDGE, HE-T, MK. II, INERT LOADED, W/FUZE, DUMMY OR INERT, M__, 40-MM AA. GUNS, is an alternative practice round to CARTRIDGE, TP-T, M91, w/FUZE, dummy or inert, M__, 40-mm AA. Guns. It consists of a service cartridge case, primer, and propelling charge; an inert-loaded Mk. II High-explosive Shell; and an inert fuze. FUZE, dummy, M69 or M69B1, or an inert service fuze (the M71 or Mk. 27 (Navy)) may be assembled to the shell.

66. CARTRIDGE, DRILL, M17, 40-MM GUNS, is a completely inert assembly for drill purposes. The iron body is shaped in the general form of a service projectile and a fixed cartridge case. The nose end of the assembly may be left open and threaded to hold an iron plug resembling a service fuze, or the body and nose may be made in one piece. The base end of the body is closed by an iron base plate which screws into the body and has a flange to provide for extraction of the cartridge after loading in the gun. The complete assembly weighs approximately 4.53 pounds and is 17.62 inches long.

Section VI

AMMUNITION FOR 60-MM MORTARS

76. GENERAL.

a. General Discussion. The 60-mm and 81-mm mortars are used primarily in missions where high angles of fire are needed to drop shells behind hills, into trenches, and implacements, or on similarly protected targets. MORTAR, 60-mm, M2, is the standard small caliber mortar, the M1 being limited standard. The ammunition falls within the classification of semifixed ammunition since the propelling charges are in increments permitting adjustment for zone fire. All rounds are issued in the form of fuzed complete rounds. A complete round consists of a fuzed projectile with a fin assembly, a propelling charge comprising a number of increments and an ignition cartridge, and a primer. The rounds need no preparation for firing, once removed from wrappings, other than the adjustment of the propelling charge as described in subparagraph d, below.

b. Identification. The characteristic shape resulting from the use of a fin to obtain the desired stability in flight serves to distinguish mortar ammunition from other artillery types. Painting and marking provides for complete identification of the round, and the components thereof, in accordance with the basic principles prescribed in TM 9-1900 (figs. 57, 58, 59, and 60).

c. Fuzes. Two types of point-detonating fuzes are used with mortar ammunition—"time" and "impact." FUZE, P.D., M52, M52B1, or M52B2 is used with the high-explosive round for the 60-mm mortars. They are single-action fuzes providing for superquick action. The only difference between these fuzes is in the kind of material used in making up the head and body; the M52 has an aluminum head and body, whereas the M52B1 has a plastic head and body; the M52B2 has a plastic head and aluminum body. The time fuze, FUZE, time (fixed), M65, is fitted to the 60-mm illuminating shell. This is a fixed powder-train time fuze which has a time delay of approximately 15 seconds (ch. 3 sec. I).

d. Propelling Charges. The Ignition Cartridge M5A1 serves as the propelling charge for the extremely short ranges. For longer ranges, the M3 and M3A1 Propelling Charges are provided. These charges are divided into removable parts or increments to provide for zone firing. To prepare the charges for firing inner zones, it is only necessary to remove those increments not required, according to the appropriate firing tables. The increments consist of stitched bundles of sheet powder having a hole in the center of each increment. Each of the M3A1 Increments is sealed in a cellophane bag; the M3 is not sealed in cellophane bags. Four such increments or bundles, and the ignition cartridge, comprise a full charge for all 60-mm mortar rounds, one increment being fitted into each of the spaces within the blades of the fin. The early practice was to place the increments between the fins, but this has been discontinued.

e. **Primers and Ignition Cartridges.** For all current manufacture, PRIMER, percussion, M32, is used in conjunction with CARTRIDGE, ignition, M5A1, to ignite the M3 and M3A1 Propelling Charge Increments. An M4 Propelling Charge was formerly used with the M83 Illuminating Shell, but has been replaced by the M3 Propelling Charge for the M83A1 Shell. The ignition cartridge also acts as the propelling charge for the extremely short ranges. The older M5 Ignition Cartridge will be used only until it can be replaced by the M5A1. Rounds with the M5 Cartridge will not be fired over the heads of friendly troops. When used in training, regulations of AR 750-10 must be followed, and in addition positive protection must be given to mortar crew members and personnel in the danger area. The M32 Primer and the M5 Cartridge together replaced the M4 Ignition Cartridge, which included both the primer and the ignition charge, except for the Training Projectile, M69. For description of M32 Primer, see chapter 3, section III.

f. **Fins.** Prior to 1944, propellent increments were placed *between* the fin blades. This has resulted in some instances in the loss of fins in flight causing erratic trajectories and dangerously short ranges. To overcome this, the present practice is to place the increments *within* the blades of the fins. In the new production of 60-mm mortar ammunition, the increment holder has been redesigned so that the increments will be placed within the fins. Also, the web between the fin blades has been increased from 38 to 52 degrees.

77. COMPLETE ROUND TABLE.

a. Data concerning the complete rounds of 60-mm ammunition, and components thereof, are given in table 12, chapter 5.

78. PACKING AND SHIPPING DATA.

a. Packing and shipping data on the rounds are given in ORD 11 SNL R-4.

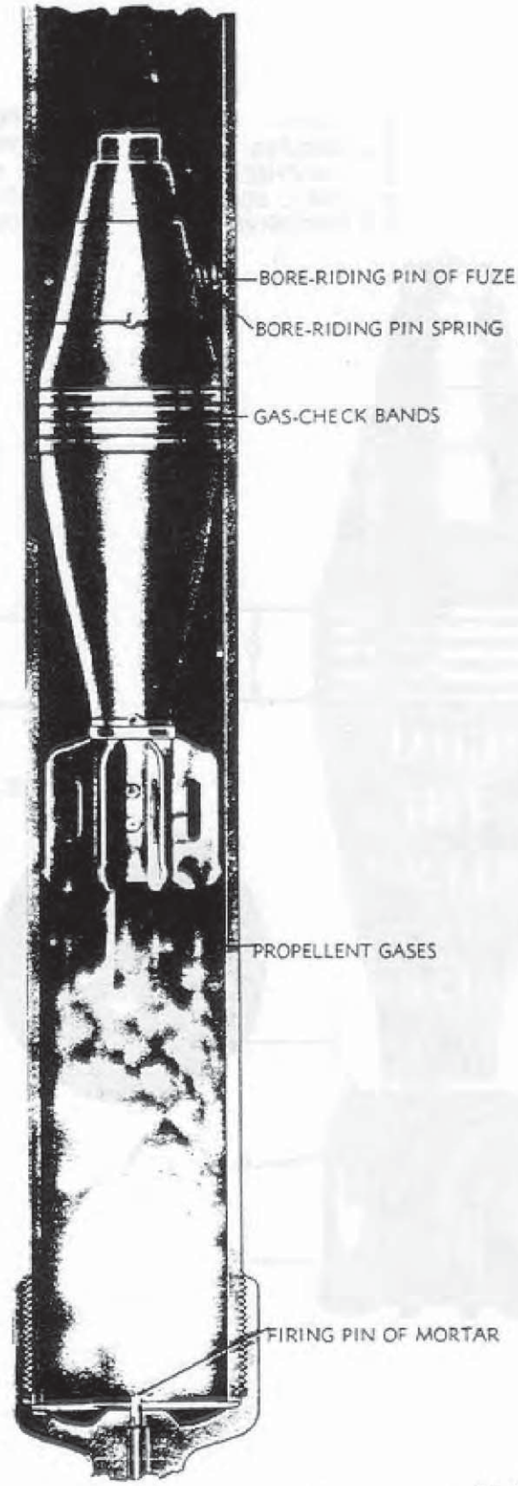

Figure 56A — 60-mm Mortar Shell Being Fired

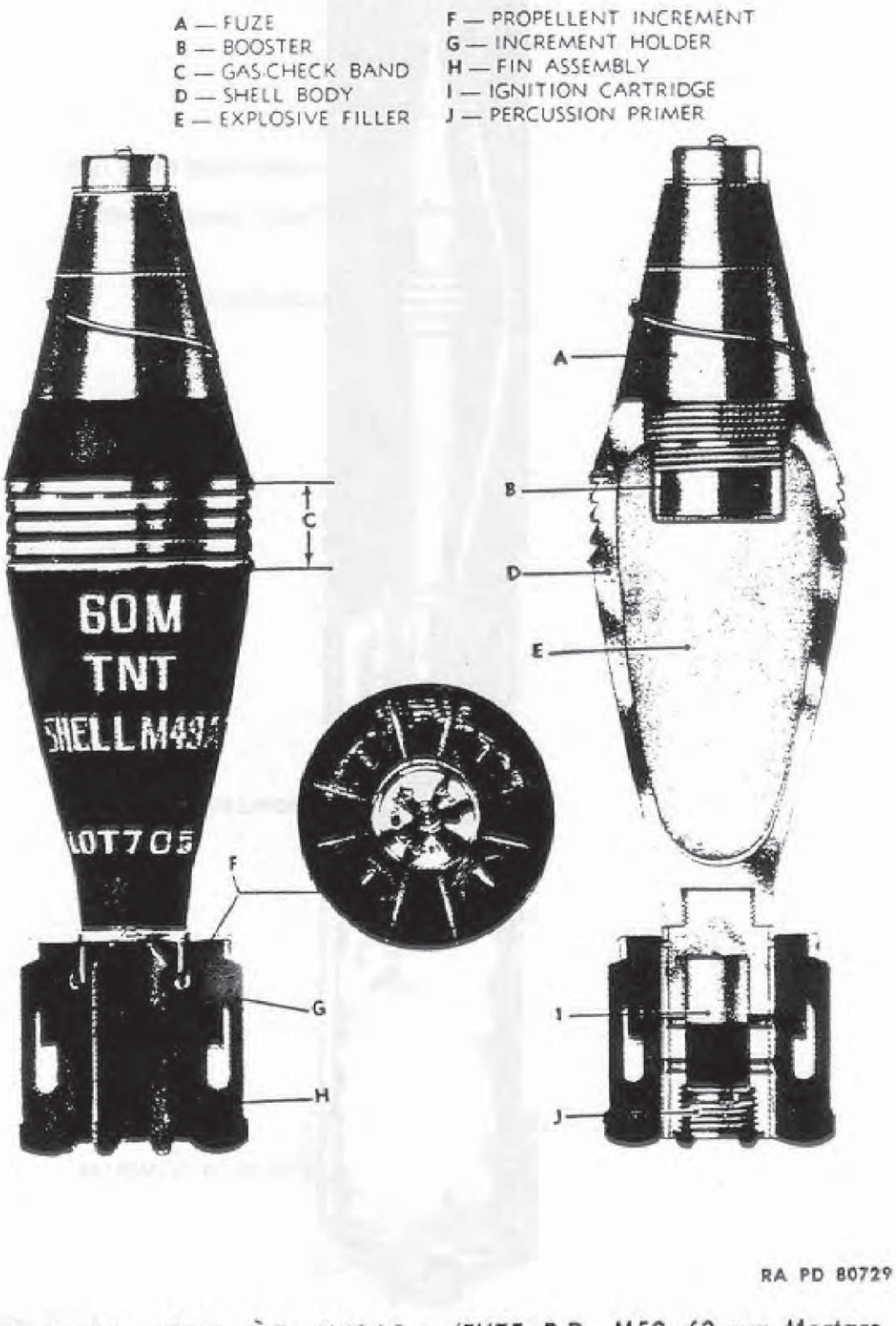

Figure 57 — SHELL, H.E., M49A2, w/FUZE, P.D., M52, 60-mm Mortars, M1 and M2, Complete Round

79. **SHELL, H.E., M49A2, W/FUZE, P.D., M52, 60-MM MORTARS, M1 AND M2, COMPLETE ROUND** (fig. 57), is the only high-explosive round provided for the 60-mm mortars. A complete round consists of six components—the M49A2 High-explosive Shell, an M52 Fuze, a fin assembly, an M3 or M3A1 (4-increment) Propelling Charge, an M5A1 Ignition Cartridge, and an M32 Primer. All are issued and shipped assembled in a complete round which is ready for firing except for adjustment of the propelling charge. The shell body consists of a thin-walled cast or forged steel casing formed in a pear or tear-drop shape and threaded at both ends, at the narrow base end to hold the fin assembly and at the nose end to hold the M52 Fuze with its booster. The TNT shell filler is shaped at the forward end to provide a suitable well for the booster. The fin assembly consists of a 2½-inch long steel cylinder to which is welded four double-bladed fins. The hollow shaft is threaded externally at the fore end to screw into the shell base, where it is staked in position. The rear is threaded internally to hold the M32 Primer. This primer, which consists of a threaded head containing the percussion element and a short housing holding the primer mixture, is screwed into the shaft after insertion of the ignition cartridge. The M5A1 Ignition Cartridge is a cartridge paper tube approximately ⅝ inch in diameter, closed at both ends by a chipboard disk, and holding 40 grains of propelling powder. This charge provides the propelling charge for the short ranges. For the longer ranges, the increments of the M3 or M3A1 (cellophane-wrapped), Propelling Charge are provided in addition to the ignition cartridge. As shipped, each increment is inserted in one of the four spaces within the fins and held in position there by the spring clip of the increment holder. Any or all of the increments may be removed as required.

DATA

	With M52 or M52B2 Fuze	With M52B1 (Plastic) Fuze
Weight of complete round	2.96 lb	2.80 lb
Length of complete round	9.54 in.	9.54 in.
Muzzle velocity	518 ft per sec*	535 ft per sec*
Maximum range (at 45 deg)	1,984 yd*	2,017 yd*

*—For charge 4 (cartridge plus 4 increments). Corresponding data for other charges are:

	Muzzle Velocity		Maximum Range	
	w/M52 or M52B2	w/M52B1	w/M52 or M52B2	w/M52B1
Charge 0 (Ignition Cartridge M5A1 only)	189	195	332	373
Charge 1 (Cartridge and 1 increment)	292	301	784	816
Charge 2 (Cartridge plus 2 increments)	377	389	1,204	1,244
Charge 3 (Cartridge plus 3 increments)	449	463	1,594	1,630

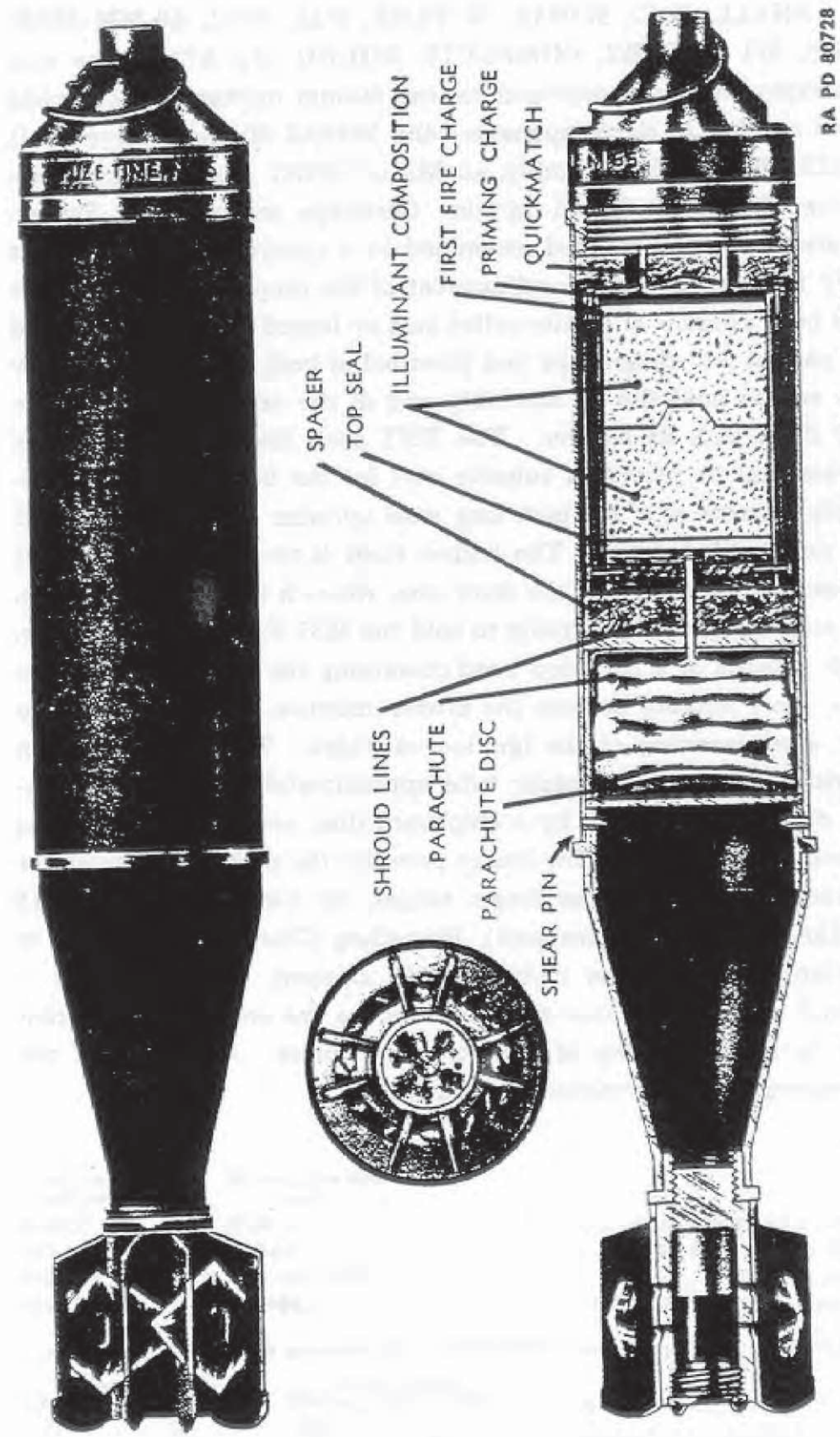

Figure 58 — SHELL, Illuminating, M83A1, w/FUZE, Time (Fixed), M65, 60-mm Mortars, M1 and M2, Complete Round

80. SHELL, ILLUMINATING, M83A1, W/FUZE, TIME (FIXED), M65, 60-MM MORTARS, M1 AND M2, COMPLETE ROUND (fig. 58), is intended for use in night missions requiring illumination for purposes of observation. The complete round consists of six components—the M83A1 Shell, an M65 Time Fuze, a fin assembly, an M3 or M3A1 (cellophane-wrapped) Propelling Charge, an M5A1 Ignition Cartridge, and an M32 Primer. These components are assembled into the complete round, before shipment, in the same manner as the M49A2 High-explosive Round. The fin assembly, primer, and ignition cartridge are the same, and function alike, in both types of round. The M83A1 Shell supersedes the M83 which was used with the M4 Propelling Charge the increments of which consisted of 28 grains of powder each, as compared with the M3 Increments which weigh 35 grains each. The M83A1 Shell is made up of four major parts: a body tube assembly, illuminant assembly, a parachute assembly, and a tail assembly. The body assembly is a thin-walled steel tubing to the front end of which is welded a steel adapter or collar threaded internally to seat the fuze. The base end is closed by the tail assembly. The tail assembly is a light-weight metal cone fitted at the front end with a coupling or collar which is inserted in the body tube and held in position there by four equally spaced shear pins. The base end of the cone is fitted with an adapter which holds the fins, ignition cartridge, and primer. The illuminant assembly consists of a quick match, a black powder priming or expelling charge, a first-fire composition, and the main charge of illuminant composition held in a boxboard casing. This casing is attached to the parachute by a suspension wire 18 inches long. In functioning, the fuze ignites the quick match (after approx 15 sec), the quick match in turn igniting the black powder charge. This charge expels the parachute and illuminant charge assemblies from the shell, at the same time igniting the illuminant charge. The illuminant composition burns for at least 25 seconds, with a minimum candlepower of 145,000 candles when the standard composition is used, and of 110,000 candles when the substitute composition is used. It drops at the rate of 10 feet per second.

DATA

Weight of complete round .... 3.77 lb	Maximum range (at 45 deg):
Length of complete round.... 14.28 in.	Horizontal .... 1,075 yd*
Length of projectile, w/fin.... 14.28 in.	Height of burst .... 153 yd*

*—For charge 4 (ignition cartridge plus 4 increments).

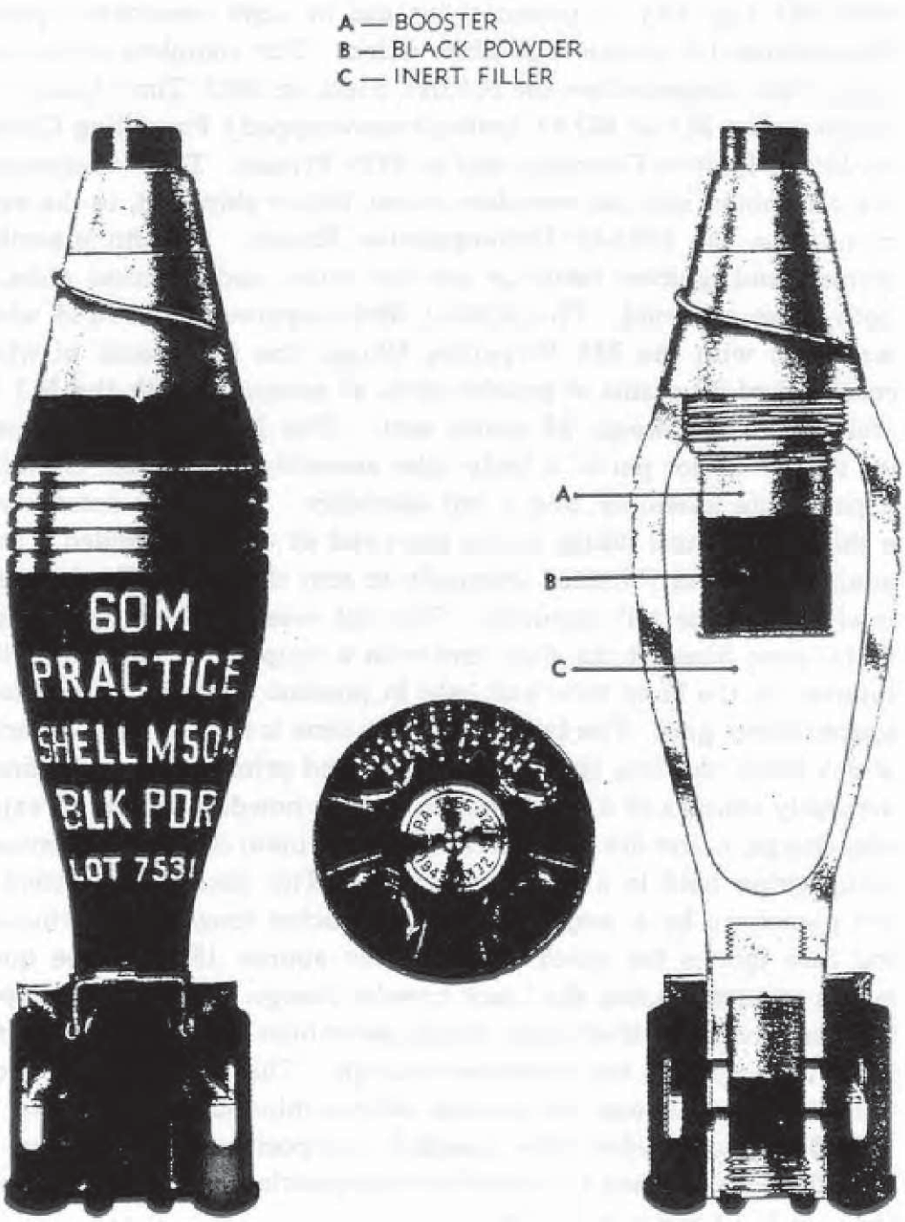

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Figure 59 — SHELL, Practice, M50A2, w/FUZE, P.D., M52, 60-mm Mortars, M1 and M2, Complete Round

81. SHELL, PRACTICE, M50A2, W/FUZE, P.D., M52, 60-MM MORTARS, M1 and M2, COMPLETE ROUND (fig. 59), is a practice round provided for the 60-mm mortars by adapting service items for this purpose. Components of the M50A2 Practice Round are the same as are used in the M49A2 Service Round except for the high-explosive shell filler. The M50A2 Projectile has a filler of inert material (plaster of paris and stearic acid) and a black powder pellet (0.05 lb) loaded adjacent to the booster of the M52 Fuze. The M52 Fuze is a superquick fuze and shell is functioned before penetration occurs. The black powder pellet and booster charge provide a spotting charge for observation purposes. The shell is loaded to the same weight as the service round, thereby providing for the same ballistic values.

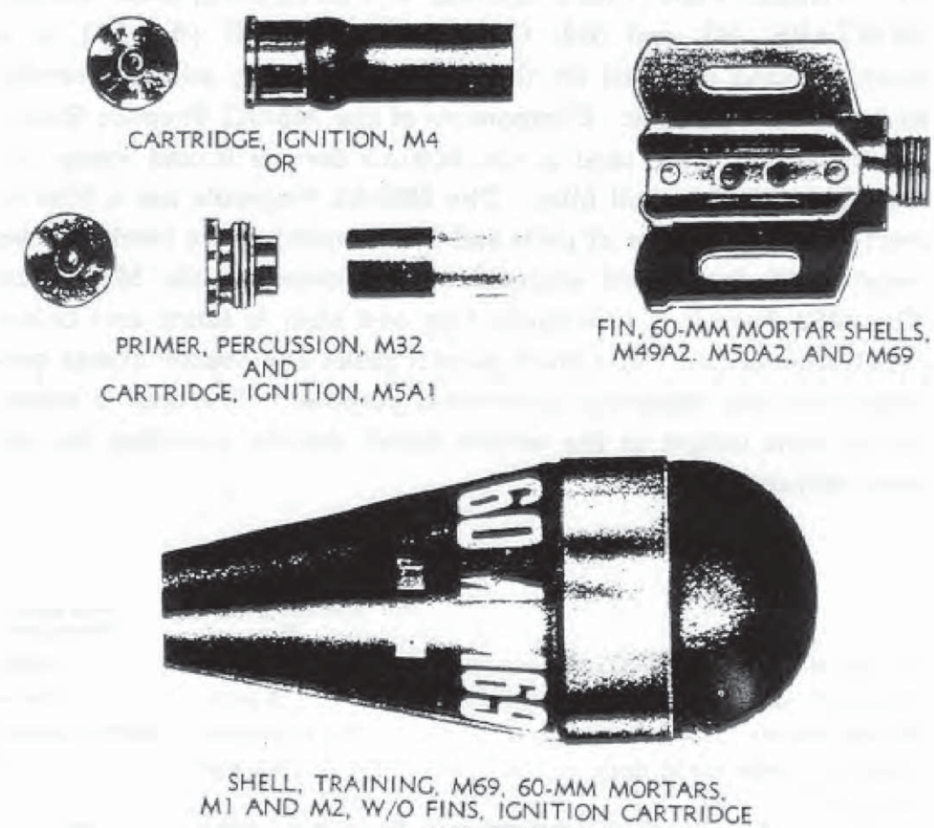
DATA

	With M52 or M52B2 Fuze	With M52B1 (Plastic) Fuze
Weight of complete round	2.96 lb	2.80 lb
Length of complete round	9.54 in.	9.54 in.
Muzzle velocity	518 ft per sec*	535 ft per sec*
Maximum range (at 45 deg)	1,984 yd*	2,017 yd*

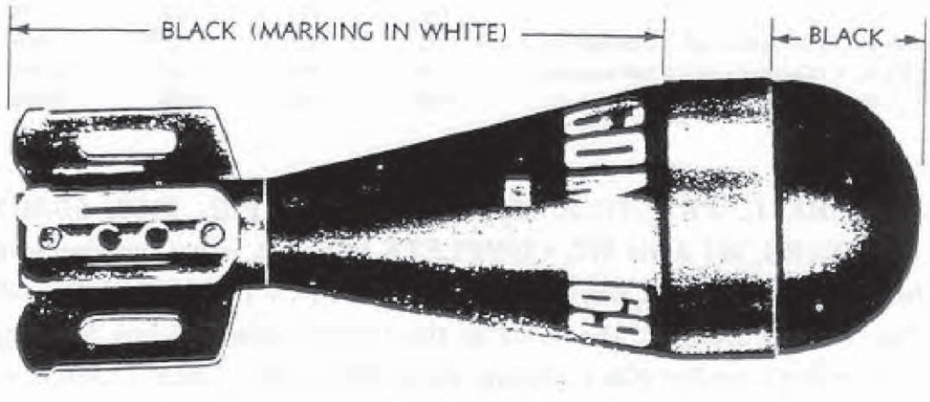
*—For charge 4 (cartridge plus 4 increments). Corresponding data for other charges are:

	Muzzle Velocity		Maximum Range	
	w/M52 or M52B2	w/M52B1	w/M52 or M52B2	w/M52B1
Charge 0 (Ignition Cartridge M5A1 only)	189	195	332	373
Charge 1 (Cartridge and 1 increment)	292	301	784	816
Charge 2 (Cartridge plus 2 increments)	377	389	1,204	1,244
Charge 3 (Cartridge plus 3 increments)	449	463	1,594	1,630

82. SHELL, PRACTICE, M50A1, W/FUZE, P.D., M52, 60-MM MORTARS, M1 AND M2, COMPLETE ROUND, is limited standard for practice purposes, having been superseded by the M50A2 Round. The shell is basically the same as the current standard but contains a somewhat smaller black powder pellet (0.04 lb). Other differences are in respect to the ignition cartridge and manner of assembling the M3 Propellent Charge to the fin. The fin assembly is adapted for the M4 Cartridge which includes the primer. The propelling charge increments are held in position on the fin by inserting two corners of the bundles in the slots in the blades.



A — COMPONENTS



B — ASSEMBLED

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Figure 60 — SHELL, Training, M69, 60-mm Mortars, M1 and M2

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

83. **SHELL, TRAINING, M69, 60-MM MORTARS, W/O FIN, IGNITION CARTRIDGE, AND PRIMER** (fig. 60), is a training round provided for drill in loading and firing the mortar. The projectile differs from that in the practice ammunition in that it is completely inert and has no fuze. It consists of a solid cast-iron body of pear or tear-drop shape, drilled at the base end to hold a service-type fin assembly. No propelling charge increments are provided for the round, but the M4 Ignition Cartridge, or if not available the combination of the M5A1 Ignition Cartridge and M32 Percussion Primer is issued for use in firing the projectile. Unlike the other ammunition for the mortar, the three components are issued and shipped separately, to facilitate replacement of damaged or worn out parts and the procurement of additional ignition cartridges. Ten training shells and accessories are packed in an equipment training kit for field use.

DATA

Weight of complete round...... 4.53 lb	Length of shell, w/o fin.................. 5.54
Weight of shell, w/o fin.................. 4.07	Muzzle velocity .... 152.5 ft per sec
Length of complete round.... 7.70 in.	Maximum range (at 45 deg).... 235 yd

Section X

AMMUNITION FOR 3-INCH GUNS

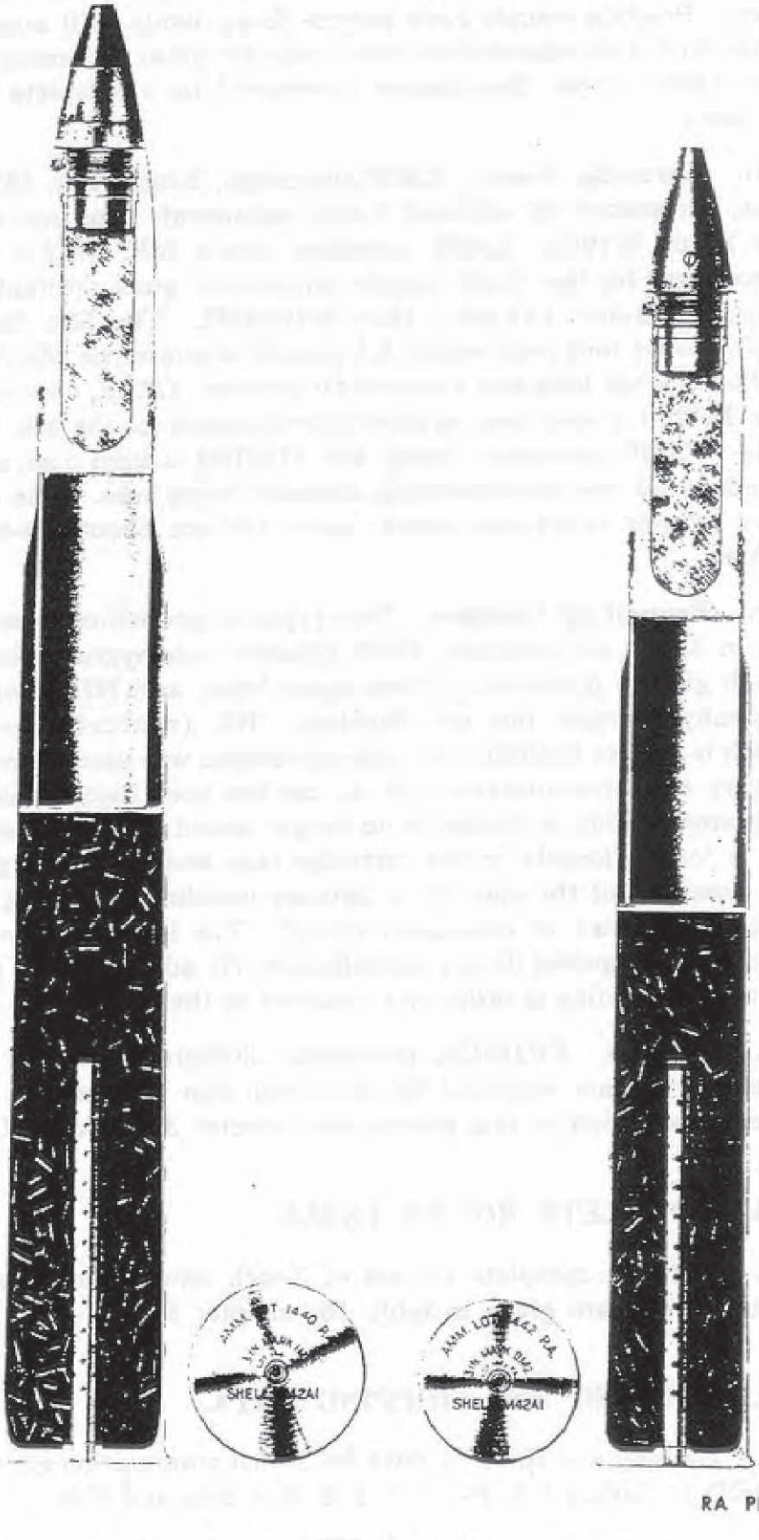
147. GENERAL.

a. **General Discussion.** Considering chamber dimensions, there are two general types of 3-inch guns: 3-inch antiaircraft guns in fixed emplacements ("fixed" guns) and the 3-inch (15-pdr.) Seacoast Gun M1903; and 3-inch antiaircraft guns on mobile mounts ("mobile" guns), 3-inch tank and antitank guns, and the 3-inch (15-pdr.) Seacoast Gun M1902MI. The first group includes the 3-inch AA. Guns M1917 and modifications, the M1925 and modifications, and the M2 and M4. Guns in the second group are the 3-inch AA. Guns M1918 and modifications, the M3, and the 3-inch Tank and Antitank Guns M5, M6, and M7. In addition there are the 3-inch Field Guns M1902, M1904, and M1905, which have been rechambered to take 75-mm blank ammunition; these guns are used for saluting purposes only. For all other guns in this caliber, service, practice, blank, and drill rounds are provided, all being issued in the form of fixed rounds. Most 3-inch high-explosive shell are used interchangeably, with appropriate fuzes, in both types of gun. However, because the larger chamber in the fixed-type gun requires a large cartridge case for ammunition to be fired from these guns, *complete rounds are not interchangeable* (fig. 85). Rounds also differ as to the type of propelling powder. Some 3-inch projectiles are also used in 76-mm ammunition. Differences in characteristics and means of distinguishing such rounds are discussed in chapter 2, section IX.

b. **Identification.** Painting and marking for identification are in accordance with the basic scheme described in TM 9-1900.

c. **Fuzes.** All 3-inch rounds requiring fuzes are shipped with fuzes assembled. Various types are provided, depending on the purpose for which the round is intended. High-explosive rounds intended for antiaircraft fire are fuzed with the M43 Mechanical Time Fuze (or modifications), which provides a time setting up to 30 seconds. This fuze has no impact element. High-explosive rounds to be fired against ground targets are fitted with a selective-type point-detonating Fuze M48A2, M48A1, or M48, which provide alternative superquick or delay (0.05 or 0.15 sec.) action upon impact. Models containing the shorter delay are used with rounds other than reduced-charge rounds; the latter are fitted with the longer delay fuzes. Loaded armor-piercing projectiles are fitted with the Base-detonating Fuze M66A1, giving delay action. Shrapnel for the fixed guns is fitted with the Mk. IIIA1 or Mk. IIIA2 AA. Fuze. As a rule, shrapnel rounds for the mobile

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES



RA PD 80753

Figure 85 — Comparison of 3-inch Gun Ammunition

guns also are assembled with the Mk. III-type fuze. However, rounds with the M1907M Combination Time-percussion Fuze are in existence. Practice rounds have service fuzes, while drill ammunition is fitted with a simulated fuze which may be either a dummy fuze or an inert service type. See chapter 3, section I, for a complete description of fuzes.

d. **Cartridge Cases.** CASE, cartridge, 3-inch. Mk. IM2, a brass case, is standard for all fixed 3-inch antiaircraft guns and 3-inch (15-pdr.) Gun M1903. CASE, cartridge, 3-inch, Mk. IIM2, a brass case, is standard for the 3-inch mobile antiaircraft guns, antitank and tank guns, and 3-inch (15-pdr.) Gun M1902MI. The Mk. IM2 Case is 26.70 inches long and weighs 8.5 pounds whereas the Mk. IIM2 Case is 23.08 inches long and weighs 6.66 pounds. CASE, cartridge, 3-inch, Mk. IM2B1, a steel case, is substitute standard for the Mk. IM2 Brass Case. CASE, cartridge, 3-inch, Mk. IIM2B1, a steel case, is alternate standard for the corresponding standard brass case. The steel cases have thinner heads and primer seats, and are about one-half pound lighter.

e. **Propelling Charges.** Two types of propelling powder are in use in 3-inch ammunition: FNH (flashless nonhygroscopic) powder, which gives a minimum of flash upon firing; and NH powder, which is nonhygroscopic but not flashless. NC (nitrocellulose) powder, which is neither flashless nor nonhygroscopic, was used in some rounds of very early manufacture, but its use has been discontinued, and 3-inch ammunition so loaded is no longer issued. The propellent powder is loaded loosely in the cartridge case and is held in position at the base end of the case by a distance wadding consisting of a split disk and a straw or chipboard tubing. The length of the tubing is adjusted as required during manufacture. No adjustment of propelling charge or wadding is ordinarily required in the field.

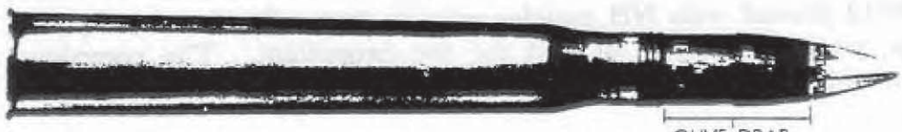
f. **Primers.** PRIMER, percussion, 300-grain, M28, or modifications thereof, are standard for all 3-inch gun ammunition. For detailed description of this primer, see chapter 3, section III.

148. COMPLETE ROUND TABLE.

a. Data on complete rounds of 3-inch ammunition, and components thereof, are given in table 16, chapter 5.

149. PACKING AND SHIPPING DATA.

a. Packing and shipping data for 3-inch ammunition are published in ORD 11 SNL's P-5, P-6, P-7, P-8, R-1, R-5, and R-6.



RA PD 80754

Figure 86 – SHELL, Fixed, H.E., M42A1, NH, w/FUZE, Time Mechanical, M43 (All Modifications), 3" Guns, M1917 (All Models), M1925MI-25MIA1, M2, and M4

150. SHELL, FIXED, H.E., M42A1, NH, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, M2, and M4 (fig. 86), has identical shell and shell loading as those of the high-explosive round for the 76-mm gun (par. 143), including the M20-type booster. The round is shipped fitted with an M43 Fuze or modifications, a mechanical time fuze without impact element. For firing from the fixed 3-inch guns, the Mk. IM2 or Mk. IM2B1 Cartridge Case, an M28 Primer (or modification), and a 4.87-pound charge of nonhygroscopic (NH) propellent powder is used. As a result, the complete round is longer and heavier than the corresponding rounds for both the mobile 3-inch and the 76-mm guns.

DATA

Weight of complete round	26.76 lb	Radius of ogive	7.05 cal.
Length of complete round	37.67 in.	Muzzle velocity	2,800 ft per sec
Length of fuzed projectile	12.36 in.	Maximum range:	
Length of cartridge case	26.70 in.	Vertical height (at 79 deg 42 min)	9,800 yd*
Width of rotating band	1.02 in.	Horizontal range (at 20 deg 30 min)	11,200 yd*
Type of base	Square		

*—Limited by maximum fuze time setting; theoretical maximum horizontal range of shell is 15,100 yards.

151. SHELL, FIXED, H.E., M42, NH, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1917 (ALL MODELS), M1925MI-M25MIA1, M2, AND M4, has the same projectile as that described in paragraphs 150 and 148, except for a slight difference in the shape of the bursting charge cavity, and a small difference in shell weight as a result. The base end of the charge cavity in the M42 Shell is nearly square; this was modified to a smooth curve and the shell thereby became the M42A1. The complete round weighs 26.70 pounds (against 26.76 for the M42A1 Round); in all other respects, data given in paragraph 150 are applicable to this round.

152. SHELL, FIXED, H.E., M42, FLASHLESS, W/FUZE, TIME MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, M2, AND M4, differs from the M42 Round with NH powder only in that a flashless nonhygroscopic powder (FNH) is used for the propellant. The complete round weighs 26.70 pounds; other data are given in paragraph 150.

153. SHELL, FIXED, H.E., MK. IX, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, M2, AND M4, is a limited standard round, very similar in appearance to the M42A1 Round (par. 150) and is fitted with the same type of fuze. The round consists, in addition to the Mk. IX Shell, of the Mk. IM2 or Mk. IM2B1 Cartridge Case with an M28 Primer or modifications thereof, and a .87-pound propelling charge of NH powder. The Mk. IX Shell resembles the M42A1 and M42 Shell, the latter being, in fact, a modification of the older design. However, the nose of the Mk. IX is cut and threaded so that an M23 Booster can be fitted to the shell by means of an adapter for use with the M43 Fuzes. The adapter is a threaded plug-like assembly formed to continue the ogival contour of the shell nose. The booster is a brass assembly holding a small booster charge of tetryl and fitted with an interrupter arrangement for more safety. Due to the different booster, the Mk. IX Shell has a slightly larger TNT bursting charge than the M42A1 Shell.

DATA

Weight of complete round	26.68 lb	Width of rotating band	1.02 in.
Length of complete round	37.57 in.	Type of base	Square
Length of fuzed projectile	12.03 in.	Radius of ogive	7.05 cal.
Length of cartridge case	26.70 in.	Muzzle velocity	2,800 ft per sec

Maximum range (at 45 deg) 12,100 yd*

*—Actual range limited by fuze time setting.

154. SHELL, FIXED, PRACTICE, M42B2, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, M2, AND M4 (fig. 87), closely simulates the service high-explosive rounds in appearance and ballistic characteristics for practice purposes. All components with the exception of the bursting charge of the shell are service items, including a full service propelling charge of NH powder. The shell charge consists of two black powder pellets (0.125 lb each) loaded in the fore part of the charge cavity adjacent to the fuze cup well. The M20 or M20A1 Booster is inserted during manufacture and staked in position. The loaded round is shipped fitted with an M43 Service fuze (or modifications). The black powder charge serves as a spotting charge for observation and adjustment of fire.

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

RA PD 80757

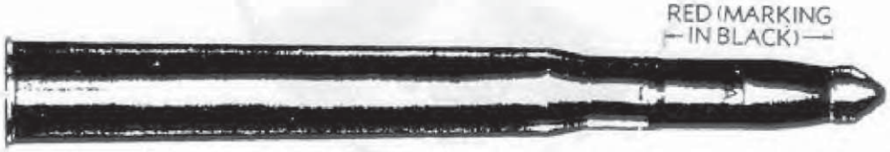
Figure 87 — SHELL, Fixed, Practice, M42B2, w/FUZE, Time, Mechanical, M43 (All Modifications), 3" Guns, M1917 (All Models), M1925MI-25MIA1, M2, and M4

DATA

Weight of complete round	26.79 lb	Width of rotating band	1.02 in.
Length of complete round	37.72 in.	Type of base	Square
Length of fuzed projectile	12.20 in.	Radius of ogive	7.05 cal.
Length of cartridge case	26.70 in.	Muzzle velocity	2,800 ft per sec

Maximum range (at 45 deg)................ 12,100 yd*

*—Actual maximum range within limits of maximum fuze setting is: horizontal—11,200 yards at 20 degrees 30 minutes elevation; vertical—9,800 yards at 79 degrees 42 minutes elevation.



RA PD 80756

Figure 88 — SHRAPNEL, Fixed, Mk. I, 3" Guns, M1917 (All Models), M1925MI-25MIA1, M2, and M4

155. SHRAPNEL, FIXED, MK. I, 3" GUNS, M1917 (ALL MODELS, M1925MI-25MIA1, M2 and M4 (fig. 88), is no longer manufactured for 3-inch guns; the supply on hand will be issued for target practice only. A complete round consists of the Mk. IA1 Cartridge Case (a brass case which has been superseded as standard by the Mk. IM2), the M28 Primer, an NH powder propelling charge, and a fuzed projectile. The projectile, similar in construction to that for 75-mm guns, is adapted to seat Mk. III-type 21-second fuzes. The cavity is loaded with lead balls to weight (approx 253 balls).

DATA

Weight of complete round	29.38 lb	Width of rotating band	0.55 in.
Length of complete round	36.99 in.	Type of base	Square
Length of fuzed projectile	11.55 in.	Radius of ogive	7.00 cal.
Length of cartridge case	27.15 in.	Muzzle velocity	2,600 ft per sec

Maximum range (at 45 deg)................ 12,600 yd*

*—Actual maximum range within limits of maximum fuze setting is: horizontal—7,575 yards at 16 degrees 54 minutes; vertical—8,300 yards at 79 degrees.

RA PD 80758

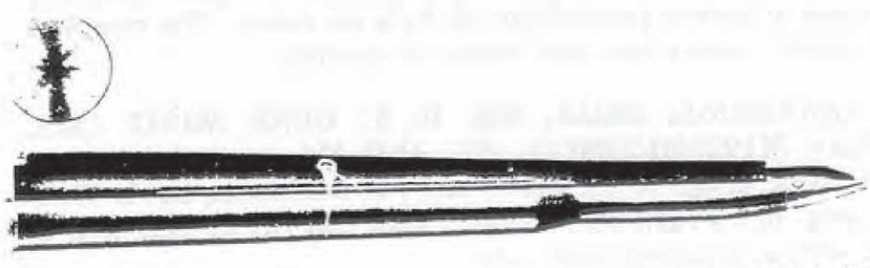
Figure 89 — AMMUNITION, Blank, 3" (15-pdr.) Gun, M1903, and 3" Guns, M1917 (All Models), M1925MI-25MIA1, M2, and M4

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

156. AMMUNITION, BLANK, 3" (15-PDR.) GUN, M1903, AND 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, M2, AND M4 (fig. 89), is authorized for saluting purposes and simulated firing during maneuvers. The complete round consists of the M12 Cartridge Case, containing a 100-grain M1B1A1 Primer and a 1-pound black powder charge. The case is closed at the forward end with a chipboard or pulpboard closing cup which serves both to hold the powder charge in position and to protect it against moisture and foreign matter. The powder charge may be either sodium nitrate composition (commercial blasting powder) or potassium nitrate composition (Army black powder). When the first-mentioned is used, the closing cup has a 0.5-inch felt pad cemented to its inner surface; when potassium nitrate is used, the pad is omitted. The round is similar to that provided for mobile 3-inch guns, differing only with respect to the cartridge case. The M12 is 6 inches long whereas the M13, used with the mobile guns, is 6.625 inches long.

DATA

Weight of complete round...... 4.47 lb	Length of complete round...... 6.00 in.
	Length of cartridge case............... 6.00 in.



RA PD 80759

Figure 90 — CARTRIDGE, Drill, M9, w/FUZE, Dummy, M59, 3" Guns, M1917 (All Models), M1925MI-25MIA1, M2, and M4, or 3" (15-pdr.) Gun, M1903

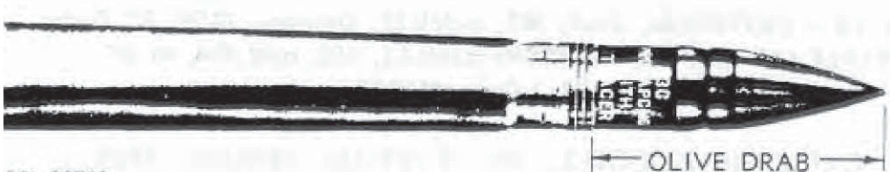
157. CARTRIDGE, DRILL, M9, W/FUZE, DUMMY, M59, 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, M2, AND M4, OR 3" (15-PDR.) GUN, M1903 (fig. 90), is provided for use in training in loading the gun and setting the fuze. It is a 1-piece assembly made up of a body formed to resemble a cartridge case and affixed projectile, closed at the rear with a removable and replaceable base plate and fuzed at the nose with an M59 Dummy Fuze. This drill cartridge may also be designated M9B1. The M9 Drill Cartridge is constructed of bronze and has a base plate which may be manganese bronze or naval brass. The M9B1 has a malleable

·on body closed by a steel base plate. The M59 Dummy Fuze is an ıert steel assembly simulating the selective superquick-delay service ıze, and has a selective setting screw similar to that on the M48. 'he two cartridges can be distinguished by their painting and markıg; the M9 will be so stamped on the base and will be unpainted, 'hereas the M9B1 will also be stamped on base and be painted black. 'he complete round weighs 26.76 pounds and is 37.56 inches long.

58. **CARTRIDGE, DRILL, M9, W/FUZE, DUMMY, 21-SEC., [42A1, 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, [2, AND M4, OR 3" (15-PDR.) GUN, M1903,** except for the fuze, the same as that described in paragraph 157. The M42A1 Fuze is ıtended to simulate a service time fuze and is of bronze casting or ıachined naval brass. The contour is stubbier than that of the reamlined M59 Dummy Fuze. As a result, the complete round is ıorter, being 35.53 inches long and weighs 27 pounds.

ı59. **CARTRIDGE, DRILL, M3A1, W/FUZE, DUMMY, 21-SEC., 42A1, 3" GUNS, M1917 (ALL MODELS), M1925MI-25MIA1, 2, AND M4, OR 3" (15-PDR.) GUN, M1903,** is very similar to e M9 Cartridge with 21-second Dummy Fuze M42A1, differing incipally in that the base plate does not screw in place but is a nple slide fit held in position for use by a set screw. The complete und is 35.55 inches long and weighs 27 pounds.

ı0. **CARTRIDGE, DRILL, MK. II, 3" GUNS, M1917 (ALL ODELS), M1925MI-25MIA1, M2, AND M4,** is similar in purse and basic design to the M3A1 and M9 assemblies, but is 39.20 :hes long and weighs 29 pounds. Like the M3A1 and M9, it fitted with a simulated time fuze.



PD 80760

ure 91 — PROJECTILE, Fixed, A.P.C., M62A1, w/FUZE, B.D., M66A1, ınd TRACER, 3" Guns, M1918 (All Models), M3, M5, M6, and M7

I. **PROJECTILE, FIXED, A.P.C., M62A1, W/FUZE, B.D., 6A1, AND TRACER, 3" GUNS, M1918 (ALL MODELS), , M5, M6, AND M7** (fig. 91), has a projectile identical with that d in the corresponding round for the 76-mm gun (par. 139), and it, is intended for use against armor plate, particularly face-hardened types. The body is solid except for a small cavity in the rear which holds a high-explosive charge. The nose of the body is fitted with an armor-piercing cap to which is affixed a light-weight steel or aluminum ballistic cap or windshield. The base is square (cylindrical behind the rotating band) and threaded to hold the M66A1 Base Fuze. This fuze, a delay-action type, contains a tracer which, operating independent of the fuze mechanism, provides a 3-second trace for observation purposes. Other components consist of the standard M28 Primer, the Mk. IIM2 Cartridge Case, and a 4.87-pound propelling charge of FNH powder. The round is approximately 1¾ inches longer than the corresponding 76-mm round.

DATA

Weight of complete round	27.24 lb	Radius of ogive (false ogive)	7.05 cal.
Length of complete round	35.59 in.	Muzzle velocity	2,600 ft per sec*
Length of fuzed projectile	9.79 in.	Maximum range (at 45 deg)	16,000 yd
Length of cartridge case	23.08 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	4.7†
Width of rotating band	1.02 in.		
Type of base	Square		

Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd).... 4.7††

*—In M3, M5, M6, and M7 Guns. In M1918 Guns, 2,400 feet per second.
†—In M3, M5, M6, and M7 Guns. In M1918 Guns, 3.9 inches.
††—In M3, M5, M6, and M7 Guns. In M1918 Guns, 4.1 inches.

162. PROJECTILE, FIXED, A.P.C., M62, W/FUZE, B.D., M66A1, AND TRACER, 3" GUNS, M1918 (ALL MODELS), M3, M5, M6, AND M7, is the same as that described in paragraph 161 except for the method of crimping the steel windshield to the armor-piercing cap of the projectile. In the M62A1, a 360-degree roll crimp is used near the end of the windshield, whereas in the M62, the end of the windshield is crimped into the groove. Also, the steel windshield of the M62A1 is slightly heavier, the added weight being offset by a corresponding decrease in weight elsewhere. Data given in paragraph 161 are also applicable to this round.

RA PD 80761

Figure 92 — PROJECTILE, Fixed, A.P.C., M62, w/TRACER, 3" Guns, M1918 (All Models), M3, M5, M6, and M7

163. PROJECTILE, FIXED, A.P.C., M62, W/TRACER, 3" GUNS, M1918 (ALL MODELS), M3, M5, M6, AND M7 (fig. 92), has been superseded for current manufacture by the round having the loaded and fuzed type projectile. Other components of the round

re the same as in the round described in paragraph 161 but the pro-
ectile cavity is empty and the fuze hole is plugged with a steel plug. 'his plug holds a tracer which functions like that in fuzed projectile.

DATA

Veight of complete round	26.71 lb	Radius of ogive (false ogive)	7.05 cal.
ength of complete round	35.54 in.	Muzzle velocity	2,600 ft per sec*
ength of projectile	8.94 in.	Maximum range (at 45 deg)	16,000 yd
ength of cartridge case	23.08 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	4.7†
Vidth of rotating band	1.02 in.		
'ype of base	Square		

Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd).... 4.5††

*—In M3, M5, M6, and M7 Guns. In M1918 Guns, 2,400 feet per second.
†—In M3, M5, M6, and M7 Guns. In M1918 Guns, 3.9 inches.
††—In M3, M5, M6, and M7 Guns. In M1918 Guns, 4.1 inches.

A PD 80763

Figure 93 — SHOT, Fixed, A.P., M79, w/TRACER, 3" Guns, M1918 (All Models), M3, M5, M6, and M7

164. **SHOT, FIXED, A.P., M79, W/TRACER, 3" GUNS, M1918 (ALL MODELS), M3, M5, M6, AND M7** (fig. 93), is avail-
ble both as a substitute for capped armor-piercing rounds for service ise, and for target-practice purposes. The M79 Shot is essentially a teel plug formed at the forward end to a relatively blunt nose. There s no armor-piercing cap or ballistic windshield. There is no bursting harge or charge cavity, the body being solid except for a small cavity n the base which holds a red tracer. This tracer is similar to that in he fuzed M62 or M62A1 Projectiles and burns for the first 3 seconds of flight. The shot is not as well adapted for combatting face-hard-
ened plate as the capped type, but performs satisfactorily against hom-
ogeneous plate. The complete round includes, in addition to the shot, he Mk. IIM2 or Mk. IIM2B1 Cartridge Case with an M28 Primer (or modifications) and a 4.38-pound charge of FNH powder.

DATA

Weight of complete round	26.56 lb	Radius of ogive	1.68 cal.
Length of complete round	31.57 in.	Muzzle velocity	2,600 ft per sec*
Length of projectile	9.22 in.	Maximum range	12,770 yd
Length of cartridge case	23.08 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	3.1†
Width of rotating band	1.02 in.		
Type of base	Square		

Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd).... 4.5††

*—In M3, M5, M6, and M7 Guns. In M1918 Guns, 2,400 feet per second.
†—In M3, M5, M6, and M7 Guns. In M1918 Guns, 2.7 inches
††—In M3, M5, M6, and M7 Guns. In M1918 Guns, 4.0 inches.

RA PD 80762

Figure 94 — SHELL, Fixed, H.E., M42A1, NH, w/FUZE, Time, Mechanical, M43 (All Modifications), 3" Guns, M1918 (All Models), and M3

165. SHELL, FIXED, H.E., M42A1, NH, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1918 (ALL MODELS), AND M3 (fig. 94), has the same components as the corresponding round for fixed 3-inch guns, described in paragraph 150, except for the cartridge case. For the mobile guns, the round is assembled with the Mk. IIM2 or Mk. IIM2B1 Case, making a slightly shorter and lighter round. The shell in this round is also used in the corresponding 76-mm round (par. 143) but the complete assembly differs both as to cartridge case and fuze.

DATA

Weight of complete round	24.91 lb	Width of rotating band	1.02 in.
Length of complete round	34.05 in.	Type of base	Square
Length of fuzed projectile	12.36 in.	Radius of ogive	7.05 cal.
Length of cartridge case	23.08 in.	Muzzle velocity	2,600 ft per sec*

Maximum range (at 45 deg) .... 13,800 yd†

*—In M1918 Guns; in M3 Guns, 2,800 feet per second.
†—In M1918 Guns; in M3 Guns, 14,780 yards.

166. SHELL, FIXED, H.E., M42, NH, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1918 (ALL MODELS), AND M3, is similar to that for fixed 3-inch guns described in paragraph 151 except that the shorter and lighter Mk. IIM2 (or Mk. IIM2B1) Cartridge Case is used. Like the assembly for the fixed guns, this round is intended primarily for antiaircraft firing, being adapted for the purpose by fuzing with M43 Mechanical Time Fuze.

DATA

Weight of complete round	24.85 lb	Width of rotating band	1.02 in.
Length of complete round	34.05 in.	Type of base	Square
Length of fuzed projectile	12.36 in.	Radius of ogive	7.05 cal.
Length of cartridge case	23.08 in.	Muzzle velocity	2,600 ft per sec*

Maximum range (at 45 deg) .... 13,800 yd†

*—In M1918 Guns; in M3 Guns, 2,800 feet per second.
†—In M1918 Guns; in M3 Guns, 14,780 yards.

167. SHELL, FIXED, H.E., MK. IX, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1918 (ALL MODELS), AND M3, is similar to the corresponding round for 3-inch fixed guns, described in paragraph 153, except for the cartridge case. For the mobile guns, the round is assembled with the Mk.

IIM2 or Mk. IIM2B1 Case, making a shorter and lighter round. The Mk. IX Shell resembles the M42A1 and M42 Shell, but differs in that the nose is cut and drilled for the M23 Booster and an adapter which permits use of the M43 Fuzes with the shell. The adapter is shaped to continue the ogival contour of the shell nose. The booster is a brass assembly holding a small booster charge of tetryl and is fitted with an interrupter arrangement providing boresafety. Because of the differences between the M23 and M20 Boosters, the Mk. IX Shell has a slightly larger TNT bursting charge than the standard M42A1 Shell.

DATA

Weight of complete round	24.84 lb	Width of rotating band	1.02 in.
Length of complete round	33.95 in.	Type of base	Square
Length of fuzed projectile	12.32 in.	Radius of ogive	7.05 cal.
Length of cartridge case	23.08 in.	Muzzle velocity	2,600 ft per sec*
Maximum range (at 45 deg)	11,000 yd†		

*—In the M1918 Guns; in M3 Guns, 2,800 feet per second.
†—In M1918 Guns; in M3 Guns, 11,800 feet per second.

168. SHELL, FIXED, H.E., M42A1, W/FUZE, P.D., M48A2, SQ & 0.05-SEC. DELAY, 3" (15-PDR.) GUN, M1902MI, AND 3" GUNS, M5, M6, AND M7, has the same projectile as that in the rounds for 3-inch antiaircraft guns (pars. 150 and 165), and that in 76-mm rounds described in paragraph 143. For use in tank and antitank guns, and the 3-inch (15-pdr.) Gun M1902MI, the shell is assembled with the Mk. IIM2 or Mk. IIM2B1 Cartridge Case, and is adapted for firing against ground targets by fuzing with the M48-type impact fuze. Standard fuze for the round is the M48A2, with 0.05-second delay. Rounds of earlier manufacture with M48 or M48A1 Fuzes may be encountered, as well as rounds of more recent assembly which are fitted with modified M48A1 Fuzes having 0.05-second delay instead of the original 0.15-second delay.

DATA

Weight of complete round	24.91 lb	Width of rotating band	1.02 in.
Length of complete round	34.05 in.	Type of base	Square
Length of fuzed projectile	12.36 in.	Radius of ogive	7.05 cal.
Length of cartridge case	23.08 in.	Muzzle velocity	2,800 ft per sec
Maximum range	14,780 yd		

169. SHELL, FIXED, H.E., M42A1, REDUCED CHARGE, W/FUZE, P.D., M48A2, SQ & 0.15-SEC. DELAY, 3" (15-PDR.) GUN, M1902MI, AND 3" GUNS, M5, M6, AND M7, has the same components as used for the round described in paragraph 168, except for the propelling charge and fuze. Instead of a full propelling charge for 2,800 feet per second muzzle velocity, a reduced charge giving approximately 1,550 feet per second velocity is used. The standard fuze for rounds with this velocity is the M48A2 with 0.15-second delay, but rounds with the M48A1 which also has an 0.15-second delay element may be encountered.

DATA

Weight of complete round...... 21.13 lb	Width of rotating band........... 1.02 in.
Length of complete round...... 34.05 in.	Type of base........... Square
Length of fuzed projectile.... 12.36 in.	Radius of ogive........... 7.05 cal.
Length of cartridge case.......... 23.08 in.	Muzzle velocity .... 1,550 ft per sec

Maximum range .... 8,805 yd

170. SHELL, FIXED, M42, W/FUZE, P.D., M48, 3" (15-PDR.) GUN, M1902MI, AND 3" GUNS, M5, M6, AND M7. has a shell similar to that described in paragraph 151 but is fuzed with the impact type of fuze for firing against ground targets from tank and antitank guns and for firing from the 3-inch Seacoast Gun M1902MI. Like the M42A1 Round described in paragraph 168, this round is used with an M48-type fuze having a short delay (0.05 sec); however, other components are the same. Except that the complete round weighs 24.85 pounds, data given in paragraph 168 are applicable.

171. SHELL, FIXED, PRACTICE, M42B2, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 3" GUNS, M1918 (ALL MODELS), AND M3, provides practice ammunition for the mobile antiaircraft guns similar to the service AA. rounds. Like the M42B2 Practice Round for the fixed 3-inch AA. guns (par. 154), which has the same projectile but is assembled with the longer, heavier, Mk. IM2 Cartridge Case, all components are service items except for the bursting charge of the shell. This charge consists of two black powder pellets (0.125 lb each), the remainder of the charge cavity being filled with inert material to the required weight. The black powder charge serves as a spotting charge for observation and adjustment of fire.

DATA

Weight of complete round...... 24.94 lb	Width of rotating band............ 1.02 in.
Length of complete round...... 34.05 in.	Type of base........... Square
Length of fuzed projectile...... 12.20 in.	Radius of ogive........... 7.05 cal.
Length of cartridge case........ 23.08 in.	Muzzle velocity .... 2,800 ft per sec

Maximum range (at 45 deg)................ 14,780 yd*

*—Actual range limited by fuze time setting.

172. SHRAPNEL, FIXED, MK. I, 3" GUNS, M1918 (ALL MODELS), AND M3, for the mobile antiaircraft guns, is essentially the same as that for the fixed 3-inch guns described in paragraph 155, and like that round, will be issued for target practice only until present supplies are exhausted. The projectile is identical with that in the fixed gun round and functions in the same manner. However, to adapt it for firing from the smaller chamber of the mobile cannon, the projectile is assembled to the short Mk. IIA1 Cartridge Case. The case is fitted with the standard M28 Primer (modifications) and is loaded with a 4.62-pound charge of NH powder.

DATA

Weight of complete round	27.19 lb	Width of rotating band	0.55 in.
Length of complete round	33.49 in.	Type of base	Square
Length of fuzed projectile	11.55 in.	Radius of ogive	7.00 cal.
Length of cartridge case	27.15 in.	Muzzle velocity	2,600 ft per sec*
Maximum range (at 45 deg)	12,600 yd†		

*—In M3 Guns; in M1918 Guns, 2,400 feet per second.
†—Actual range limited by fuze time setting. In M1918 Guns, 7,840 yards.

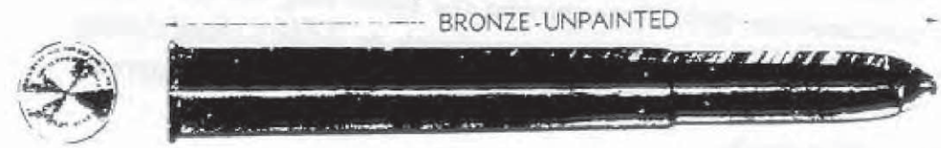
RA PD 80765

Figure 95 — AMMUNITION, Blank, 3" (15-pdr.) Gun, M1902MI, and 3" Guns, M1918 (All Models), and M3

173. **AMMUNITION, BLANK, 3" (15-PDR.) GUN, M1902MI, AND 3" GUNS, M1918 (ALL MODELS), AND M3** (fig. 95), is very similar to the blank ammunition provided for the fixed 3-inch guns, the principal difference being in the cartridge case. For the mobile guns, the M13 Cartridge Case is used. This case is 6.625 inches long whereas the M12 Case for the fixed guns is 6 inches. Other components are the same, and consist of M1B1A1 Primer and a 1-pound charge which may be either sodium nitrate or potassium nitrate composition. With the first-mentioned charge, a closing cup with a felt inner wad or pad is used to close the mouth of the case. With the potassium nitrate charge, the belt wad is unnecessary and is omitted. Weight of complete round is 4.21 pounds.

174. **CARTRIDGE, DRILL, M4A1, W/FUZE, DUMMY, 21-SEC., M42A1, 3" GUNS, M1918 (ALL MODELS), AND M3, OR 3" (15-PDR.) GUN, M1902MI,** is a completely inert bronze cartridge provided for drill with the mobile antiaircraft guns and the 15-pdr. Seacoast Gun M1902MI in loading the piece and setting the fuze. The 1-piece cartridge is fitted to a bronze or brass plate which

is locked in position by a set screw. FUZE, dummy, 21-sec., M42A1, is assembled to the cartridge nose, giving a simulated service time fuze. Both the base and the fuze are replaceable if damaged in handling. The complete assembly is 31.90 inches long and weighs approximately 24 pounds.



RA PD 80766

Figure 96 — CARTRIDGE, Drill, M10, w/FUZE, 21-sec., M42A1, 3" Guns, M1918 (All Models), and M3, or 3" (15-pdr.) Gun, M1902MI

175. **CARTRIDGE, DRILL, M10, W/FUZE, DUMMY, 21-SEC., M42A1, 3" GUNS, M1918 (ALL MODELS), AND M3, OR 3" (15-PDR.) GUN, M1902MI** (fig. 96), is similar in size and appearance to older M4A1 design described in paragraph 174. The principal difference is that M10 Cartridge is screwed on to a steel base plate, whereas in the M4A1, the bronze or brass plate is a slide fit. The complete assembly is 31.9 inches long and weighs 24.5 pounds.

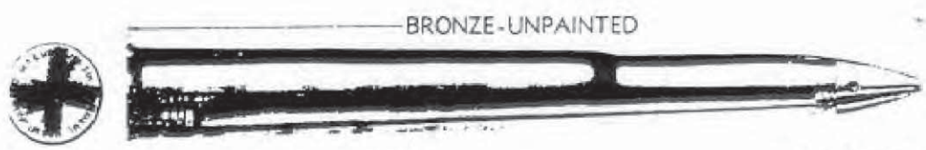


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Figure 97 — CARTRIDGE, Drill, M15, w/FUZE, Dummy, M59, 3" Guns, M1918 (All Models), M1, M3, M5, M6, and M7 or 3" (15-pdr.) Gun, M1902MI

176. **CARTRIDGE, DRILL, M15, W/FUZE, DUMMY, M59, 3" GUNS, M1918 (ALL MODELS), M3, M5, M6, AND M7, OR 3" (15-PDR.) GUN, M1902MI** (fig. 97), may also be designated M15B1. Both types are functionally alike and are provided for use in training in loading the gun and in setting the fuze. However, the M15B1 is made of malleable iron and steel, whereas the M15 is made of bronze and brass parts. The assemblies differ from earlier drill cartridges in that the cartridge is fitted at the base end

ARTILLERY AMMUNITION

ı a sleeve in which the base plate is a sliding fit. The base is held
ıormal position by a short rod and Belleville spring arrangement,
slides rearward against the tension of the spring during insertion
:he round into the gun. The spring device provides for easier ex-
ction and reduces wear and tear on the base. **FUZE**, dummy, M59,
assembled to the cartridge as shipped. This is an inert assembly
ıich simulates the M48 Fuze, having the same long contour and a
:ting pin for simulating selective superquick or delay setting during
ill. The complete cartridge is 33.7 inches long and weighs approxi-
ately 25.02 pounds.

Section XI

AMMUNITION FOR 81-MM MORTARS

177. GENERAL.

a. **General Discussion.** The 81-mm Mortar M1 is a refinement of the 3-inch trench mortar, which no longer is manufactured. The 81-mm mortar, like the 60-mm, is a smooth-bore, muzzle-loading weapon for high-angle fire. It is mounted on tripod mounts for ground placement or for use from motor vehicles, and is employed primarily for infantry and cavalry support. With high-explosive ammunition, a plunging type of fire is obtained. Light and heavy types of explosive rounds are provided for the weapon, together with several chemical rounds for screening purposes and suitable practice and training ammunition. The 81-mm rounds are considered to be "semifixed," that is, the propelling charges are adjustable and the round is loaded into the weapon in one operation. All service and practice ammunition is issued and shipped in the form of fuzed complete rounds. The ammunition may be adapted for firing from the Mk. I, IA1, or IA2, 3-inch Mortar by properly reducing the propelling charges.

b. **Identification.** The use of a fin to provide stability of flight to the projectile in place of rotational forces gives a characteristic appearance to the round which serves to distinguish mortar rounds from other artillery types. Complete identification is provided for by painting and marking in accordance with the basic scheme as prescribed in TM 9-1900.

c. **Fuzes.** Service and practice 81-mm rounds are fuzed with point-detonating fuzes. The fuzes in use are: FUZE, P.D., M52; FUZE, P.D., M53; FUZE, P.D., M45; and FUZE, TSQ, M77 (T88). FUZE, P.D., M45, is limited standard, and is assembled only to shell of earlier design. This is a selective superquick and short delay (0.1-sec) fuze. FUZE, P.D., M52, and FUZE, P.D., M53, are single-action types, the M52 providing for superquick action and the M53 having an 0.1-second delay element. The M77 is a combination time and superquick fuze for use with M56 and M57 Shell. Until the M77 Fuze becomes available for use with the M56 Shell, the M52 Fuze is to be issued (ch. 3, sec. I).

d. **Propelling Charges.** Propellent Increments M1 and M2 are now provided for 81-mm mortar ammunition. The M1 Charge is similar to the M3 and M4 Charges for the 60-mm mortar rounds

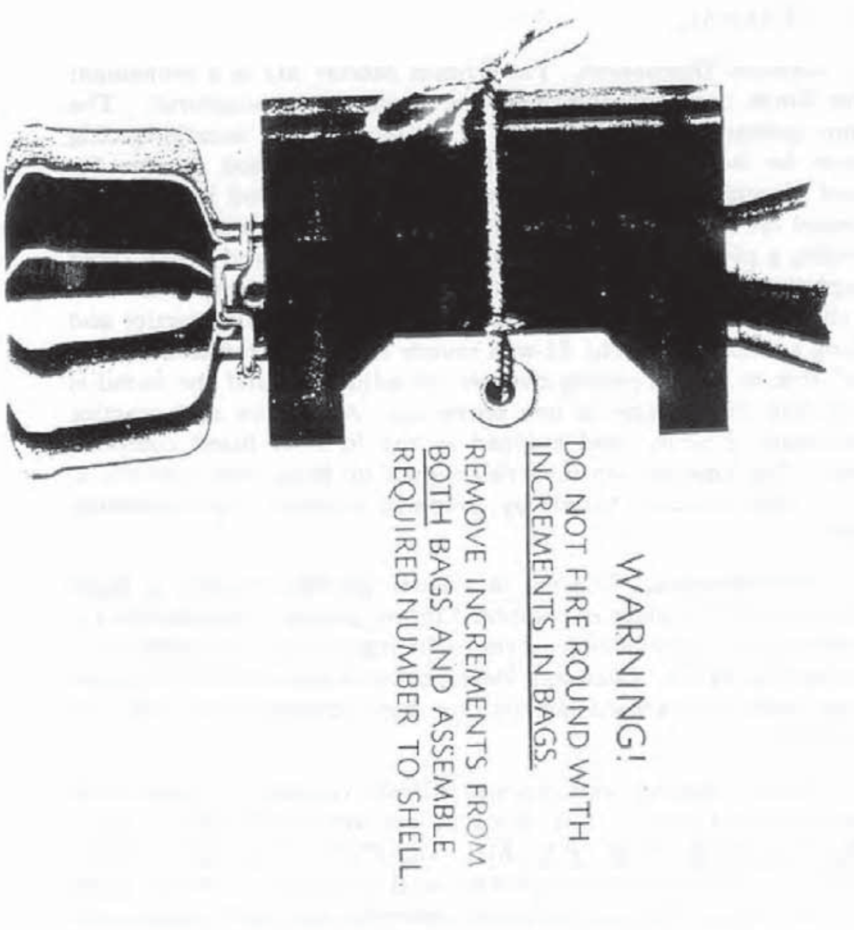

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Figure 98 — Method of Shipping M2 Increments for 81-mm Shell, M56 and M57

and assembled in the same manner to the fin assembly. The M1A1 Increments are the same as M1 Increments but are shipped in individual cellophane bags for protection against moisture. A full charge consists of six increments for the High-explosive, and Practice Rounds M43A1, and of four increments for the High-explosive M45 and M45B1 Rounds and the Practice M44 Rounds. Not more than four increments are to be used in firing from the 3-inch trench mortars. The M2 Charge or increment differs from the other trench-mortar increments in that it has a slit from the center hole to one edge to provide for seating on the fin shaft of the M56 High-explosive and M57 Chemical Shell. Four increments comprise a full charge and not more than three are to be used in 3-inch trench mortar firing. For protection in shipment, four M2 Increments are packed in a foil-cell asphalt paper bag, containing an inner cellophane bag, and this asphalt bag with increments is wrapped around the fin shaft (fig. 98). The increments must be removed from *both* bags before firing. The M2A1 Increments consist of the same propelling charge as the M2 but of different design and are individually cellophane-wrapped. The M2A1 Increments are held around the fin shaft by the M3 Holder. An older type of charge consists of loose powder held in a celluloid container, four containers making a full charge. All increments of all types of charges are removable as required for zone firing. In case all the increments are removed from a round for firing Charge O, the Ignition Cartridge M6, or the older M3, serves solely as the propellant. For the heavy High-explosive Rounds M56 and M45B1, and Chemical Round M57, the minimum charge used is charge 1, that is, ignition cartridge plus one increment.

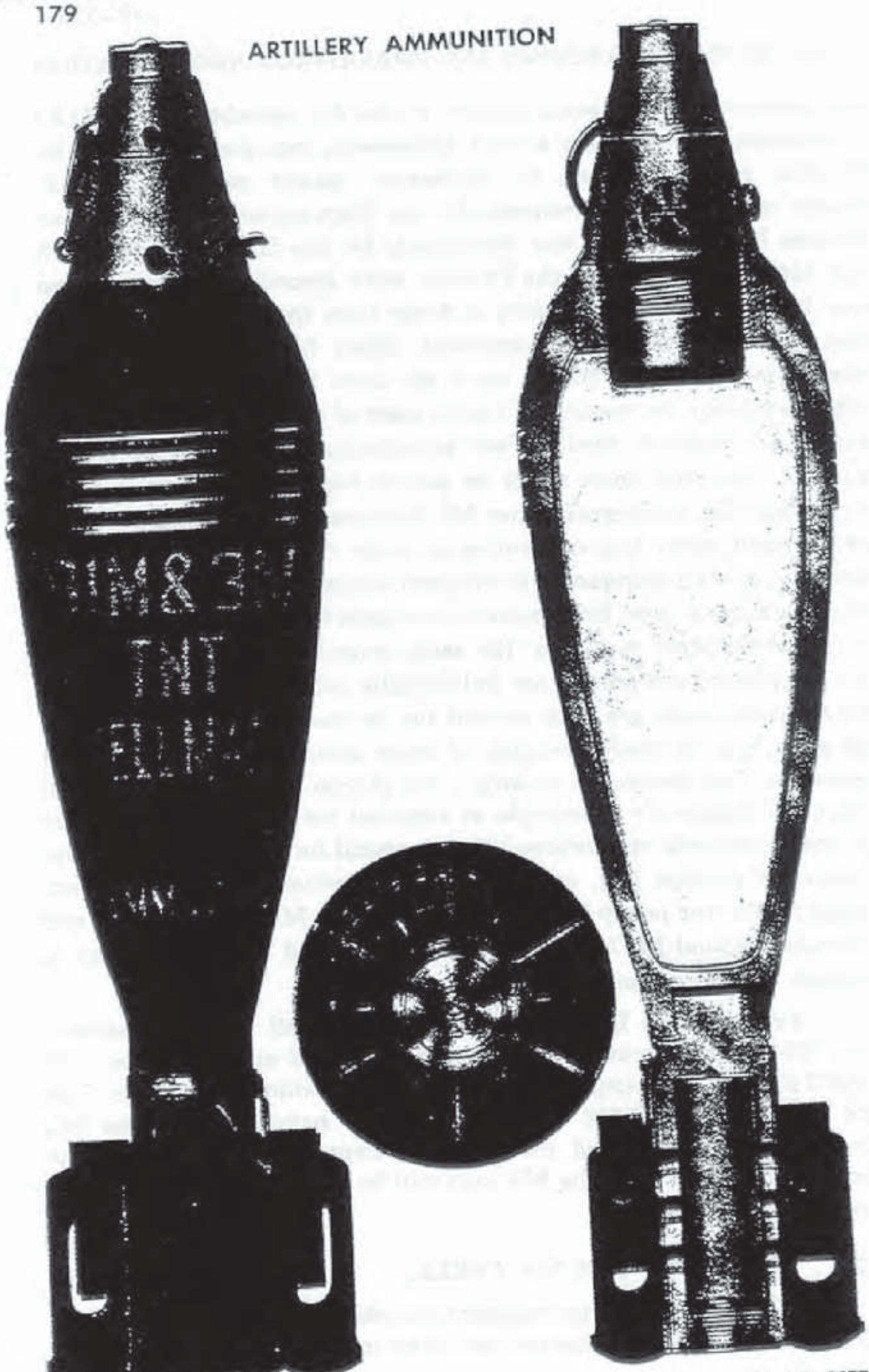
e. **Primers and Ignition Cartridges.** For all current manufacture, PRIMER, percussion, M33 or M34, is used in conjunction with CARTRIDGE, ignition, M6, to ignite the propelling increments. The M6 Cartridge and M33 and M34 Primers have replaced the M3 Cartridge which included the primer, except for the Training Projectile, M68. However, the M3 may still be found in older assemblies (ch. 3, sec. III).

178. COMPLETE ROUND TABLE.

a. Data concerning the complete rounds of 81-mm mortar ammunition, and components thereof, are given in table 17, chapter 5.

179. PACKING AND SHIPPING DATA.

a. Packing and shipping data for the rounds are given in ORD 11 SNL R-4.



RA PD 80770

Figure 99 — SHELL, H.E., M43A1, w/FUZE, P.D., M52, 81-mm Mortar, Complete Round

180. SHELL, H.E., M43A1, W/FUZE, P.D., M52, 81-MM MORTAR, COMPLETE ROUND (fig. 99), is a light-weight round provided for fragmentation and blast effect. The complete round is made up of six components: the M43A1 Shell, an M52 Superquick Fuze, a fin assembly, an M1 Propellent Charge, an M6 Ignition Cartridge, and an M33 Percussion Primer. The shell consists of a thin-walled egg-shaped steel casing holding a 1.23-pound high-explosive charge. The shell casing is cut and threaded at the nose end to fit an adapter into which the M52 Fuze with its booster is screwed after the shell is loaded, the bursting charge being shaped at the free end to provide a suitable well for the booster. The base of the shell is drilled and threaded to hold the fin assembly. The fin assembly consists of three double-bladed fins welded to a cylindrical shaft. The shaft is drilled and threaded internally at the rear to hold the igniter cartridge and the primer, the latter holding the cartridge in position. The shaft is threaded at the front end to screw into the base of the shell. Vents in the shaft provide for transmission of the cartridge flash to the propellent increments and facilitate burning and disintegration of the cartridge and case. The propellent increments are pushed into the spaces between the fin blades and held there by a spring clip arrangement which permits easy removal as desired. The M43A1 Round may be adapted for the 3-inch trench mortar by reducing the outer zone propelling charge from six to four increments. With the M52 Fuze, the shell functions with superquick action and before any appreciable penetration of the target.

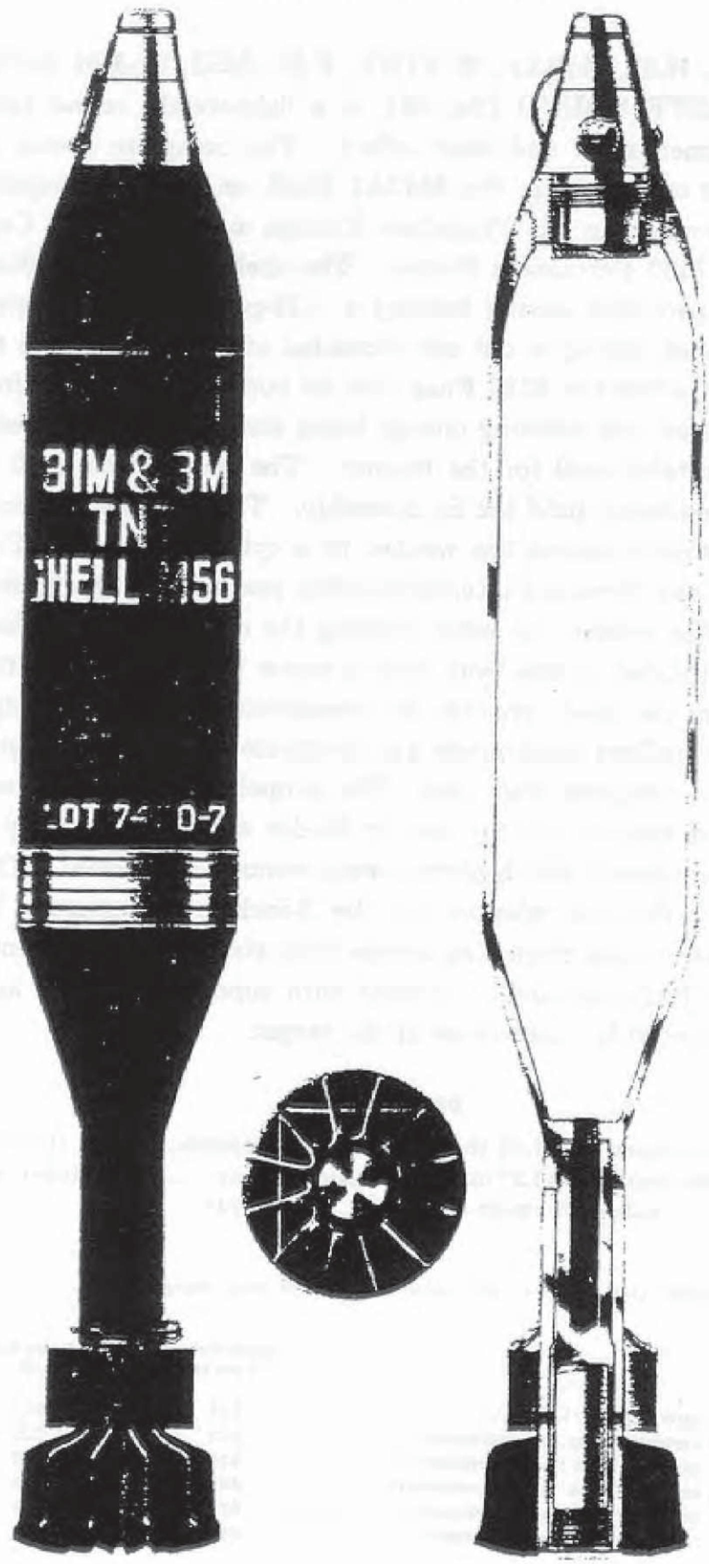
DATA

Weight of complete round...... 7.10 lb	Length of projectile, w/fin.... 13.27 in.
Length of complete round...... 13.27 in.	Muzzle velocity .... 700 ft per sec*

Maximum range .... 3,290 yd*

*—For six increments (full charge). Corresponding data for other charges are:

	Muzzle Velocity (ft per sec)	Maximum Range (yd)
Charge 0 (ignition cartridge only)	235	541
Charge 1 (ignition cartridge plus one increment)	332	1,020
Charge 2 (ignition cartridge plus two increments)	419	1,502
Charge 3 (ignition cartridge plus three increments)	449	2,042
Charge 4 (ignition cartridge plus four increments)	572	2,517
Charge 5 (ignition cartridge plus five increments)	638	2,963



RA PD 80771

Figure 100 — SHELL, H.E., M56, w/FUZE, P.D., M53, 81-mm Mortar, Complete Round

181. SHELL, H.E., M56, W/FUZE, P.D., M53, 81-MM MORTAR, COMPLETE ROUND (fig. 100), is the heavy type of the two current standard rounds for fragmentation and blast effect. The complete round consists of six components: the M56 Shell, an M53 Short-delay Fuze, a fin assembly, an M2 Propelling Charge, an M6 Ignition Cartridge, and an M34 Percussion Primer. Rounds of future manufacture will also be assembled with FUZE, TSQ, M77. Until the M77 Fuze is available, the FUZE, P.D., M52, will be issued. The projectile is made up of a 4.3-pound high-explosive charge (TNT or an alternative) held in a thin-walled shell made of steel tubing. The shell casing is formed to a long cylindrical shape with a long tapered (boat-tailed) base and a short ogival nose. The nose is threaded to hold an adapter into which the fuze with its booster is screwed and staked after the shell is loaded. The tapered base is drilled and threaded to hold the fin assembly. The fin assembly is an aluminum alloy die casting with 12 blades seated on a hollow cylindrical shaft. The shaft acts as a sleeve for a steel liner which is threaded at the front end to screw into the shell base. The rear of the liner is hollow and holds the ignition cartridge and primer, the latter screwing in and holding the cartridge in position. The shaft is vented to permit transmission of the ignition of the flash cartridge to the propelling increments. The M2 Propelling Charge comprises four increments or bundles of propelling powder in the form of square flakes or sheets. The flakes have a hole through the center and a slit from center to edge to permit seating on, and removal from, the fin shaft. The increments are held against the front edges of the fin blades by a spring clip arrangement. See figure 98 for method of shipping M2 Increments. The M2A1 Increments (cellophane-wrapped) are held flat around the fin shaft by means of the Holder M3. The M56 Round may be adapted for firing from the 3-inch trench mortar by reducing the outer zone propelling charge from four to three increments.

DATA

Weight of complete round...... 10.82 lb
Length of complete round...... 22.89 in.
Length of projectile, w/fin.... 22.89 in.
Muzzle velocity .... 583 ft per sec*
Maximum range .... 2,560 yd*

*—For four increments (full charge). Corresponding data for other charges are:

	Muzzle Velocity (ft per sec)	Maximum Range (yd)
Charge 1	306	875
Charge 2	412	1,474
Charge 3	502	2,046

RA PD 80772

Figure 101 — SHELL, Smoke, Phosphorus, WP, M57, w/FUZE, P.D., M52, 81-mm Mortar, Complete Round

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

182. **SHELL, SMOKE, PHOSPHORUS, WP, M57, W/FUZE, P.D., M52, 81-MM MORTAR, COMPLETE ROUND** (fig. 101), is assembled from the same components as are used with the M56 High-explosive Round (par. 181) but is loaded with a phosphorus filler for screening purposes. To adapt the M57 Shell for this filler, the nose of the shell casing is fitted with a special adapter. This serves to provide the tight seal necessary with chemical loading and also acts as the seat for the burster assembly. The burster consists of a thin-walled tubing filled with a small charge of tetryl. This assembly extends from the nose longitudinally through the chemical filler for about three-quarters the length of the cavity. Its function is to burst the shell casing and scatter the chemical contents. The superquick type of fuze is fitted to the shell to provide for burst before penetration. White phosphorus burns with a dense smoke and has an incendiary effect. For firing the 3-inch trench mortar, the maximum charge is reduced from four to three increments.

DATA

Weight of complete round ..... 11.61 lb*
Length of complete round ..... 22.89 in.
Length of projectile, w/fin ..... 22.89 in.
Muzzle velocity ..... 560 ft per sec
Maximum range ..... 2,466 yd†

*—Weight with M52B2 Fuze (plastic head) is 11.57 pounds.
†—For four increments (full charge). Corresponding data for other charges are:

	Muzzle Velocity (ft per sec)	Maximum Range (yd)
Charge 1	297	833
Charge 2	399	1,409
Charge 3	484	1,952

183. **SHELL, SMOKE, FS, M57, W/FUZE, P.D., M52, 81-MM MORTAR, COMPLETE ROUND**, is assembled from the same components as are used with the M56 High-explosive Round (par. 181), but is loaded with FS, a liquid smoke-producer which functions very much like white phosphorus, but lacks the incendiary effect. It differs from that described in paragraph 182 only with respect to the kind of chemical filler.

DATA

Weight of complete round ..... 12.11 lb*
Length of complete round ..... 22.89 in.
Length of projectile, w fin ..... 22.89 in.
Muzzle velocity ..... 544 ft per sec†
Maximum range ..... 2,431 yd†

*—Weight with M52B2 Fuze (plastic head) is 12.07 pounds.
†—For four increments (full charge). Corresponding data for other charges are:

	Muzzle Velocity (ft per sec)	Maximum Range (yd)
Charge 1	291	808
Charge 2	390	1,374
Charge 3	472	1,916

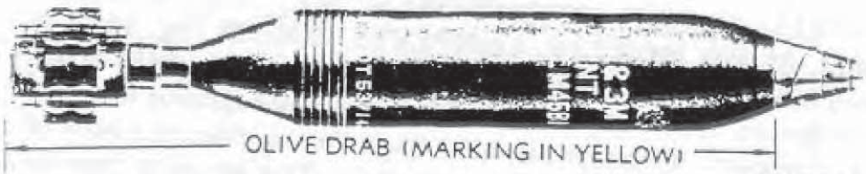


Figure 102 — SHELL, H.E., M45B1, w/FUZE, P.D., M53, 81-mm Mortar, Complete Round

184. **SHELL, H.E., M45B1, W/FUZE, P.D., M53, 81-MM MORTAR, COMPLETE ROUND** (fig. 102), is an earlier design which is no longer being manufactured. The round is essentially the same as the current standard rounds and intended for the same purposes. However, the M45B1 Shell is longer and heavier than the shell now being manufactured but contains less explosive in relation to the total weight of the loaded shell. The fin assembly consists of a short shaft with four supports to which are spring-hinged four slightly arched leaves. These are held in a closed position by shear pins prior to firing, and are released and open to form stabilizing vanes during flight. In the closed position, the leaves provide a shallow cup-like seat for the propelling charge. The charge used consists of loose powder grains held on a celluloid container. Four of these comprise a full charge. The M3 Ignition Cartridge, which includes the primer, is assembled to this round, being seated as in other rounds, in a hole in the shaft beneath the fin. The shaft is vented to permit the flash from the cartridge to reach the propellent increments. The short-delay type of fuze is used with this round. This ammunition can be fired from the 3-inch trench mortar, without adjustments.

DATA

Weight of complete round	15.15 lb	Length of projectile, w/fin	23.62 in.
Length of complete round	23.62 in.	Muzzle velocity	380 ft per sec*
Maximum range	1,275 yd*		

*—For four increments (full charge). Corresponding data for other charges are:

	Muzzle Velocity (ft per sec)	Maximum Range (yd)
Charge 1	216	446
Charge 2	276	715
Charge 3	330	986

185. **SHELL, H.E., M45, W/FUZE, P.D., M45, 81-MM MORTAR, COMPLETE ROUND,** differs principally from the M45B1, described in paragraph 184, with respect to the fuze. FUZE, P.D., M45, is a selective type providing for superquick or short-delay (0.1-sec) functioning. Because of the difference in the fuze, the complete round weighs slightly less than the M45B1 (15.10 lb), and is slightly shorter (23.59 in.).

RA PD 80776

Figure 103 — SHELL, Practice, M44, w/FUZE, P.D., M52, 81-mm Mortar, Complete Round

186. **SHELL, PRACTICE, M44, W/FUZE, P.D., M52, 81-MM MORTAR, COMPLETE ROUND** (fig. 103), simulates the M43A1 High-explosive Round for use in practice. When loaded and fuzed, the cast-iron projectile weighs the same as the service shell. However, the shell loading consists of 0.2 pound of black powder together with sufficient inert material to give the required shell weight. Since ballistic and other characteristics are the same as for the M43A1 Service Round, data given in paragraph 180 also are applicable to the M44 Round.

RA PD 80775

Figure 104 — SHELL, Practice, M43A1, w/FUZE, P.D., M52, 81-mm Mortar, Complete Round

187. **SHELL, PRACTICE, M43A1, W/FUZE, P.D., M52, 81-MM MORTAR, COMPLETE ROUND** (fig. 104), is an alternative practice round to the M44. It is an adaptation of the M43A1 Service Round (par. 180) for practice purposes, accomplished by changing the shell filler. All other components are the same as for the service round, and construction and assembly of these in the round are the same. For practice purposes, the shell cavity is filled with an inert material (plaster of paris and stearic acid) except for a 0.06-pound black powder pellet. The black powder is loaded at the front end of the cavity, adjacent to the rear wall of the booster casing when the fuze is assembled to the shell. The fuze booster and black powder pellet provide a spotting charge for observation of fire. Ballistic properties are the same as for the M43A1 Service Round and data given in paragraph 180 are applicable to the practice round.

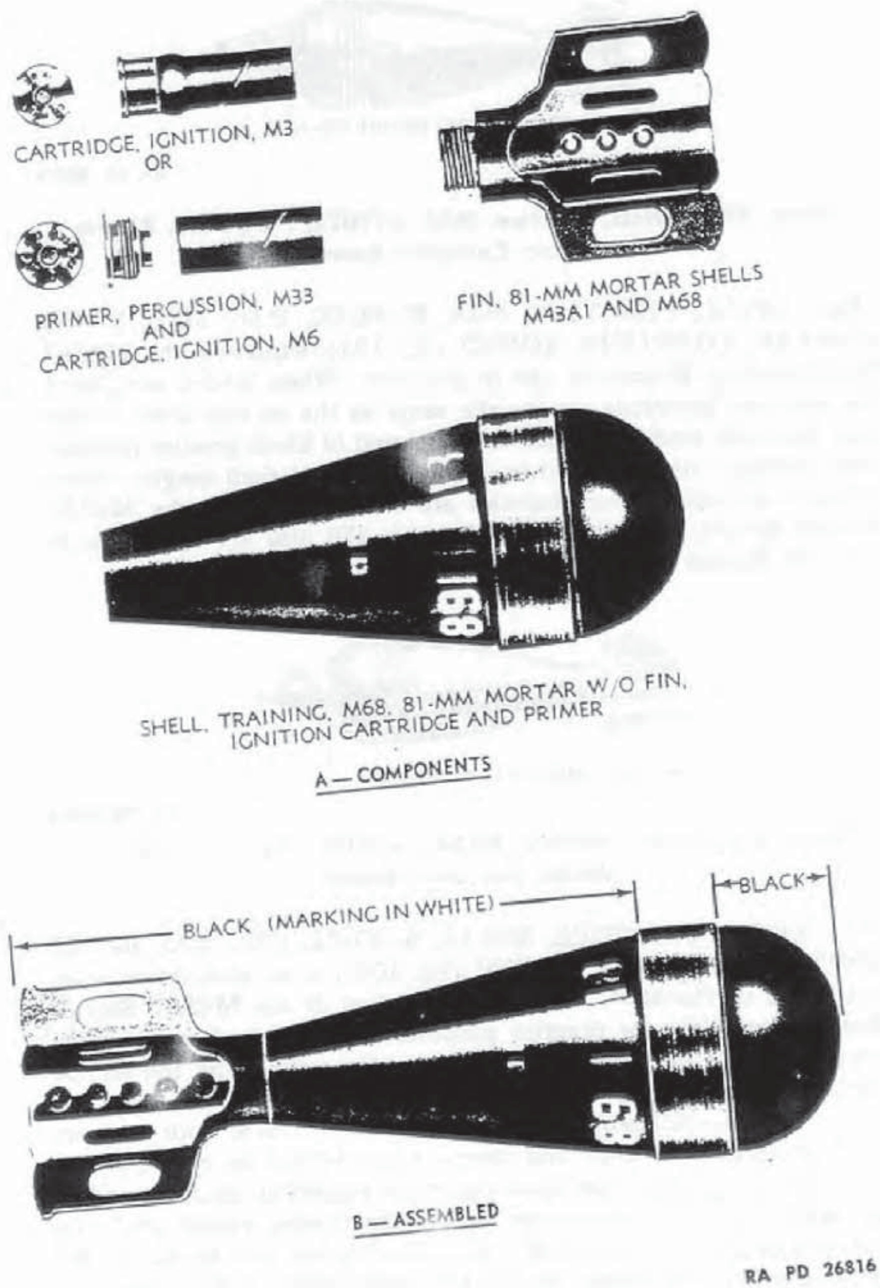


Figure 105 — SHELL, Training, M68, 81-mm Mortar

188. **SHELL, PRACTICE, M43, W/FUZE, P.D., M52, 81-MM MORTAR, COMPLETE ROUND,** an earlier design of practice round, is essentially the same as the M43A1 described in paragraph 187. However, a somewhat smaller (0.04 lb) black powder pellet is loaded in the shell and the propelling increments are held in position by inserting two corners of each bundle in the slots of the fin blades. Ballistic properties are similar to those of the M43A1 Practice and Service Rounds. Data given in paragraph 180 are applicable to this round.

189. **SHELL, TRAINING, M68, 81-MM MORTAR, W/O FIN, IGNITION CARTRIDGE, AND PRIMER** (fig. 105), is provided for drill in loading and firing the mortar. The projectile is completely inert and has no fuze, consisting of a cast-iron body shaped to a pear or tear-drop contour, and drilled at the narrow base to hold a service-type fin assembly similar to that on the M43A1 Projectiles. No propellent increments are issued or used, but the M3 Ignition Cartridge, or if this is not available the combination of the M33 Ignition Cartridge and M6 Percussion Primer, is issued for use in firing the projectile. The four components are issued separately to facilitate replacement of damaged or worn-out parts and the procurement of extra ignition cartridges. A training kit used in the field holds 10 training shell and accessories, including a ground hook used in the recovery of fired training shell.

DATA

Weight of complete round	10.82 lb	Length of projectile	7.92 in.
Length of complete round	11.08 in.	Muzzle velocity	172.8 ft per sec
Weight of projectile	9.8 lb	Maximum range	306 yd

Section XII

AMMUNITION FOR 90-MM GUNS

190. GENERAL.

a. **General.** Originally intended for antiaircraft defense, the 90-mm gun has since been adapted, by the use of various types of mounts, for use also against ground and water-borne targets. Of the several models of 90-mm guns now in use, all have the same type of chamber and can fire the same ammunition. The ammunition is of the fixed type, that is the rounds have propelling charges which are not adjustable and are loaded into the cannon in one operation. Armor-piercing, high-explosive, practice, blank, and drill rounds are provided. Rounds requiring fuzes are shipped with fuzes assembled. Once removed from packing materials, the rounds require only adjustment of the fuzes to be ready for firing.

b. **Identification.** Painting and marking for identification is in accordance with the basic color scheme as prescribed in TM 9-1900.

c. **Fuzes.** Shell for antiaircraft use are fitted with the M43 Mechanical Time Fuze (all modifications), which permits adjustment of setting to 30 seconds but has no impact element. Shell for ground fire or anti-motor-torpedo-boat defense are shipped fuzed with M48 series fuzes. These provide for selective superquick or delay setting, for surface burst or for detonation after penetration or upon ricochet with either 0.05-second or 0.15-second delay. The modification, M48A2, is manufactured with either delay, depending on the lot. The M48 and M48A1 Fuzes are manufactured with 0.05-second and 0.15-second delay, respectively, but some M48A1 Fuzes modified to have 0.05-second delay elements are in existence. Fuzes with 0.15-second delay are used in anti-motor-torpedo-boat firing, while models with the short (0.05-sec) delay are used against ground targets. Loaded armor-piercing projectiles are fitted with FUZE, B.D., M68, a base-detonating fuze which functions with delay action. Practice and drill rounds are fitted with either dummy or inert service fuzes. For a complete description of fuzes, see chapter 3, section I.

d. **Cartridge Cases.** CASE, cartridge, 90-mm, M19, made of brass, is standard for all ammunition except blank. Substitute standard is CASE, cartridge, 90-mm, M19B1. The M19B1 is a steel case weighing 10.1 pounds whereas the brass case weighs 11 pounds. CASE, cartridge, M27 or M27B1, is used with 90-mm blank ammunition.

e. NH (nonhygroscopic, flashing) propellent powder has been established as standard for all 90-mm ammunition except time-fuzed rounds, which, for AA. fire, will be loaded with FNH (flashless nonhygroscopic) powder. Impact-fuzed rounds with FNH powder are to be reserved for target-practice firing insofar as is practicable. Time-fuzed NH rounds will be used for daytime fire or for practice until supplies are exhausted and replaced by rounds with the standard propellant.

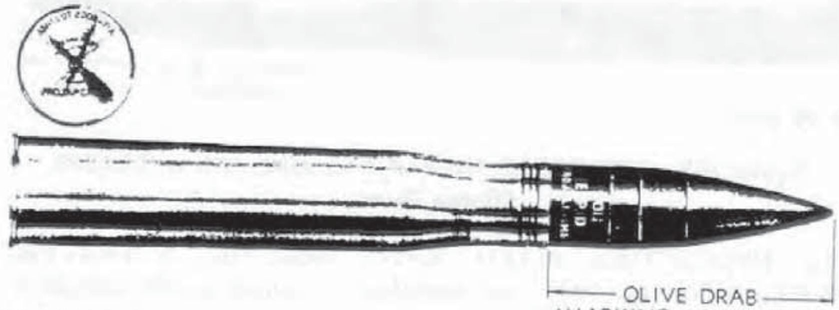
f. **Primers.** PRIMER, percussion, 300-grain, M28A2, is standard for all ammunition for 90-mm guns except blank ammunition. Alternative primer is PRIMER, percussion, 300-grain, M28B2 (steel). Rounds of earlier manufacture may have PRIMER, percussion, 300-grain, M28A1 or M28B1A1. PRIMER, percussion, 100-grain, M1B1A2, is used with blank ammunition (ch. 3, sec. III).

191. COMPLETE ROUND TABLE.

a. Data concerning complete rounds for 90-mm guns, and components thereof, are given in table 18, chapter 5.

192. PACKING AND SHIPPING DATA.

a. Packing and shipping data for 90-mm ammunition are given in ORD 11 SNL's P-5, P-7, and P-8.



RA PD 80778

Figure 106 — PROJECTILE, Fixed, A.P.C., M82, NH, w/FUZE, B.D., M68, and TRACER, 90-mm Guns

193. PROJECTILE, FIXED, A.P.C., M82, NH, W/FUZE, B.D., M68, AND TRACER, 90-MM GUNS (fig. 106), is provided for 90-mm guns for use against ground targets, particularly armored materiel. The projectile, which has been manufactured both with and without a high-explosive charge (par. 194) is similar to other standard types especially adapted for combating face-hardened armor. The body proper is made of hard steel, with a square base and a nose shaped to a relatively short ogive. The nose is sweated to a softer steel cap, on which in turn is screwed a light-weight steel ballistic cap or windshield. The rear portion of the body contains a small cavity which, in the loaded projectile, holds a small charge of explosive D. The base hole is threaded to receive the M68 Base-detonating Fuze. This fuze, a simple inertia type, functions with delay action. The rear housing of the fuze extends approximately ¾ inch beyond the rear surface of the projectile base. This portion of the fuze contains a red tracer for observation purposes. Operating independent of the fuze mechanism, the tracer composition is ignited by the propelling charge when the round is fired. It burns with a visible tracer for about 3 seconds, equivalent to a range of about 2,400 yards.

DATA

Weight of complete round	42.75 lb	Radius of ogive (false ogive)	9.09 cal.
Length of complete round	38.24 in.	Muzzle velocity	2,650 ft per sec
Length of fuzed projectile	16.19 in.	Maximum range	13,540 yd
Length of cartridge case	23.70 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	6.0
Width of rotating band	1.20 in.		
Type of base	Square		

Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd).... 5.5

RA PD 80779

Figure 107 — PROJECTILE, Fixed, A.P.C., M82, NH, w/TRACER, 90-mm Guns

194. PROJECTILE, FIXED, A.P.C., M82, NH, W/TRACER, 90-MM GUNS (fig. 107), was manufactured prior to the standardization of the M68 Base Fuze, which permitted loading and fuzing the projectile for blast as well as penetrating effect. In this round, the projectile bursting charge cavity is left empty. The base hole is plugged with a steel plug which contains a tracer similar to that in the fuze of the loaded projectile. Weight of the complete round is 42.04 pounds; over-all length of the projectile is 15.49 inches, 0.70 inch less than the fuzed propectile due to the omission of the fuze, otherwise, the data in paragraph 193 is applicable to this round.

195. SHOT, FIXED, A.P., M77, NH, W/TRACER, 90-MM GUNS (fig. 108), has the same components, other than the projectile, as the M82 Armor-piercing-capped Round, and is used for the same purpose. The shot is a solid steel slug similar in contour to the body of the

M82 Projectile but lacking the armor-piercing cap and ballistic windshield of the standard projectile and without explosive. The base is drilled to provide a small cavity for holding a red tracer. The tracer is similar to that in the loaded and fuzed round and burns for approximately 3 seconds.

RA PD 80782

Figure 108 — SHOT, Fixed, A.P., M77, NH, w/TRACER, 90-mm Guns

DATA

Weight of complete round	42.04 lb	Radius of ogive	1.51 cal.
Length of complete round	32.75 in.	Muzzle velocity	2,700 ft per sec
Length of projectile	10.00 in.	Maximum range	12,790 yd
Length of cartridge case	23.70 in.	Penetration (in. at 0-deg obliquity of face-hardened plate at 1,000 yd)	4.5
Width of rotating band	1.20 in.		
Type of base	Square		

Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd).... 5.5

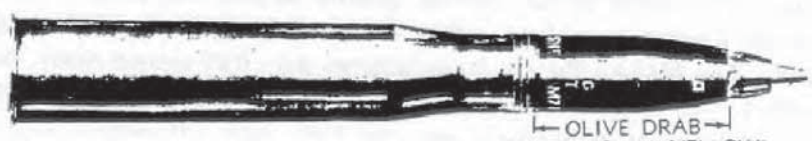


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Figure 109 — SHELL, Fixed, H.E., M71, w/FUZE, Time, Mechanical, M43 (All Modifications), 90-mm Guns

196. **SHELL, FIXED, H.E., M71, W/FUZE, TIME, MECHANICAL, M43 (ALL MODIFICATIONS), 90-MM GUNS** (fig. 109), consists of a hollowed steel casing containing a high-explosive filler and a booster, and fitted with a point fuze. The bursting charge cavity tapers in conical fashion over the lower half of the cavity and is hemispherical at the bottom. The result is a relatively small cavity, with comparatively thick walls, for a high-explosive shell. The base is boat-tailed and the nose formed to a long ogive, the sweep of which is continued by the contour of the fuze. When to be fired against aircraft, the projectile is fitted with the M43 Mechanical Time Fuze. This fuze gives selective time setting up to 30 seconds but has no impact element. To obtain the desired fragmentation and blast effect, the shell is loaded with TNT; an alternative high-explosive is 50-50

amatol. The high-explosive charge is shaped at the front end to provide for a booster well. When 50-50 amatol is used, an additional booster is provided by surrounding the booster well with TNT. BOOSTER, M20A1, is a manufacturing component of the shell, being inserted after loading and staked permanently in position.

DATA

Weight of complete round	42.04 lb	Degree of taper	7 deg 15 min
Length of complete round	37.44 in.	Radius of ogive	9.01 cal.
Length of fuzed projectile	16.37 in.	Muzzle velocity	2,700 ft per sec
Length of cartridge case	23.70 in.	Maximum range (at 45 deg)	19,560 yd*†
Width of rotating band	1.20 in.		
Type of base	Boat-tailed		

*—Effective maximum range limited by fuze time limits to around 13,000 yards.
†—Range shown in horizontal range; maximum vertical height is about 12,000 yards.

197. **SHELL, FIXED, H.E., M71, NH, W/FUZE, P.D., M48A2, SQ & 0.05-SEC. DELAY, 90-MM GUNS,** has the same components as the round described in paragraph 196, except for the fuze. Since this round is intended for use against ground targets, the shell is fuzed with an impact type fuze, either FUZE, P.D., M48A2, M48A1, or M48. The M48A2 Fuze is manufactured with 0.05-second delay, the M48A1 with 0.15-second delay (although modified fuzes with 0.05-sec delay are in existence), and the M48 with 0.05-second delay. The short-delay models are prescribed for batteries firing against ground targets. As loaded with a 7.31-pound propelling charge of NH powder, the projectile has a muzzle velocity of 2,700 feet per second and a maximum range of approximately 19,500 yards (at approx 45 deg 45 min). Other data is the same as that given in paragraph 196 for the time-fuzed AA. round.

198. **SHELL, FIXED, H.E., M71, NH, W/FUZE, P.D., M48A2, SQ & 0.15-SEC. DELAY, 90-MM GUNS,** is exactly the same as the M71 Round described in paragraph 197 except for the delay element in the fuze. The data described in paragraphs 196 and 197 are applicable. This long-delay fuze (0.15-sec delay) is for use in rounds to be fired in anti-motor-torpedo-batteries.

199. **SHELL, FIXED, PRACTICE, INERT LOADED, M71, NH, W/FUZE, DUMMY OR INERT, M _, 90-MM GUNS,** is provided for training in marksmanship in anti-motor-torpedo-boat firing. It differs from the M71 Service Round in that the shell is loaded with inert material and fuzed with an inert service M48A1 Fuze or FUZE, dummy, M73. Data for the practice round is the same as that for the M71 Round given in paragraphs 197 and 196.

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Figure 110 — AMMUNITION, Blank, 90-mm Guns

200. AMMUNITION, BLANK, 90-MM GUNS (fig. 110), consists of the M27 or M27B1 (steel) Cartridge Case, similar to a service case but shortened to 7.25 inches; a 100-grain M1B1A2 Primer or alternative PRIMER, percussion, 100-grain, M1A2; and a 1.5-pound charge of black powder (sodium nitrate). The round is constructed like other standard types of blank ammunition, the blank charge being held in a cotton bag which is so loaded into the cartridge case as to surround the primer. The charge is held firmly in position at the base of the case by a closing cup assembly. For 90-mm blank ammunition, the closing cup assembly consists of two pulpboard disks glued one to each surface of a felt disk or wad. The assembly is inserted into the case and glued securely in position about 2.42 inches from the mouth of the case. Weight of complete round is 8.23 pounds and length is 7.27 inches.

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Figure 111 — CARTRIDGE, Drill, M12, w/FUZE, Dummy, M44A2, 90-mm Guns

201. CARTRIDGE, DRILL, M12, W/FUZE, DUMMY, M44A2, 90-MM GUNS (fig. 111), may be stamped either M12 or M12B1. Both are functionally alike and completely inert. However, the M12B1, which is being manufactured at present, is made of malleable iron and steel parts whereas the M12 is made of bronze and brass parts. Both are 1-piece castings threaded at the base to receive the base plate and at the nose to hold the M44A2 Dummy Fuze. The base plate is held in position by a set screw; the fuze, by a set screw and shoe arrangement. Both parts are replaceable. FUZE, dummy, M44A2, used with this cartridge, may be made of bronze, brass, aluminum, copper alloy or sintered iron. In form, the casting resembles the M43 Fuze but is without the time ring. The complete assembly weighs 39.15 pounds, and is 37.44 inches long. This drill cartridge is not used in the 90-mm M2 Gun which has a power-operated rammer.

Section XIII

AMMUNITION FOR 105-MM HOWITZERS

202. GENERAL.

a. **General Discussion.** Two distinct types of 105-mm howitzer are now in use—the M2, M2A1, and M4 type and the M3 type. The M2 and M2A1 are the basic models making up the traditional light field howitzer mounted on split-trail type carriage. These models also are used as assault artillery by the armored forces. The M4 Howitzer is mounted in the medium tanks. The M3 is basically of the same design, being a stripped-down and shortened light-weight M2A1 Howitzer for infantry and air-borne service. Except that ammunition for the M3 model has a smaller quicker-burning propelling charge, rounds provided for the 105-mm howitzers are alike. All rounds are classified as semifixed ammunition, and all have adjustable propelling charges for zone firing, with one exception. The H.E., A.T. round is a special type in that the charge is fixed, that is, not adjustable, the cartridge case and projectile not being crimped together because of the method of packing and shipment. Standard projectiles are shipped with fuzes assembled.

b. **Identification.** Painting and marking for identification is in accordance with the basic scheme as prescribed in TM 9-1900. Rounds for the M2, M2A1, and M4 Howitzers may be readily identified from those for the M3 by the marking on the packing containers, and on the round itself, since the designation of the cannon is marked on containers and on base of cartridge case of each round (fig. 112).

c. **Fuzes.** FUZE, B.D., M62, or M62A1, is assembled in the base of the H.E., A.T. Shell M67. These are boresafe base-detonating fuzes which function with nondelay action. High-explosive shell are assembled as shipped with either FUZE, P.D., M48, M48A1, M48A2, or FUZE, TSQ, M54. The M48, M48A1, and M48A2 Fuzes are selective superquick-delay types. They function alike except for differences in the length of delay (0.05 sec in the M48, 0.15 sec in the M48A1 although modified fuzes with 0.05-sec delay are in existence, and 0.05 sec or 0.15 sec in the M48A2, depending on the lot). FUZE, TSQ, M54, is a combination time and superquick type in which the superquick action is always operative. It will function on impact unless prior functioning has been caused by time action. FUZE, P.D., M57, a single-action superquick type, is used with the chemical shell. This fuze is used in order to give surface bursts, and thereby, the most effective dissemination of the smoke or gas filler of the shell. For a complete description of the fuzes, see chapter 3, section I.

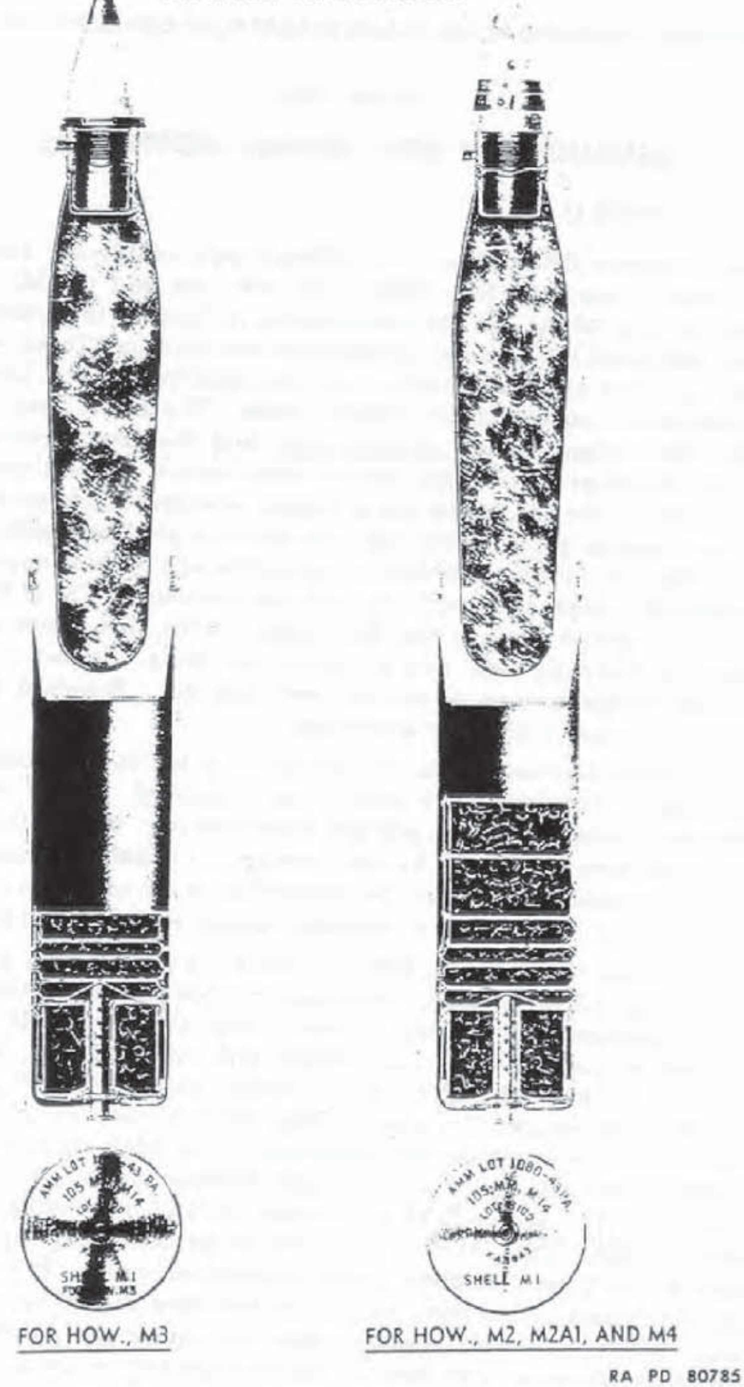

Figure 112 – Comparison of 105-mm Howitzer Complete Rounds

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

d. **Cartridge Cases.** CASE, cartridge, 105-mm, M14, made of brass, is standard for all 105-mm howitzer ammunition. Substitute standard is the M14B1 Cartridge Case which is made of steel and weighs approximately 0.5 pound less than the standard brass case due to a thinner head and primer seat. Prior to the change in cartridge case for the H.E., A.T. shell from a crimped case to the removable type, two types of cartridge case were made (type I and type II). Type II had a mouth with a slightly smaller diameter, to adapt it for crimping to the H.E., A.T. shell. However, all cases now used are type I, that is, the free-fit or removable type.

e. **Propelling Charges.** Although assembled with removable cartridge case, the H.E., A.T. round has a fixed (nonadjustable) propelling charge. Propelling charges of all other rounds are divided into parts to permit adjusting for zone firing. For rounds to be fired from the M2, M2A1, and M4 Howitzers, the full (outer zone) charge consists of seven sections, a base charge and six increments, providing for seven zones of fire. For the M3 Howitzer, the full charge consists of five sections, a base charge and four increments, for five zones of fire. The powder for each section is assembled in a cloth bag on which is marked the number of the charge. The base charge (charge 1) is tied to a retainer in the bottom of the cartridge case. The first increment, or second section (charge 2) is tied to the base increment by a long twine. The other increments, in numerical order, are tied to each other with a short twine. This permits withdrawal of the increments, except the base charge, to the mouth of the cartridge case where those increments not required for the particular inner zone to be fired may be removed by cutting or breaking the twine. The increments to be used are then readily reassembled in the cartridge case in numerical order, the increment the number of which corresponds to the zone to be fired being uppermost. All increments up to and including the number of the charge to be fired are required to fire the charge called for. Thus, to fire charge 3 the base charge (marked "1") and increments marked "2" and "3," in numerical order, must be used. The sections are of unequal weight and, hence, are not interchangeable. Propelling charges for the M2, M2A1, and M4 Howitzers are not directly interchangeable with those for the M3 Weapon since the latter consists of a quicker-burning powder. However, the high-explosive rounds may be used interchangeably as outlined in paragraph f, below.

CAUTION: *For the M3 Howitzer, zone 5 charge will not be fired above a 45-degree elevation except in case of emergency. Zones 1, 2, 3, and 4 charges may be fired up to elevation of 65 degrees.*

f. **Interchangeability.** By applying suitable corrections for the resultant velocities listed below, the M1 High-explosive Rounds for the M3 Howitzer may be fired with full charge, or any part thereof, in the M2, M2A1, and M4 Howitzers. Conversely, M1 H.E. Rounds for the M2 and M2A1 Weapons may be fired in the M3 Howitzer, *but*, due to poor obturation, low pressures, and excessive muzzle flash, *only with charges 1 through 3, and then only in cases of extreme emergency.* Suitable corrections for the resultant different velocities must be made. Muzzle velocities and maximum range obtained with interchanged rounds are:

M1 Round for M3 Howitzer When Fired in M2 and M2A1 Howitzers			M1 Round for M2, M2A1, and M4 Howitzers When Fired in the M3 Howitzer		
Charge	Muzzle Velocity (ft per sec)	Maximum Range (yd)	Charge	Muzzle Velocity (ft per sec)	Maximum Range (yd)
1	695	4,293 (at 43° 36′)	1	605	3,357 (at 43° 28′)
2	755	4,974 (at 43° 38′)	2	660	3,920 (at 43° 27′)
3	825	5,711 (at 43° 24′)	3	730	4,690 (at 43° 11′)
4	925	7,050 (at 43° 24′)			
5	1,080	8,967 (at 43° 14′)			

g. **Primer.** PRIMER, percussion, 100-grain, M1B1A2, is used with all rounds except the H.E., A.T. Round M67, which uses the 300-grain Primer M28A2. Alternative primers for the M1B1A2 are 100-grain M1, M1A1, M1B1, or M1B1A1 Primers (ch. 3, sec. III).

203. COMPLETE ROUND TABLE.

a. Data concerning the complete rounds of 105-mm howitzer ammunition, and components thereof, are given in table 19, chapter 5.

204. PACKING AND SHIPPING DATA.

a. Packing and shipping data for the ammunition described in this section are published in ORD 11 SNL's R-1, R-5, and R-6.

205. SHELL, SEMIFIXED, H.E., M1, W/FUZE, P.D., M48A2, SQ & 0.15-SEC. DELAY, 105-MM HOW., M2, M2A1, AND M4 (fig. 113), consists of the M14 or M14B1 Cartridge Case fitted with the standard primer and an FNH propelling charge (seven increments), assembled with free fit to the fuzed M1 Projectile. The M1 Projectile is similar to other standard high-explosive shell of modern design. The body is a relatively thin-walled steel shell with boat-tailed base and a nose formed to a long ogive and threaded to hold a point fuze. The fuze contour continues the long sweep of the shell nose, maintaining the streamlined effect throughout the assembly. The bursting charge is TNT—or the alternative 50-50 amatol—formed at the front end to provide a well for the booster. When

50-50 amatol is loaded in the cavity, a booster surround consisting of a small amount of TNT is used. BOOSTER, M20A1, is a standard manufacturing component of the M1 Shell, being inserted after

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Figure 113 — SHELL, Semifixed, H.E., M1, w/FUZE, P.D., M48A2, SQ & 0.15-sec. Delay, 105-mm How., M2, M2A1, and M4

the shell is loaded and secured permanently in position by a set screw. As fuzed with FUZE, P.D., M48A2 (or M48A1 in the case of rounds of earlier manufacture), giving selective superquick or delay (0.15-sec) setting, the shell is adapted for firing for fragmentation and blast effect with surface burst, or after penetration or on ricochet.

DATA

Weight of complete round	42.07 lb	Type of base	Boat-tailed
Length of complete round	31.07 in.	Degree of taper	9 deg 15 min
Length of fuzed projectile	19.63 in.	Radius of ogive	6.02 cal.
Length of cartridge case	14.64 in.	Muzzle velocity	1,550 ft per sec*†
Width of rotating band	0.81 in.	Maximum range (at 44 deg)	12,205 yd*†

*—When fired in the M2, M2A1, and M4 Howitzers. For muzzle velocity and range data when this round is fired in the M3 Howitzer, see paragraph 202 f.

†—With full charge (charge 7); corresponding data for other charges are:

	Muzzle Velocity	Maximum Range
Charge 1	650 ft per sec	3,825 yd (at 48°38')
Charge 2	710 ft per sec	4,475 yd (at 43°38')
Charge 3	780 ft per sec	5,280 yd (at 43°24')
Charge 4	875 ft per sec	6,430 yd (at 43°24')
Charge 5	1,020 ft per sec	8,295 yd (at 43°14')
Charge 6	1,235 ft per sec	10,150 yd (at 43°17')

206. SHELL, SEMIFIXED, H.E., M1, W/FUZE, P.D., M48, 105-MM HOW., M2, M2A1, AND M4, is the same as the round with M48A1 or M48A2 Fuze described in paragraph 205, except that FUZE, P.D., M48 has an 0.05-second delay element incorporated in its delay action train.

207. SHELL, SEMIFIXED, H.E., M1, W/FUZE, TSQ, M54, 105-MM HOW., M2 AND M2A1, differs from those described in paragraph 205 only with respect to the fuze. FUZE, TSQ, M54, provides alternative setting for superquick action or over any time up to 25 seconds after firing the round. The superquick action is always operative, providing for detonation of the shell bursting charge should prior action not be caused by the time train. This fuze adapts the shell for time fire or high-burst ranging.

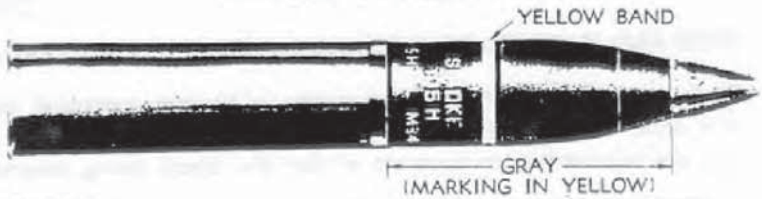

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Figure 114 — SHELL, Semifixed, Smoke, HC (White), B.E., M84, w/FUZE, TSQ, M54, 105-mm How., M2, M2A1, and M4

208. **SHELL, SEMIFIXED, SMOKE, HC (WHITE), B.E., M84, W/FUZE, TSQ, M54, 105-MM HOW., M2, M2A1, AND M4** (fig. 114), is assembled with one of the several new types of smoke shell intended to overcome certain deficiencies of the bursting type smoke shell. It is a base-ejection shell consisting essentially of a drawn steel tubing containing a small black powder expelling charge at the nose end and three canisters of HC smoke mixture (fig. 5). The shell casing, like that of the M60 Chemical Shell, resembles the high-explosive shell in outward appearance, being boat-tailed and having the nose formed to the same long ogive. Internal construction differs in that the cavity is cylindrical in shape and extends the full length of the shell. Both ends are threaded, the rear to hold a base plug and the front to hold the M54 Fuze. An expelling charge (0.14 lb) of black powder is loaded in the front end of the cavity. The remainder of the cavity holds three canisters of HC smoke mixture. A baffle plate separates the black powder charge and the smoke filler, but transmission of the flash and explosive action of the black powder is provided for by a flash tube which extends through the doughnut-shaped smoke canisters. In functioning, the black powder ignites the smoke filler and at the same time expels the canisters through the base end of the shell. Time of action is governed by the fuze, which provides for time setting up to 25 seconds or action on impact. Air burst does not materially alter the path of flight since the expelled canisters continue approximately along the original trajectory and land close to the shell body. The smoke filler will burn for approximately 3 minutes after reaching the ground. Maximum emission of smoke from the canisters occurs in about 2 minutes although an effective smoke develops in about 1 minute. The M84 Shell is fired with the standard semifixed propelling charge for the Howitzers, M2, M2A1, and M4.

DATA

Weight of complete round	41.94 lb	Type of base	Boat-tailed
Length of complete round	30.49 in.	Degree of taper	9 deg 15 min
Length of fuzed projectile	18.84 in.	Radius of ogive	6.02 cal.
Length of cartridge case	14.64 in.	Muzzle velocity	1,550 ft per sec
Width of rotating band	0.81 in.	Maximum range	12,205 yd

209. SHELL, SEMIFIXED, SMOKE (COLORED), B.E., M84, W/FUZE, TSQ, M54, 105-MM HOW., M2 AND M2A1 (W/GREEN, RED, VIOLET, OR YELLOW SMOKE FILLER), in addition to the white-smoke B.E. shell (par. 208), have been standardized for use in the 105-mm field howitzers for target and battery identification purposes. Characteristics are similar to those for the white-smoke shell with the exception of the differences in color of smoke and some slight variations in weight due to different densities of the fillers. Like the white-smoke shell, the colored-smoke projectiles are intended for firing with the standard propelling charge and other components for the weapons. Complete round weights are: green or violet, 39.57 pounds; red, 39.77 pounds; yellow, 39.37 pounds.

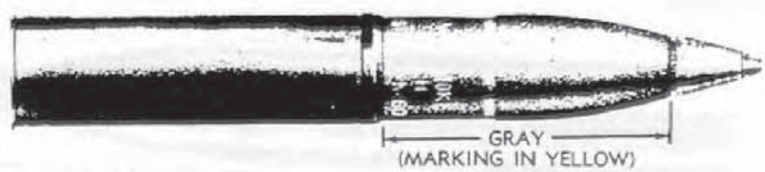

Figure 115 — SHELL, Semifixed, Smoke, Phosphorus, WP, M60, w/FUZE, P.D., M57, 105-mm How., M2, and M2A1

210. SHELL, SEMIFIXED, SMOKE, PHOSPHORUS, WP, M60, W/FUZE, P.D., M57, 105-MM HOW., M2 AND M2A1 (fig. 115), is assembled with the M60 Smoke Shell which resembles the high-explosive shell in outward appearance. The shell is boat-tailed and the nose is ogival and threaded to take an adapter. The adapter serves three purposes: it provides a tight seal for the chemical contents of the shell; it holds the fuze and booster; and it provides a seat for the forward end of BURSTER, M5, a thin-walled steel tube extending from the adapter to the rear of the shell cavity. It contains a detonator relay chain and a burster charge to rupture the shell casing and disperse the chemical contents. FUZE, P.D., M57, is used with the projectile, in conjunction with BOOSTER, M22, to provide for superquick action and functioning of the shell before any appreciable penetration has taken place. White phosphorus is a smoke-producing chemical which also has an incendiary effect.

DATA

Weight of complete round	43.77 lb
Length of complete round	31.08 in.
Length of fuzed projectile	19.46 in.
Length of cartridge case	14.64 in.
Width of rotating band	0.81 in.
Type of base	Boat-tailed
Degree of taper	9 deg 15 min
Radius of ogive	6.02 cal.
Muzzle velocity	1,550 ft per sec*
Maximum range (at 44 deg)	12,150 yd*

*—Full charge (charge 7).

211. **SHELL, SEMIFIXED, SMOKE, FS, M60, W/FUZE, P.D., M57, 105-MM HOW., M2 AND M2A1,** contains the chemical filler FS, a liquid smoke producer which functions very much like white phosphorus. When filled with FS, the complete round weighs approximately 44.28 pounds. In other respects it is similar to the round described in paragraph 210. Data given therein apply equally to this round.

212. **SHELL, SEMIFIXED, GAS, PERSISTENT, H, M60, W/FUZE, P.D., M57, 105-MM HOW., M2 AND M2A1,** is similar to the phosphorus and FS filled shell rounds, but the filler consists of mustard gas, a persistent liquid vesicant. The complete round weighs 42.84 pounds. Otherwise, data given in paragraph 210 also apply to this round.

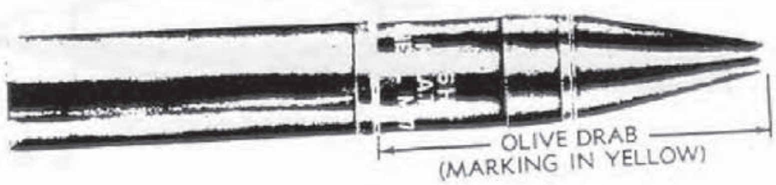

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Figure 116 — SHELL, Semifixed, H.E., A.T., M67, w/FUZE, B.D., M62 or M62A1, 105-mm How., M2, M2A1, and M4

213. **SHELL, SEMIFIXED, H.E., A.T., M67, W/FUZE, B.D., M62, OR M62A1, 105-MM HOW., M2, M2A1, AND M4** (fig. 116), is similar in all respects except size to the H.E., A.T. round for the 75-mm howitzers. Like that round, it provides an effective ammunition for the howitzers against tanks. The effect of the projectile is produced by the force of detonation of the high-explosive filler rather than by striking velocity. The construction of the shell differs materially from standard armor-piercing types. The shell body is a relatively thin-walled casing containing a shaped high-explosive filler and closed off at the forward end by a ballistic cap in the form of a thin steel cone. The ballistic cap is attached to an ogive and union assembly which provides sufficient "stand-off" from the target after the ballistic cap crushes on impact with the target. The base is boat-tailed and fitted with a base-detonating fuze which functions with nondelay action. A standard cartridge case and the M28A2 300-grain Primer are used with the projectile. However, the propelling charge consists of 1.60 pounds of flashless powder (little more

than half the full charge used with semifixed rounds) in a cloth bag, and is not intended to be adjustable, the cartridge case being a loose fit on the projectile only for shipping and storage purposes.

DATA

Weight of complete round	36.85 lb	Type of base	Boat-tailed
Length of complete round	31.05 in.	Degree of taper	9 deg 15 min
Length of fuzed projectile	19.43 in.	Degree of nose taper	21 deg 30 min
Length of cartridge case	14.64 in.	Muzzle velocity	1,250 ft per sec
Width of rotating band	0.81 in.	Maximum range	8,590 yd
Penetration (at any range)	4.0 in.		

214. SHELL, SEMIFIXED, EMPTY, FOR SAND LOADING, M1, W/FUZE, INERT, P.D., M48, 105-MM HOW., M2, M2A1, AND M4, provides practice ammunition for the howitzer, and consists of service case, primer, and propelling charge and an inert projectile. The projectile is an M1 Shell with the bursting charge cavity left empty, for loading with inert material in the field. An inert service fuze is used with the round. Ballistically the projectile is the same as the service round described in paragraph 205 and data therein are applicable to the practice round.

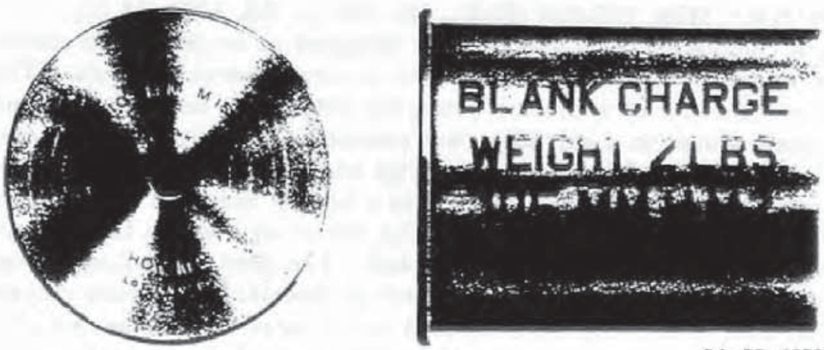

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Figure 117 — AMMUNITION, Blank (1.5-lb. or 2-lb. Charge), 105-mm How., M2, M2A1, M3, and M4

215. AMMUNITION, BLANK (1.5- OR 2-LB. CHARGE), 105-MM HOW., M2, M2A1, M3, AND M4 (fig. 117), is provided for the 105-mm howitzers for salutes and simulated fire and consists of the M15 Cartridge Case, which is essentially the service case cut down to a 6-inch length, a 49-grain primer, and a black powder charge. Construction is similar to other standard blank rounds. The powder charge is loaded in a cotton bag wrapped about the primer and held in position by a closing cup assembly. Standard powder is sodium nitrate composition but potassium nitrate may be used as an alternative. When sodium nitrate is used, the charge weighs 2 pounds and the closing cup assembly includes a felt wad cemented to the inner surface of a pulpboard disk. The assembly is inserted and cemented in position about 0.5 inch from the cartridge case mouth. When potassium nitrate is used, the charge weighs 1.5 pounds. The felt wad is omitted from the closing cup, which is inserted about 1 inch in the cartridge case and cemented in position at that point. Weight of complete round is 6.23 pounds and length is 6.00 inches.

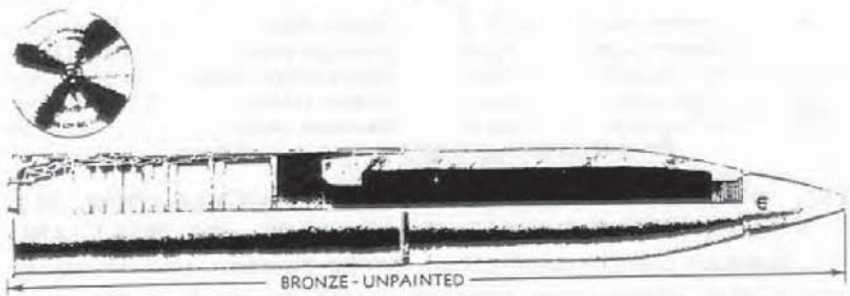

Figure 118 — CARTRIDGE, Drill, Semifixed, M14, w/FUZE, Dummy, M59, 105-mm How., M2, M2A1, M3, and M4

216. CARTRIDGE, DRILL, SEMIFIXED, M14, W/FUZE, DUMMY, M59, 105-MM HOW., M2, M2A1, M3, AND M4 (fig. 118), is a completely inert assembly so designed as to permit simulation of all adjustments required in the semifixed service rounds. The round consists of a dummy projectile fitted with an inert fuze and loosely seated in a cartridge case containing an inert service primer and propelling charge. The cartridge case is a cadmium-plated steel tubing threaded at the rear to hold a bronze base and fitted at the front end with a bronze collar which serves as a sleeve for the projectile when the round is assembled. The inert propelling charge consists of seven sections constructed to resemble the service charge. The base or first section is secured to the inner face of the cartridge case base; the second section is attached to the base section by a 16-inch sash chain or, more recently, by twine. Each additional section is attached to the one preceding by snaps, if the chain is used, or by twine. The arrangement permits withdrawal of all sections, except the base, to the mouth of the case where adjustments of the charge can be made. As shipped with the 7-section charge, the round simulates the service ammunition for the M2, M2A1, and M4 Howitzers, but can be adapted for M3 Howitzer drill by removing the top two sections (numbered 6 and 7). The dummy projectile is a hollow bronze casting with an open base to facilitate extraction from the howitzer. As fitted with FUZE, dummy, M59, the round provides for drill in setting the M48-type fuzes since this dummy fuze has a setting pin arrangement like that of the M48 Fuze. The complete round weighs 41.35 pounds and is 31.07 inches long.

217. CARTRIDGE, DRILL, SEMIFIXED, M14, W/FUZE, INERT, TSQ, M54, 105-MM HOW., M2, M2A1, M3, AND M4, is the same as the drill cartridge described in paragraph 216 except that the fuze is an inert M54 Fuze made up of a burned out service fuze or of rejected parts. This fuze provides for drill in time setting.

218. SHELL, SEMIFIXED, H.E., M1, W/FUZE, P.D., M48A2, SQ & 0.15-SEC. DELAY, 105-MM HOW., M3, differs from the corresponding round for the M2, M2A1, and M4 models (par. 205) only with respect to the propelling charge. For the M3 Weapon and its mount, a lighter charge, five increments of quick-burning powder, is used to obtain the desired muzzle velocity.

DATA

Weight of complete round	40.46 lb	Type of base	Boat-tailed
Length of complete round	31.07 in.	Degree of taper	9 deg 15 min
Length of fuzed projectile	19.63 in.	Radius of ogive	6.02 cal.
Length of cartridge case	14.64 in.	Muzzle velocity	1,020 ft per sec*†
Width of rotating band	0.81 in.	Maximum range (at 42 deg 53 min)	8,295 yd*†

*—When fired from the M3 Howitzer. For conditions under which this round may be fired in M2 and M2A1 Howitzers, and resultant muzzle velocities and range data, see paragraph 205 f of this section.

†—With full charge (charge 5): corresponding data for other charges are:

	Muzzle Velocity	Maximum Range
Charge 1	650 ft per sec	3,825 yd (at 43°28')
Charge 2	710 ft per sec	4,475 yd (at 43°27')
Charge 3	780 ft per sec	5,280 yd (at 43°11')
Charge 4	875 ft per sec	6,430 yd (at 43° 8')

219. SHELL, SEMIFIXED, H.E., M1, W/FUZE, P.D., M48, 105-MM HOW., M3, is the same as that described in paragraph 218 except for the fuze. The M48 Fuze has an 0.05-second delay action incorporated in the delay action train whereas the M48A1 and M48A2 used with howitzer shell, have 0.15-second delay. Data and other information given in paragraph 218 apply to this round also.

220. SHELL, SEMIFIXED, H.E., A.T., M67, W/FUZE, B.D., M62 OR M62A1, 105-MM HOW., M3, has the same components as the corresponding round for the M2, M2A1, and M4 Howitzers except that a lighter (1.40-lb) nonadjustable propelling charge is used to obtain the 1,020 feet per second muzzle velocity when fired from the M3 Howitzer. Range is 8,490 yards at a 45-degree elevation. Other applicable data are given in paragraph 213.

221. SHELL, SEMIFIXED, HC, B.E., M84, W/FUZE, P.D., M54, 105-MM HOW., M3, is similar to the corresponding one for the M2, M2A1, and M4 Howitzers with the exception of the propelling charge. For the M3 Howitzer, the lighter 5-increment charge is used to provide the desired muzzle velocity. For a more complete description of other components, see paragraph 208.

DATA

Weight of complete round	40.32 lb	Type of base	Boat-tailed
Length of complete round	30.49 in.	Degree of taper	9 deg 15 min
Length of fuzed projectile	18.84 in.	Radius of ogive	6.02 cal.
Length of cartridge case	14.64 in.	Muzzle velocity	1,020 ft per sec
Width of rotating band	0.81 in.	Maximum range	8,295 yd

222. SHELL, SEMIFIXED, SMOKE, PHOSPHORUS, WP, M60, W/FUZE, P.D., M57, 105-MM HOW., M3, is the same as the phosphorus-filled assembly described in paragraph 210, except that the 5-increment propelling charge is used when the round is fired from the M3 Howitzer.

DATA

Weight of complete round	41.83 lb	Type of base	Boat-tailed
Length of complete round	31.08 in.	Degree of taper	9 deg 15 min
Length of fuzed projectile	19.46 in.	Radius of ogive	6.02 cal.
Length of cartridge case	14.64 in.	Muzzle velocity	1,020 ft per sec
Width of rotating band	0.81 in.	Maximum range	8,295 yd

223. SHELL, SEMIFIXED, SMOKE, FS, M60, W/FUZE, P.D., M57, 105-MM HOW., M3, differs from the phosphorus-filled round in the type of chemical filler. When filled with the FS smoke producer, the complete round weighs 42.32 pounds. In other respects, data given for the phosphorus-filled round (par. 222) are applicable to this round also.

Section XVIII

AMMUNITION FOR 155-MM GUNS

260. GENERAL.

a. The 155-mm Guns M1917-17A1-18MI, M1, and M1A1, being chambered alike, fire the same projectiles. The projectiles for these guns are of two general design types, those of earlier design distinguished by two narrow rotating bands, each approximately 0.6 inch wide, and those of current design which have a broad rotating band approximately 2 inches wide. Only those of current design are authorized for use in the 155-mm Guns M1 and M1A1. However, there are certain cases of emergency interchangeability, which may be followed only in accordance with specific regulations permitting same. Although projectiles for the 155-mm guns and the 155-mm howitzers are of the same size and shape, they are readily distinguished by the marking as well as by the rotating bands. The howitzer projectiles have rotating bands 0.6 inch or 1.02 inches wide; the gun projectiles have two bands, 0.6 inch wide, or one band 2 inches wide.

b. **Identification.** The ammunition, including components, for the 155-mm guns, is completely identified by the painting and marking on the items themselves.

c. **Fuzes.** See chapter 3, section I.

d. **Propelling Charges.** The propelling charge for the 155-mm Guns M1 and M1A1 is of the base and increment type, approximately 6½ inches in diameter. This charge should not be confused with the 155-mm gun Propelling Charge M1917-17A1-18MI, which is of approximately the same over-all length, but somewhat smaller in diameter (approx 5¾ in.). The FLASH REDUCER, M1, is for use with the propelling charges for 155-mm guns. It greatly reduces the flash and is primarily intended for night firing (ch. 3, sec. II).

e. **Primers.** See chapter 3, section III.

f. **Interchangeability.**

(1) The H.E. M101 and H.E. Mk. IIIA1 Shell are authorized for emergency use in the 155-mm Guns M1 and M1A1 with the propelling charge intended for the M1917-17A1-18MI Guns (full charge only).

(2) The H.E. Mk. IIIA1 Shell is authorized for emergency use in the 155-mm Guns M1 and M1A1 with the propelling charge standard for these weapons (base section only, or in case of extreme emergency, the full charge).

261. COMPLETE ROUND TABLE.

a. Data concerning complete rounds for 155-mm Guns M1917-17A1, 18MI, M1, and M1A1, are given in table 24, chapter 5.

262. PACKING AND SHIPPING DATA.

a. Packing and shipping data concerning 155-mm gun rounds are given in ORD 11 SNL's P-1, P-2, and P-8.

Figure 134 — PROJECTILE, A.P., 100-lb., M112, w/FUZE, B.D., M60, 155-mm Guns, M1917-17A1-18MI, M1, and M1A1

263. PROJECTILE, A.P., 100-LB., M112, W/FUZE, B.D., M60, 155-MM GUNS, M1917-17A1-18MI, M1, AND M1A1 (fig. 134), is intended for use against armored targets, concrete emplacements, and similar targets. It consists of a hardened steel body which contains a cavity in the base filled with explosive D, a base-detonating fuze with delay action, and a ballistic cap or windshield. A base cover is fitted over the fuze in the base of the projectile.

DATA

Length of projectile .... 23.62 in.	Maximum range, supercharge .... 24,075*; 19,200 yd†
Width of rotating band .... 2.00 in.	Penetration (in. at 0-deg obliquity of homogeneous plate at 1,000 yd) 7.5*
Type of base .... Square	Penetration (in. of reinforced concrete at 1,000 yd) 60
Radius of ogive .... 10.70 cal.	
Muzzle velocity (supercharge) ...... 2,740*; 2,360 ft per sec†	

*—In M1 and M1A1 Guns.
†—In M1917-17A1-18 MI Guns.

264. SHELL, H.E., M101, UNFUZED, 155-MM GUNS, M1917-17A1-18MI, M1, AND M1A1 (fig. 135), was developed from the Mk. IIIA1 Shell described in paragraph 265, differing chiefly in that it has a single wide rotating band, and the angle of taper of the boat-tailed base is 0.5 degree greater. The rear of the rotating band is located approximately 3.48 inches forward of the base. The shell is adapted for either the P.D. M51 Fuze and modifications, or the M67 Mechanical Time Fuze and modifications.

Figure 135 — SHELL, H.E., M101, Unfuzed, 155-mm Guns, M1917-17A1-18MI, M1, and M1A1 (Early Type Grommet Fastening Shown)

DATA

Length of projectile*.............. 26.88 in.
Width of rotating band.......... 2.00 in.
Type of base .... Boat-tailed
Degree of taper.......................... 8.5 deg
Radius of ogive...................... 10.75 cal.
Muzzle velocity:
Maximum charge, M1 and M1A1 Guns .... 2,800 ft per sec
Maximum charge, M1917-17A1-18 Guns .... 2,410 ft per sec
Maximum range:
M1A1 Gun (at 46 deg 49 min) .... 25,715 yd
M1917-17A1-18 Guns (at 35 deg 24 min).................... 20,100 yd

*—With eyebolt-lifting plug.

Figure 136 — SHELL, H.E., Mk. IIIA1, Unfuzed, 155-mm Guns, M1917-17A1-18MI

265. SHELL, H.E., MK. IIIA1, UNFUZED, 155-MM GUNS, M1917-17A1-18MI (fig. 136), being of earlier design than projectiles for 155-mm Guns M1 and M1A1, is distinguished by two narrow rotating bands. It is a modification of the earlier Mk. III Projectile, the nose being adapted to the new type fuzes. This modification of ogive and use of a standard contour fuze improve the ballistic characteristics.

DATA

Length of projectile*.............. 26.88 in.
Width of rotating bands (two each) .... 0.59 in.
Type of base............8 deg —boat-tailed
Radius of ogive .... 10.75 cal.
Muzzle velocity, supercharge ...... 2,410*; 2,800 ft per sec††
Maximum range, supercharge:
(35 deg 22 min).............. 19,100 yd†
(35 deg) .... 22,450 yd††

*—With eyebolt-lifting plug. †—In M1917-17A1-18MI Guns. ††—In M1 and M1A1 Guns.

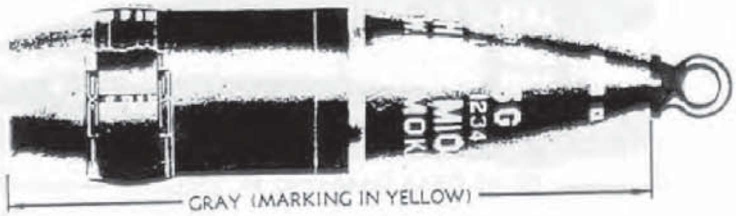

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Figure 137 — SHELL, Smoke, Phosphorus, WP, M104, Unfuzed, 155-mm Guns, M1917-17A1-18MI, M1, and M1A1 (Early Type Grommet Shown)

266. SHELL, M104, GAS AND SMOKE, have the same contour as the H.E. M101 Shell described in paragraph 264. The M104 WP Phosphorus Smoke Shell is shown in figure 137. The explosive charge of the burster which is contained in a cardboard or thin aluminum casing, is held in place in the casing by the fuze well cup. One end of the burster casing is fastened to an adapter in the nose cavity. The shell is adapted for the P.D. M51 Fuze and modifications. The various types of gas and smoke shell using the M104 body and burster are:

SHELL, gas, persistent, H, M104, unfuzed, 155-mm guns, M1917-17A1-18MI, M1, and M1A1

SHELL, smoke, FS, H104, unfuzed, 155-mm guns, M1917-17A1-18MI, and M1A1

SHELL, smoke, phosphorus, WP, M104, unfuzed, 155-mm guns, M1917-17A1-18MI, M1, and M1A1

DATA

Length of projectile*	26.78 in.	Muzzle velocity, supercharge:	2,410†; 2,800 feet per sec††
Width of rotating band	2.00 in.	Maximum range, supercharge:	
Type of base	Boat-tailed	(at 35 deg 15 min)	20,247 yd†
Degree of taper	8.5 deg	(at 46 deg 45 min)	25,940 yd††
Radius of ogive	10.75 cal.		

*—With eyebolt-lifting plug. †—In M1917-17A1-18MI Guns. ††—In M1 and M1A1 Guns.

267. SHELL, MK. VIIA1, GAS AND SMOKE, are modifications of the Mk. VII Shell described in paragraph 268, the adapter being changed to take the P.D. M51 Fuze, or modifications. The Mk. VIIA1 H Gas Shell is shown in figure 138. The various types of gas and smoke shell using the Mk. VIIA1 Shell body are:

SHELL, gas, persistent, H, Mk. VIIA1, unfuzed, 155-mm guns, M1917-17A1-18MI

SHELL, smoke, FS, Mk. VIIA1, unfuzed, 155-mm guns, M1917-17A1-18MI

SHELL, smoke, phosphorus, WP, Mk. VIIA1, unfuzed, 155-mm guns, M1917-17A1-18MI

RA PD 80816

Figure 138 — SHELL, Gas, Persistent, H, Mk. VIIA1, Unfuzed, 155-mm Guns, M1917-17A1-18MI (Early Type Grommet Fastening Shown)

DATA

Length of projectile* .... 26.82 in.	Degree of taper .... 8 deg
Width of rotating band (two each) .... 0.59 in.	Radius of ogive .... 10.75 cal.
Type of base .... Boat-tailed	Muzzle velocity, supercharge .... 2,385 ft per sec

Maximum range, supercharge (at 34 deg 15 min)........ 20,247 yd

*—With eyebolt-lifting plug.

268. **SHELL, MK. VII, GAS AND SMOKE,** are adapted for the P.D. M46 Fuze. They have tapered or pipe threads, and do not have a base cover. The adapter-booster is tightly screwed into place, forming a gastight seal for the filler. The two types of gas and smoke shell using the Mk. VII Shell body are:

SHELL, gas, persistent, H, Mk. VII, unfuzed, 155-mm guns, M1917-17A1-18MI

SHELL, smoke, phosphorus, WP, Mk. VII, unfuzed, 155-mm guns, M1917-17A1-18MI

DATA

Length of projectile* .... 26.82 in.	Radius of ogive .... 10.75 cal.
Width of rotating band .... 2.00 in.	Muzzle velocity, supercharge .... 2,410 ft per sec
Type of base .... Boat-tailed	Maximum range .... 17,900 yd
Degree of taper .... 8 deg	

*—With eyebolt-lifting plug.

269. **SHELL, TARGET-PRACTICE, FOR SAND LOADING, UNFUZED, 155-MM GUNS, M1917-17A1-18MI, M1, AND M1A1,** consists of a M101 Shell body, inert adapter-booster, and inert fuze. Shell is shipped empty and sand-loaded to weight at point of use.

270. **PROJECTILE, DUMMY, 95-LB., MK. I, 155-MM GUNS,** is provided for training in the service of the 155-mm howitzer as well as the gun. However, when used with the gun, the projectile is fitted with a rotating band having a maximum diameter of 6.5 inches; when used with the howitzer the band has a diameter of 6.1 inches. For further details, see paragraph 258 and figure 133.

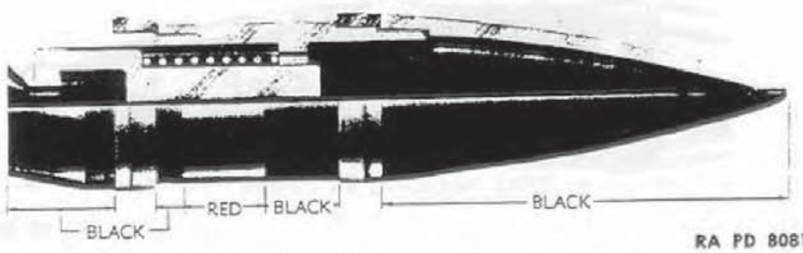

Figure 139 — PROJECTILE, Dummy, 95-lb., M7, 155-mm Gun or How.

271. **PROJECTILE, DUMMY, 95-LB., M7, 155-MM GUN OR HOW.** (fig. 139), is intended for practice in loading and handling of the 155-mm howitzer, as well as the gun. It is of the type having a fully enclosed spring-cushioned plunger, which kicks the projectile loose from the forcing cone of the gun on the rebound upon ramming. It has a malleable iron cap, steel body, bronze front band, steel base, and bronze rear band. The bronze front band simulates the bourrelet of a service projectile. The bronze rear band simulates the rotating band of a service projectile. The several parts are replaceable. The projectile is 27.56 inches long.

Section XX

AMMUNITION FOR 8-INCH GUNS

280. GENERAL.

a. The 8-inch Field Gun M1 is a long-barrelled weapon. It is manually operated and uses separate-loading ammunition. The projectiles authorized for use in this weapon comprise a high-explosive type fitted with a point-detonating fuze, and a dummy type used for training in service of the piece. Rounds for the 8-inch Seacoast Guns, M1888-88MI-88MII, and Mk. VI-Mod. 3A2 (Navy) only, are not discussed in this manual (TM 4-205, Coast Artillery Ammunition).

b. **Identification.** The ammunition, including components, is completely identified by means of the painting and marking on the items themselves.

c. **Fuzes.** See chapter 3, section I.

d. **Propelling Charges.** See chapter 3, section II.

e. **Primers.** See chapter 3, section III.

281. COMPLETE ROUND TABLE.

a. Data concerning 8-inch complete rounds and components therefor are given in table 26, chapter 5.

282. PACKING AND SHIPPING DATA.

a. Data concerning 8-inch rounds are given in ORD 11 SNL's P-1, P-2, and P-8.

283. SHELL, H.E., 240-LB., M103, W/FUZE, P.D., M51A1-MOD. 3, W/BOOSTER, M20A1, OR M51A3-MOD. 3, W/BOOSTER, M21A2, 8" GUNS, MK. VI-MOD. 3A2 (NAVY), MK. IX-MOD. 2 (NAVY), AND M1 (fig. 143), is fitted with a false ogive (windshield). The shell has two bourrelets of 7.990 inches diameter; one (front bourrelet) is just to the rear of the windshield; the other (rear bourrelet) is at the rear of the projectile body. The rotating band, 3.3 inches wide, is located approximately 6 inches forward of the base and within the rear bourrelet. This shell contains a filler of 21 pounds of TNT. A base cover is calked or welded to the base of the shell. The FUZE, time, mechanical, M67, and modifications, is authorized for use with this shell when fired from the 8-inch Gun M1 and is assembled in place of the M51A1 Mod. 3, or M51A3-Mod. 3 Fuze, at point of use.

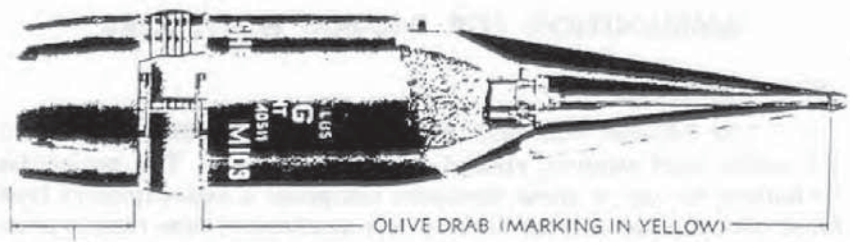

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Figure 143 — SHELL, H.E., 240-lb., M103, w/FUZE, P.D., M51A1-Mod. 3, w/BOOSTER, M20A1, or M51A3-Mod. 3, w/BOOSTER, M21A2, 8" Guns, Mk. VI-Mod. 3A2 (Navy), Mk. IX-Mod. 2 (Navy), and M1

DATA

Length of projectile	40.95 in.	Ogive	Conical
Width of rotating band	3.31 in.	Muzzle velocity (supercharge)	2,850 ft per sec
Type of base	Boat-tailed	Maximum range	35,635 yd
Degree of taper	6 deg		

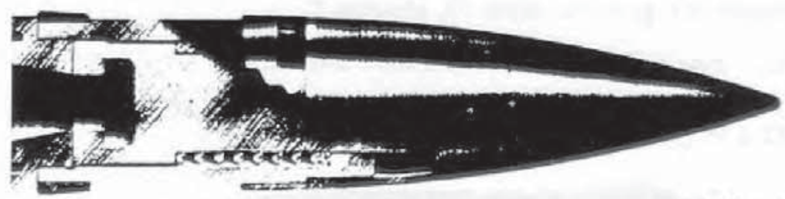

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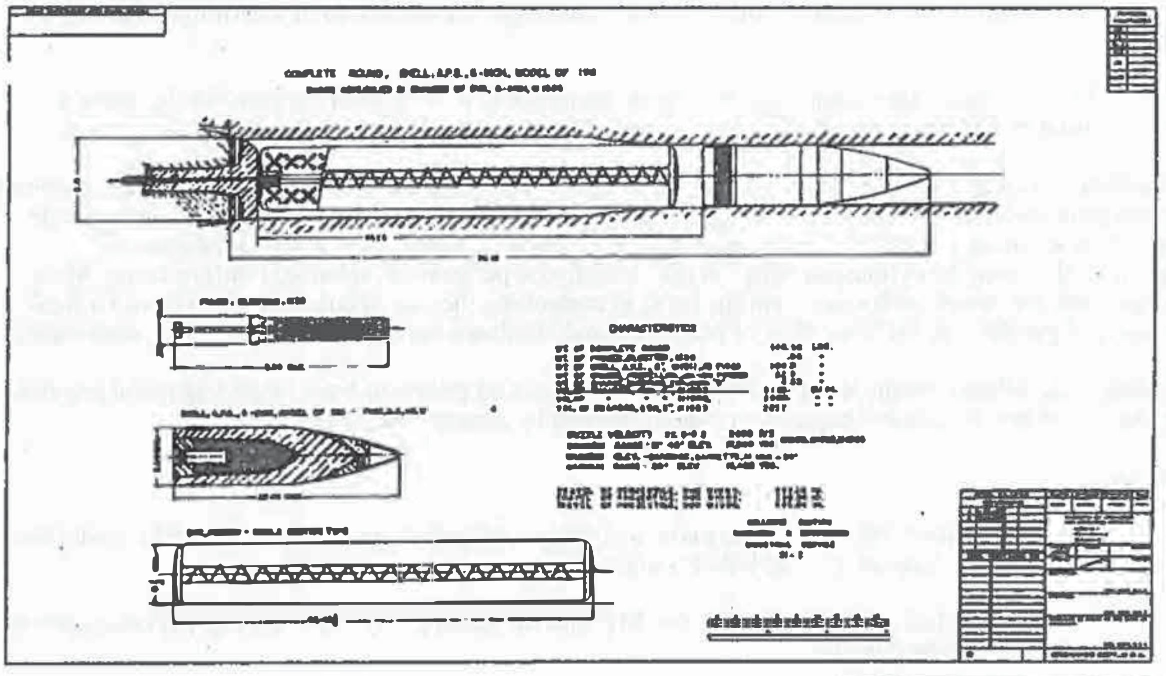
Figure 144 — PROJECTILE, Dummy, 240-lb., M13, 8" Gun

284. PROJECTILE, DUMMY, 240-LB., M13, 8" GUN, M1 (fig. 144) simulates the H.E. Shell, M103 described in paragraph 283, and is intended for training in service of the piece. It is 35.90 inches long and is of the type having a fully enclosed spring-cushioned plunger, which loosens the projectile in the forcing cone of the gun on rebound resulting from ramming. It has a malleable iron cap, steel body, bronze front band, steel base, and bronze rear band. The iron cap is ogival in shape and is attached to the forward end of the body. The bronze front band simulates the bourrelet of a service projectile. The bronze rear band simulates the rotating band of the service projectile. The several parts are replaceable.

COMPLETE ROUND, AP, 6-INCH, Model 1911



Use: This is the armor piercing used with the 6-inch Coast Artillery.

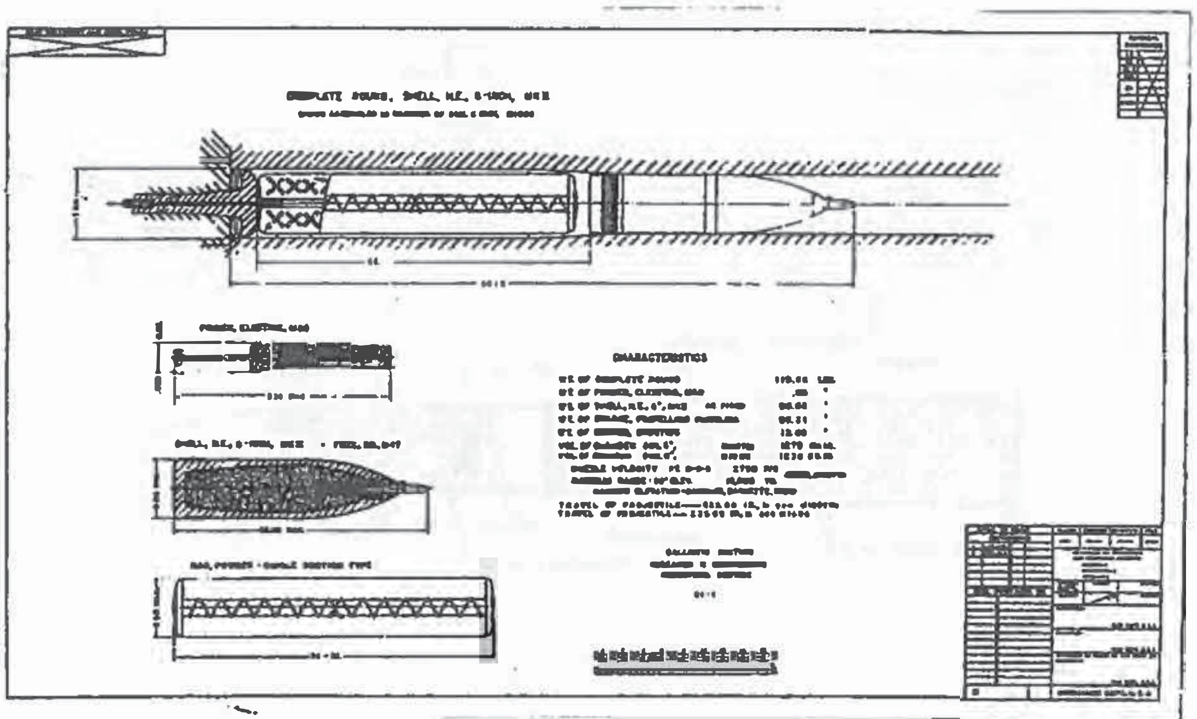
Description: The MK II is a separate loaded, armor piercing munitions which is used by the Coast Artillery against ship targets. A single rotating band is located near the base of the projectile.

Weight of Projectile as fired.. 140.55 pounds
Length of Projectile w/fuze ....22.65 inches
Filler and Weight ....4.53 lbs, Explosive D
Fuzes..Base Detonating
Propelling charges..32.5 lbs
Color ....Unknown

Reference: Complete Round Charts and Drawings, 1945

Source: *ARCHIVES SEARCH REPORT – FINDINGS*
Fort Learnard
Eider Point, AK

COMPLETE ROUND, HE, 6-INCH, MK II



Use: This is the high explosive round used with the 6-inch Coast Artillery.

Description: The MK II is a separate loaded, high explosive (or common) munitions which is used by the Coast Artillery against ship targets. A single rotating band is located near the base of the projectile.

Weight of Projectile as fired.. 119.96 pounds
Length of Projectile w/fuze.. 25.6 inches
Filler and Weight.. 13.69 lbs, TNT
Fuzes.. PD
Propelling charges.. 29.3 lbs
Color.. Unknown

Reference: Complete Round Charts and Drawings, 1945

Source: *ARCHIVES SEARCH REPORT – FINDINGS*
Fort Learnard
Eider Point, AK

Section XXII

AMMUNITION FOR SUBCALIBER WEAPONS

294. GENERAL.

a. Subcaliber ammunition is intended for use in subcaliber guns for training personnel in target practice. For small caliber weapons, interior type subcaliber guns are provided which fire small-arms ammunition, such as cal. .22 and cal. .30 cartridges. Cal. .30 and cal. .50 cartridges are also used in machine guns on exterior subcaliber mounts on the 37-mm Antiaircraft Gun M1A2, and on medium caliber antitank weapons. For the remaining medium and heavy weapons, the 37-mm Subcaliber Guns M12, M13, M14, and M1916 and modifications are used on appropriate subcaliber mounts. See table 2 for a list of weapons and their subcaliber weapons and ammunition. This section deals primarily with ammunition for the 37-mm Subcaliber Guns M12, M13, M14, and M1916. Also described in this section is the Field Artillery Trainer M3, which, although not subcaliber equipment, simulates field artillery firings.

b. **Identification.** The 37-mm subcaliber rounds are completely identified by means of the painting and marking on the items themselves.

c. **Fuzes.** See chapter 3, section I.

d. **Cartridge Cases.** The standard 37-mm cartridge case for ammunition used in 37-mm Subcaliber Gun M1916 is the Mk. IA2. The Mk. IA2B1 Case is a steel case alternate and is 0.02 pound lighter than the Mk. IA2 Case, which is made of drawn brass.

e. **Primers.** See chapter 3, section III.

295. COMPLETE ROUND TABLE.

a. Data concerning the 37-mm subcaliber rounds are given in table 28, chapter 5.

296. PACKING AND SHIPPING DATA.

a. Data concerning the 37-mm subcaliber rounds are given in ORD 11 SNL R-1.

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

TABLE 2

SUBCALIBER MATERIEL AND AMMUNITION

Weapon and Mount	Subcaliber Weapon and Mount	Subcaliber Ammunition
37-mm guns, M3, M3A1, on	RIFLE, subcaliber, cal. .22, M2A1	CARTRIDGE, ball, cal. .22, long rifle
CARRIAGE, gun, 37-mm, M4	MOUNT, subcaliber, cal. .22-.30, M6*	
CARRIAGE, gun, 37-mm, M4A1	MOUNT, subcaliber, cal. .22-.30, M7*	
CARRIAGE, motor, 37-mm gun, M6	MOUNT, subcaliber, cal. .22-.30, M7A1*	
57-mm gun M1, on CARRIAGE, gun, 57-mm, M1A3	MOUNT, subcaliber, cal. .22-.30, M14*	
37-mm gun, M6, in light, medium, and heavy tanks	RIFLE, subcaliber, cal. .22, M5 MOUNT, subcaliber*	
37-mm guns, M3, M3A1, on CARRIAGE, gun, 37-mm, M4	RIFLE, subcaliber, cal. .30, M1903A2 MOUNT, subcaliber, cal. .22-.30, M6	CARTRIDGE, ball, cal. .30, M2 CARTRIDGE, ball, cal. .30, M1
CARRIAGE, gun, 37-mm, M4A1	MOUNT, subcaliber, cal. .22-.30, M7*	
CARRIAGE, motor, 37-mm gun, M6	MOUNT, subcaliber, cal. .22-.30, M7A1*	
57-mm gun, M1, on CARRIAGE, 57-mm, M1A3	MOUNT, subcaliber, cal. .22-.30, M14*	
37-mm auto. gun, M1A2, on CARRIAGE, automatic, 37-mm, M3	GUN, machine, cal. .30, Browning, M1917A1 MOUNT, subcaliber, cal. .30, M8†	
76-mm gun, M1, M1A1, M1A2, on CARRIAGE, motor, 76-mm gun, M18	GUN, machine, cal. .50, Browning, M2, HB (flexible) MOUNT, subcaliber, cal. .50, M10†	CARTRIDGE, ball, cal. .50, M2
3-inch gun, M7, on CARRIAGE, motor, 3-inch gun, M10, M10A1	MOUNT, subcaliber, cal. .50, M9†	
3-inch gun, M5, on CARRIAGE, gun, 3-inch, M1	MOUNT, subcaliber, cal. .50, M12†	

ARTILLERY AMMUNITION

Weapon and Mount	Subcaliber Weapon and Mount	Subcaliber Ammunition
75-mm gun, M1917, on CARRIAGE, gun, 75-mm, M1917A1	GUN, subcaliber, 37-mm, M1916A1 MOUNT, subcaliber (interior type)*	SHELL, fixed, practice, M92, w/FUZE, P.D., M74, 37-mm sub-caliber guns, M12, M13, M14, and M1916††
75-mm gun, M1897, on	GUN, 37-mm, M1916	SHELL, fixed, practice, M63-Mod. 1, w/FUZE, base, practice, M58, 37-mm subcaliber guns, M12, M13, M14, and M1916††
CARRIAGE, gun, 75-mm, M1897MIA2, M1897A4	MOUNT, subcaliber, 37-mm, M2†	
CARRIAGE, gun, 75-mm, M2, M2A1, M2A2, M2A3	MOUNT, subcaliber, 37-mm, M7†	SHELL, fixed, practice, Mk. IIA1, w/FUZE, base, practice, M38, 37-mm subcaliber gun, M1916†† §
CARRIAGE, gun, 75-mm, M1897MI, M1897A4	MOUNT, subcaliber, 37-mm, M8†	
75-mm gun, M1916, on CARRIAGE, gun, 75-mm, M1916A1	MOUNT, subcaliber, 37-mm, M9†	
75-mm how., M1, M1A1, on CARRIAGE, how., 75-mm, M1, M2A1, M3, M3A2, M3A3	MOUNT, subcaliber, 37-mm, M5†	
105-mm how., M2, M2A1, on CARRIAGE, how., 105-mm, M2, M2A1, M2A2, and CARRIAGE, motor, 105-mm how., M7	MOUNT, subcaliber, 37-mm, M16†	
4.5-inch gun, M1, on CARRIAGE, gun, 4.5-inch, M1	MOUNT, subcaliber, 37-mm, M13A1†	
155-mm how., M1, on CARRIAGE, how., 155-mm, M1	MOUNT, subcaliber, 37-mm, M13A1†	
155-mm how., M1917-17A1-18, on CARRIAGE, how., 155-mm, M1917A4 or M1918A3	MOUNT, subcaliber, 37-mm, M4†	
155-mm gun, M1917-17A1-18MI, on CARRIAGE, gun, 155-mm, M1917-17A1-M1918-18A1, M2, M3	MOUNT, subcaliber, 37-mm, M1†	
155-mm gun, M1, M1A1, on CARRIAGE, gun, 155-mm, M1	MOUNT, subcaliber, 37-mm, M10†	
8-inch how., M1, on CARRIAGE, how., 8-inch, M1	MOUNT, subcaliber, 37-mm, M10†	

FIXED AND SEMIFIXED ROUNDS AND SEPARATE-LOADING PROJECTILES

Weapon and Mount	Subcaliber Weapon and Mount	Subcaliber Ammunition
75-mm how., M1, M1A1, on CARRIAGE, how., 75-mm, M1A1 75-mm how., M2 and M3, on CARRIAGE, motor, 75-mm how., M8	GUN, subcaliber, 37-mm, M12*	SHELL, fixed, practice, M92, w/FUZE, P.D., M74, 37-mm subcaliber guns, M12, M13, M14, and M1916†† SHELL, fixed, practice, M63-Mod. 1, w/FUZE, base, practice, M58, 37-mm subcaliber guns, M12, M13, M14, and M1916††
105-mm how., M2, M2A1, on CARRIAGE, how., 105-mm, M2A2 105-mm, how., M3, on CARRIAGE, how., 105-mm, M3, M3A1 105-mm how., M4, on CARRIAGE, motor, 105-mm how., T76, M7 medium tanks, M4, M4A3	GUN, subcaliber, 37-mm, M13*	
90-mm gun, M1, on CARRIAGE, gun, 90-mm, M3	GUN, subcaliber, 37-mm, M14*	SHELL, fixed, practice, Mk. IIA1, w/FUZE, base, practice, M38, 37-mm subcaliber gun, M1916†† §
76-mm gun, M1A1, M1A2, on CARRIAGE, motor, 76-mm gun, M18	GUN, subcaliber, 37-mm, T34*	
3-inch gun, M5, on CARRIAGE, gun, 3-inch, M1, M1A1, M6	GUN, subcaliber, 37-mm, T36*	

*—Interior mount. †—Exterior mount. ††—Also assembled with "steel case".
§—This round is not to be fired over the heads of troops, and no personnel in the vicinity of the gun are to be forward of a line perpendicular to the muzzle.

297. CARTRIDGE, BALL, CAL. .22, LONG RIFLE (fig. 149). The muzzle velocity of the 40-grain lead bullet is 1,130 feet per second and the maximum range is 1,350 yards.

298. CARTRIDGE, BALL, CAL. .30, M2 (fig. 149). Weight of the complete cartridge is 396 grains. Muzzle velocity of the 150-grain bullet is 2,760 feet per second and maximum range is 4,700 yards.

299. CARTRIDGE, BALL, CAL. .30, M1, is used in the same weapon and for the same purpose as CARTRIDGE, ball, cal. .30, M2, described in paragraph 298. The weight of the complete cartridge is 420 grains. Muzzle velocity of the 174-grain bullet is 2,647 feet per second and the maximum range is 4,950 yards.

300. CARTRIDGE, BALL, CAL. .50, M2 (fig. 149), is for use with the Browning Machine Gun, cal. .50, M2, HB (flexible), on subcaliber mounts on medium caliber antitank guns. Muzzle velocity of 698-grain bullet is 2,935 feet per second in a 45-inch barrel, and maximum range is 7,600 yards.

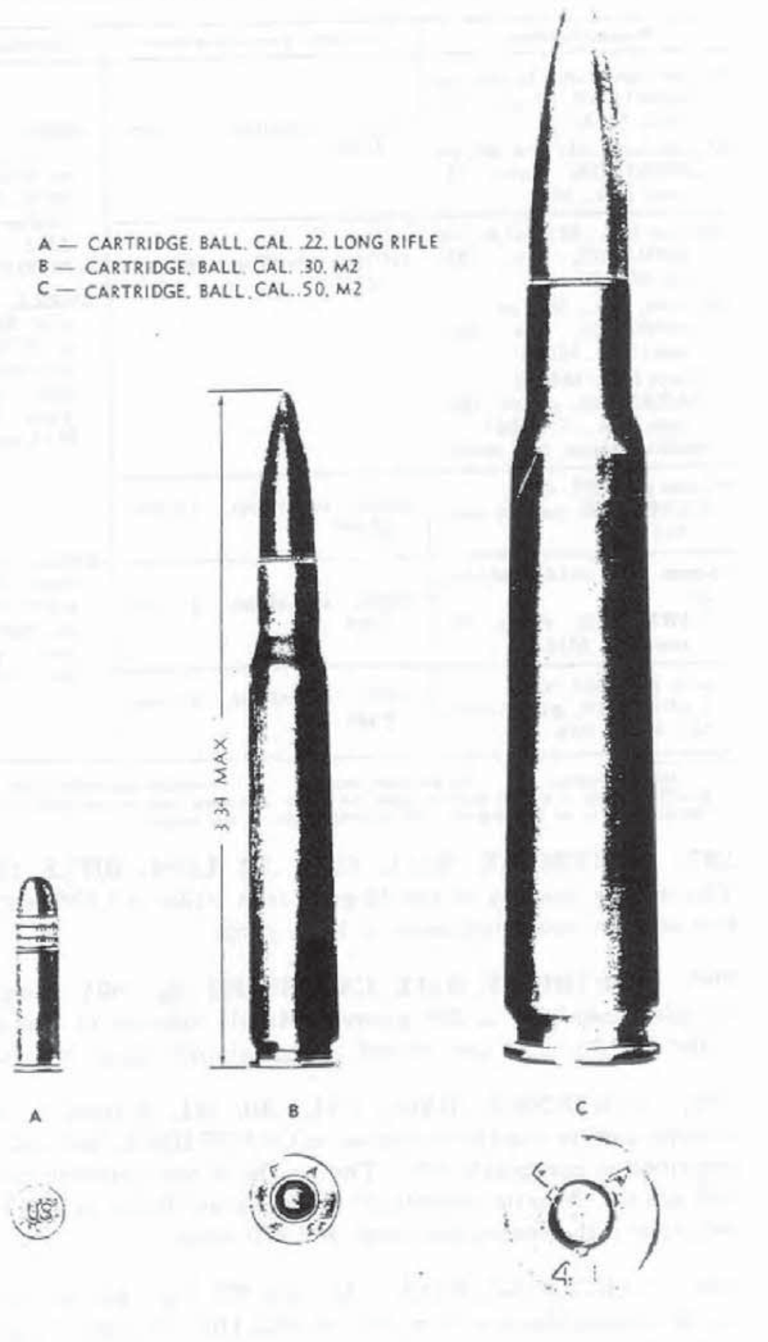


Figure 149 — Cal. .22, cal. .30, and cal. .50 Subcaliber Ammunition

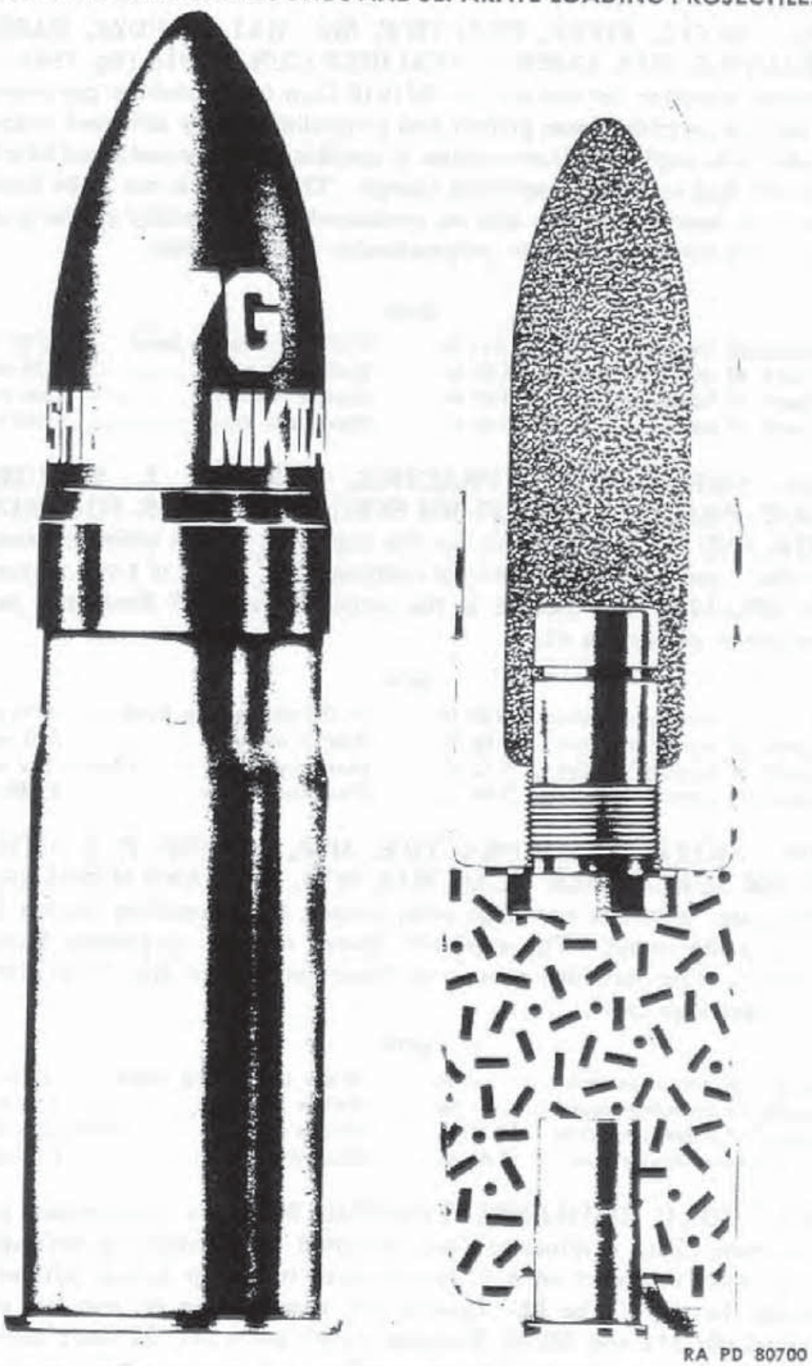


Figure 150 — SHELL, Fixed, Practice, Mk. IIA1, w/FUZE, Base, Practice, M38, 37-mm Subcaliber Gun, M1916

301. SHELL, FIXED, PRACTICE, MK IIA1, W/FUZE, BASE, PRACTICE, M38, 37-MM SUBCALIBER GUN, M1916 (fig. 150), is limited standard for use only in M1916 Gun for subcaliber purposes. A service cartridge case, primer and propelling charge are used in the round. The explosive filler consists of graphite (15 percent) and black powder and serves as a spotting charge. This round is not to be fired over the heads of troops, and no personnel in the vicinity of the gun are to be forward of a line perpendicular to the muzzle.

DATA

Weight of complete round	1.61 lb	Width of rotating band	0.74 in.
Length of complete round	6.92 in.	Radius of ogive	2.24 cal.
Length of fuzed projectile	4.60 in.	Muzzle velocity	1,276 ft per sec
Length of cartridge case	3.64 in.	Maximum range	4,915 yd

302. SHELL, FIXED, PRACTICE, M63-MOD. 1, W/FUZE, BASE, PRACTICE, M58, 37-MM SUBCALIBER GUNS, M12, M13, M14, AND M1916. Except for the explosive charge which consists of black powder and diameter of rotating band which is 1.491 inches, the M63-Mod. 1 Projectile is the same as the M63 Projectile described in paragraph 41.

DATA

Weight of complete round	2.01 lb	Width of rotating band	0.76 in.
Length of complete round	8.98 in.	Radius of ogive	8.97 cal.
Length of fuzed projectile	6.15 in.	Muzzle velocity	1,100 ft per sec
Length of cartridge case	3.64 in.	Maximum range	4,980 yd

303. SHELL, FIXED, PRACTICE, M92, W/FUZE, P. D., M74, 37-MM SUBCALIBER GUNS, M12, M13, M14, AND M1916 (fig. 151), uses a service cartridge case, primer, and propelling charge as used in the round. The explosive charge consists of pressed black powder. The cartridge case is of brass; rounds are also made with steel cartridge cases.

DATA

Weight of complete round	1.65 lb	Width of rotating band	0.74 in.
Length of complete round	7.21 in.	Radius of ogive	2.24 cal.
Length of fuzed projectile	4.175 in.	Muzzle velocity	1,276 ft per sec
Length of cartridge case	3.64 in.	Maximum range	5,165 yd

304. FIELD ARTILLERY TRAINER, M3, is a compressed air unit comprising a miniature gun mounted on a miniature carriage. Four units mounted on a firing platform make up a field artillery trainer battery. The M3 Trainer is a modification of, and has replaced, the M2 and M2A1 Trainers, which use a cal. .22 short blank cartridge as propellant. The projectile is a 1-inch commercial steel ball weighing approximately 1,024 grains. The range is 90 yards.

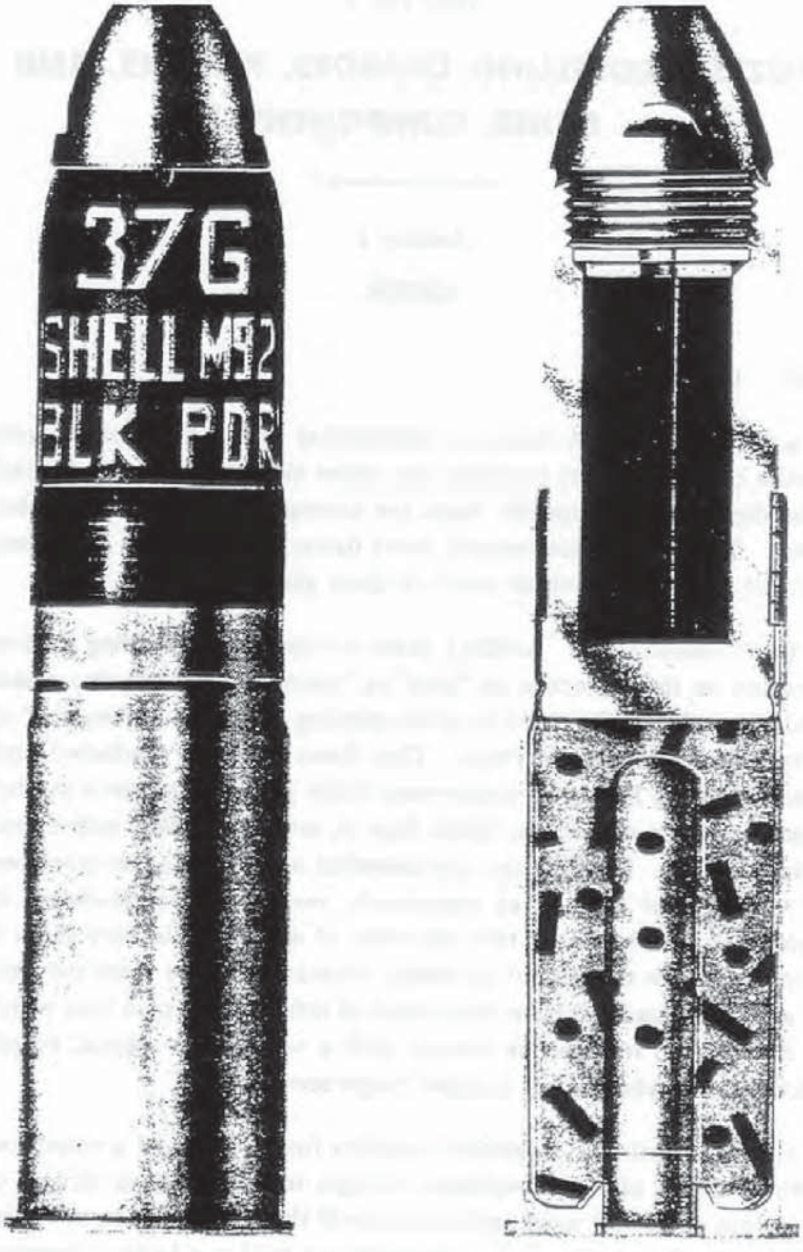


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Figure 151 — SHELL, Fixed, Practice, M92, w/FUZE, P.D., M74, 37-mm Subcaliber Guns, M12, M13, M14, and M1916

are used in the interior of the container to prevent sideward motion, upper and lower guide rings are provided on the interior of the container.

c. **Metal cans.** A sealed metal can (fig. 72) with metal tear strips is used to pack separate-loading artillery primers. These cans are packed, in turn, in a wooden box.

d. **Waterproof bags.** Propelling charges may be packed in waterproof bag in fiber containers (fig. 77).

Section V

BOMBS

109. GENERAL.

a. A bomb is a stream-lined container of explosives or chemicals intended for release from aircraft. It consists of a body containing the charge and a device to explode or scatter the charge at the target. Aircraft torpedoes, submarine mines planted by aircraft, rockets, pyrotechnics, and mortar bombs, although similar in nature, are not classified as bombs.

b. For reasons of safety, the components of a bomb are usually stored and shipped separately, and must be assembled prior to use. The components of bombs (fig. 82) differ (depending on the particular type and model) but, in general, they consist of:

(1) The unfuzed bomb body containing explosive, incendiary, or chemical filler.

(2) The fuze, or fuzes.

(3) The fin assembly (assembled to smaller bombs as shipped).

(4) The arming wire assembly.

c. Bombs are installed in airplanes by means of suspension lugs. Bombs of 100 pounds and more have the suspension lugs on the side of the body, arranged for horizontal suspension of the bomb. Some smaller bombs have one lug on the side and another on the tail end, which permits the bomb to be installed either in a horizontal or vertical bomb rack; others are strapped in clusters of several bombs and suspended as a unit. Some AN bombs have three suspension lugs, two on one side of the bomb body and one on the opposite side to provide for use in both Army and Navy aircraft.

d. The functioning of bombs depends primarily upon the action of the fuze, which may be superquick, delay, or time. The terms "superquick" (instantaneous) and "delay" refer to the action at the instant of fuze impact, whereas "time" refers to the time from the release of the bomb to the instant of function.

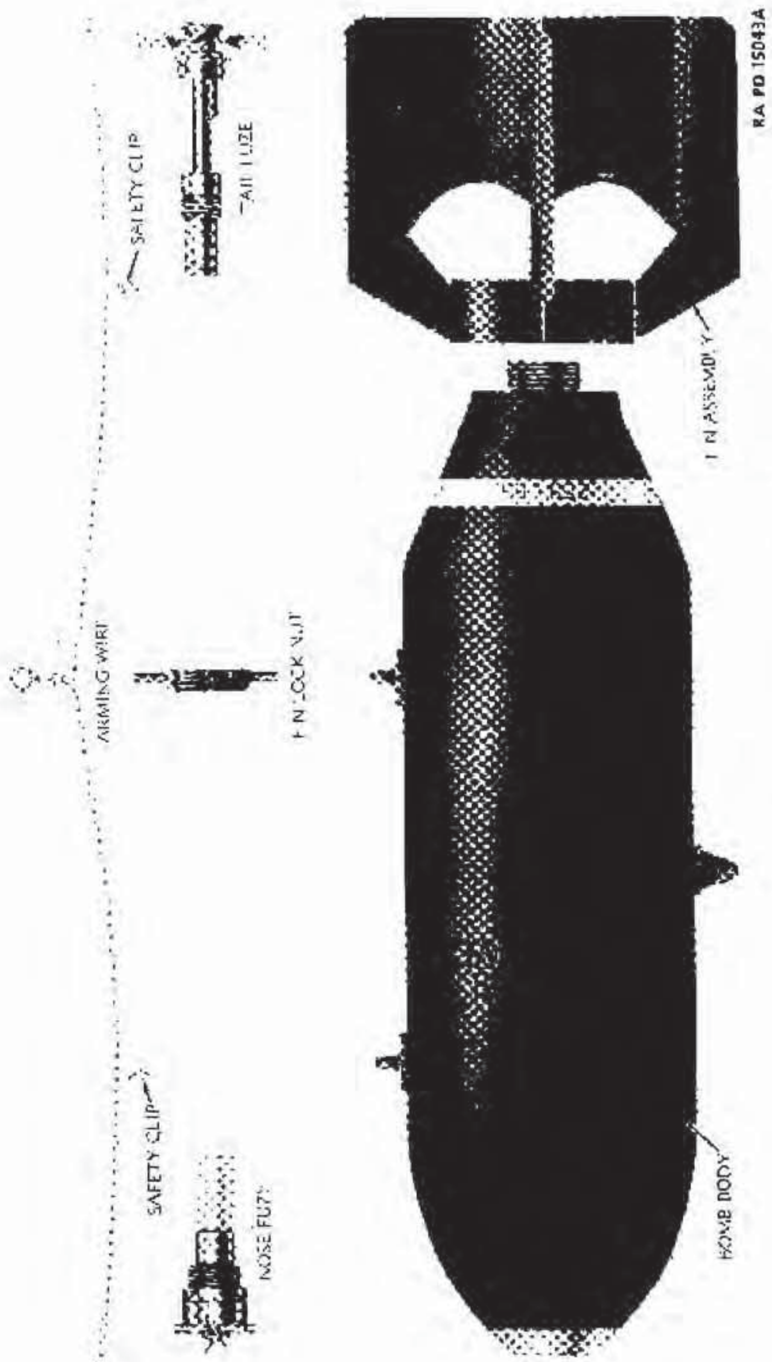


Figure 82 — Components of Bombs

e. Bomb fuzes, after assembly into the bombs, are prevented from arming or functioning during handling by means of an arming wire which is normally removed by the bomb's release from the airplane. When it is necessary to remove the arming wire to unfuze a bomb, instructions attached to the fuze should be followed closely. Provision is made for releasing the bomb "safe" from the airplane without removing the arming wire from the fuze when it is desired that the bomb should land without functioning.

f. A general description of the several types of bombs is included in the following paragraphs.

110. IDENTIFICATION. Bombs are painted in accordance with the basic color scheme outlined in chapter 1, section II and illustrated in figures 9 and 10. Bombs are marked to indicate type, weight, model, filler, lot number, and loading plant and date loaded. In addition, the AIC symbol is stenciled on uncrated bombs.

111. CLASSIFICATION. Because of the many uses for bombs dropped from aircraft, there are many types and sizes of bombs, ranging in weight from 2 to 4,000 pounds. In common with other types of ammunition, bombs are classified according to filler as explosive, chemical, incendiary, pyrotechnic, and inert. Explosive bombs are classified according to use as general-purpose (GP) (demolition), light case (LC), armor-piercing (AP), semi-armor-piercing (SAP), fragmentation, and depth. Chemical bombs are classified according to type of filler as gas or smoke. Inert bombs are used for practice and drill.

112. EXPLOSIVE BOMBS.

a. These bombs are intended for the destruction or demolition of materiel targets. The destructive effect is produced by the violence of the detonation, "blast effect"; by projection of pieces of the case, "fragmentation"; and by displacement of earth and buildings, "mining." An explosive train for bombs is illustrated in figure 83.

b. **General-purpose.** The general-purpose (GP) bomb (fig. 84) meets the requirements of most bombing missions. The various models range in weight from 100 to 2,000 pounds and the quantity of explosive in this type averages 55 percent by weight. General-purpose bombs may be used for blast, fragmentation, or mining effect. They use both nose and tail fuzes. Nose fuzes produce more efficient surface effect, and tail fuzes produce more efficient mining and penetration effect. Both fuzes are generally used, the secondary fuze as insurance against malfunctioning. The metal case is strong enough to withstand impact with ordinary materials when released from high altitude, but it may fail on impact with heavy armor or heavily reinforced concrete structures.

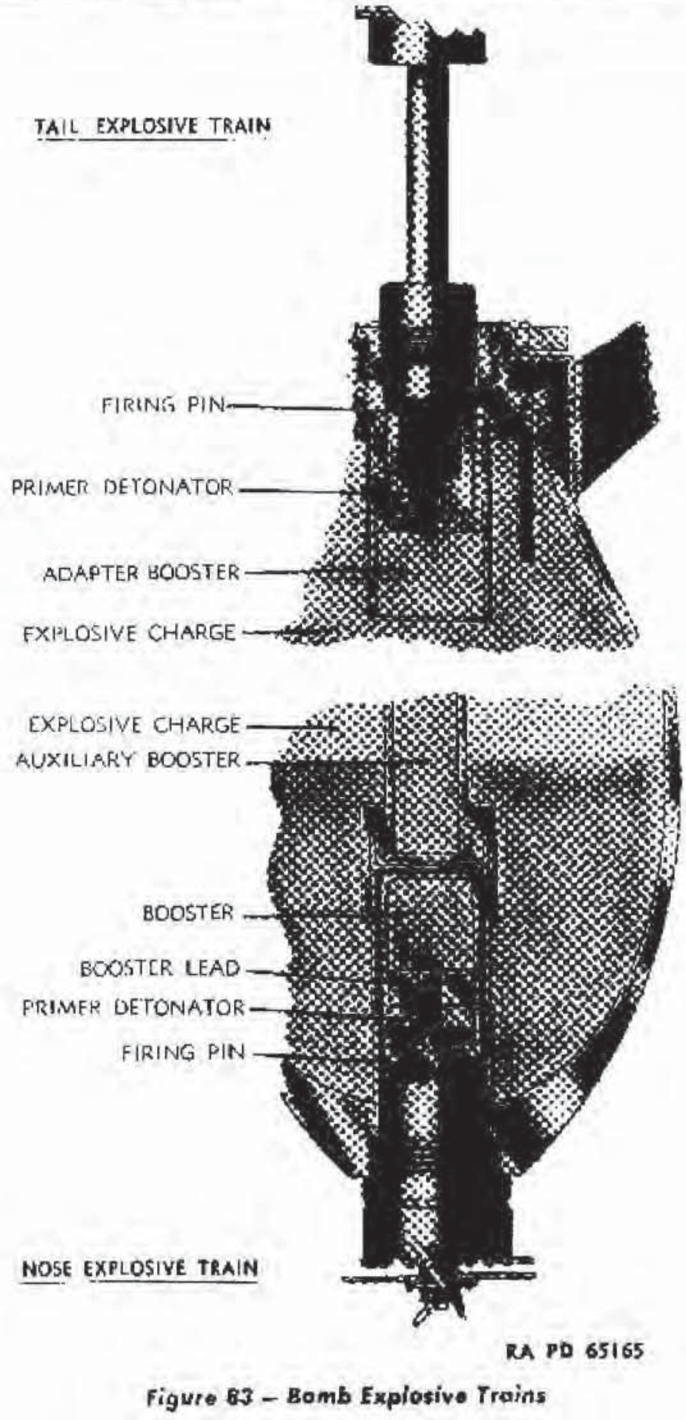


Figure 63 — Bomb Explosive Trains

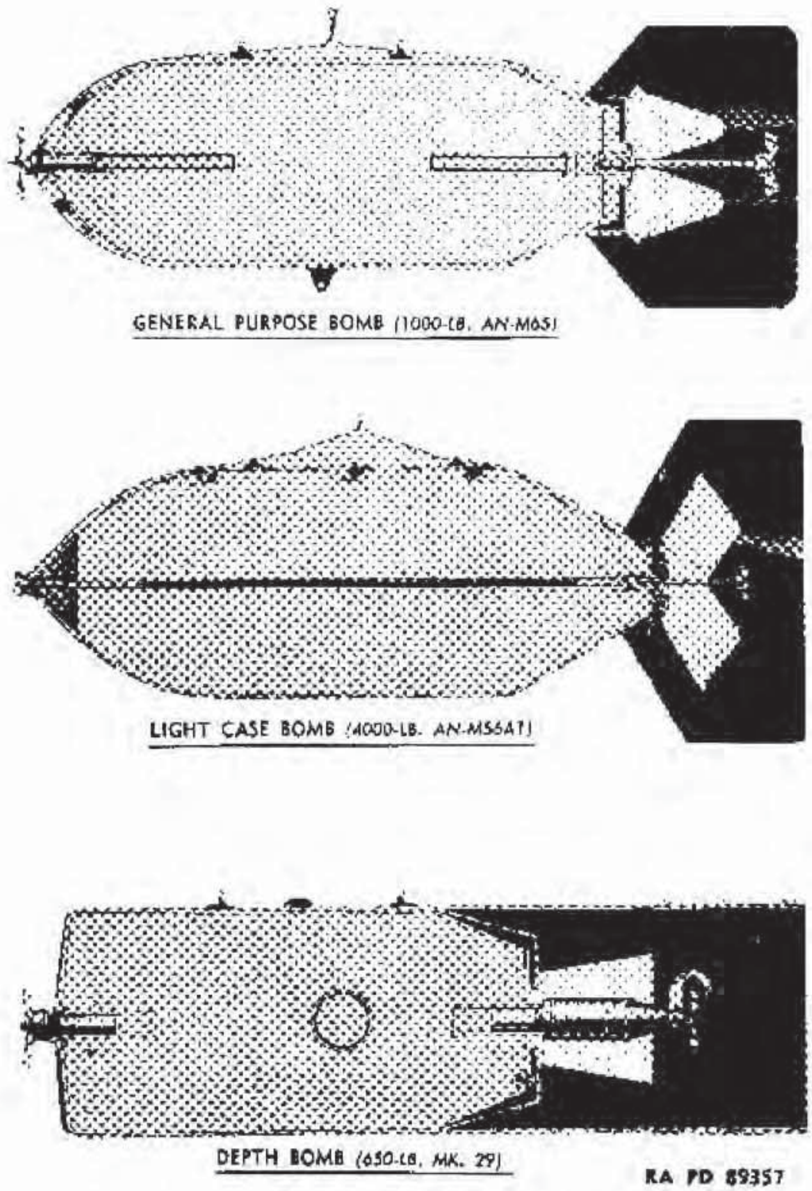


Figure 84 — Types of Bombs

c. **Light-case.** The light-case (LC) bomb (fig. 84) is similar in appearance to the general-purpose bomb but has a thinner, lighter case and contains a higher percentage of explosive filler by weight. Since strength of case has been sacrificed, this bomb cannot be used for penetration and must be fuzed to explode before the case breaks up on impact. Approximately 75 percent of the total weight is high-explosive filler.

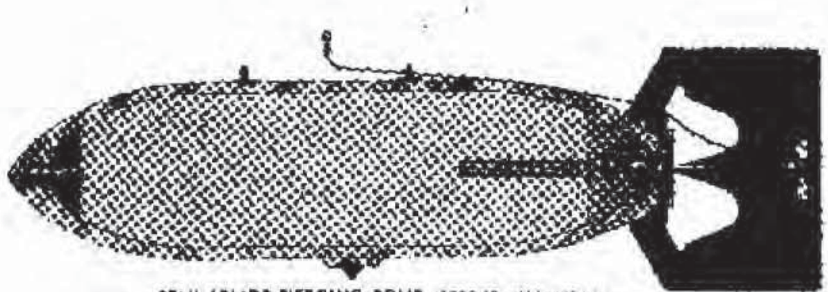
d. **Armor-piercing.** The armor-piercing (AP) bomb (fig. 85) is used to pierce deck armor of battleships, heavy concrete structures, and similar highly resistant targets. The nose of the AP bomb is solid and sometimes is fitted with an armor-piercing cap (APC) (fig. 85). These bombs are effective against heavy deck armor when dropped from sufficient altitude to attain their rated velocity. They contain a relatively small percentage (8 to 18 percent) of explosive filler and use tail fuzes of the delay type.

e. **Semi-armor-piercing.** The semi-armor-piercing (SAP) bomb (fig. 85) is conventional in outline, resembling the cylindrical GP bomb. However, the SAP bomb has a heavy case of steel which is drawn into a thickened nose and contains approximately 30 percent by weight of explosive filler. It may be used against concrete pill boxes or other targets of moderately high resistance.

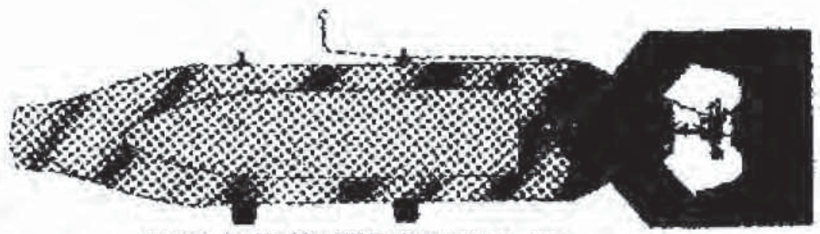
f. **Depth.** The depth bomb (fig. 84) is a special light-case bomb for use against submarines and surface craft. It averages 70 percent by weight of explosive. When detonated by a hydrostatic fuze, the effect of this bomb does not depend upon hitting the target directly but upon the shock of detonation of the explosive being transmitted through the water. The hydrostatic fuze functions at a predetermined depth rather than on impact. If it is desired to use these bombs for demolition effect only, they may be equipped with nose fuzes which function on impact. Fuzes may be of the nose or tail type or installed in a cavity running transversely through the bomb body.

g. **Fragmentation bombs.**

(1) Fragmentation bombs are for use against personnel and light materiel targets. The effect is produced primarily by the fragments of the bomb body projected at high velocity. The blast at the point of impact will cause additional damage to nearby objects. Some fragmentation bombs have stabilizing fins, others, for low-altitude bombing, have parachutes for retarding rate of fall (fig. 86). The design of the bomb body is such as to produce the greatest number of effective fragments. The body walls are of uniform thickness and may be made up of coiled helix springs. Any fragment having 60 foot-pounds of energy will disable personnel. Most types of fragmentation bombs are fitted with a nose fuze only. The weight of the high explosive in these bombs is about 15 percent by weight. Since the fragments are projected at approximately

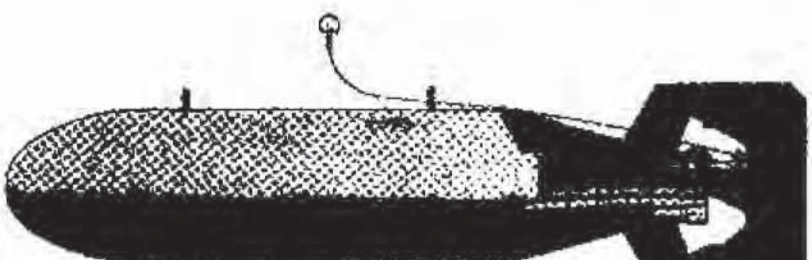


SEMI-ARMOR-PIERCING BOMB (1000-LB. AN-M59A1)



CAPPED ARMOR-PIERCING BOMB (1000-LB. M52)

ARMOR-PIERCING BOMB (1000-LB. AN-MK.33)



PRACTICE BOMB (100-LB. M38A2)

RA PD 89360

Figure 85 — Types of Bombs (Continued)

APPENDIX C

Characteristics of Targets Identified During the WAA Survey

Object ID	WAA Target ID	Latitude	Longitude	Height (feet)	Length (feet)	Width (feet)	Shadow (feet)	Initial Classification
1	WAA_SSS_400kHz_CaptainsBayArmyPier_2	53.8522217	-166.5729890	2.250	2.850	1.660	3.080	Box
2	WAA_SSS_400kHz_CaptainsBayArmyPier_4	53.8520279	-166.5731946	1.890	3.060	1.880	3.060	Box
3	WAA_SSS_400kHz_CaptainsBayArmyPier_5	53.8515940	-166.5740031	1.210	1.910	1.420	1.890	Unknown
4	WAA_SSS_400kHz_CaptainsBayArmyPier_8	53.8507305	-166.5753411	0.890	2.440	0.930	1.870	Cylinder
5	WAA_SSS_400kHz_CaptainsBayArmyPier_6	53.8512360	-166.5751380	1.430	4.770	1.960	2.510	Box
6	WAA_SSS_400kHz_CaptainsBayArmyPier_7	53.8507610	-166.5751294	1.830	5.860	3.410	11.140	
7	WAA_SSS_400kHz_CaptainsBayArmyPier_3	53.8520833	-166.5739564	0.940	3.550	1.790	3.290	Box
8	WAA_SSS_400kHz_CaptainsBayArmyPier_1	53.8523750	-166.5731764	1.370	2.030	1.760	2.520	Box
9	WAA_SSS_400kHz_CaptainsBayArmyPier_9	53.8494089	-166.5762820	1.950	3.960	1.310	6.030	Unknown
10	WAA_SSS_400kHz_CaptainsBayArmyPier_0054	53.8493317	-166.5770300	0.740	5.700	2.290	1.980	debris
11	WAA_SSS_400kHz_CaptainsBayArmyPier_0052	53.8495229	-166.5772164	0.860	6.040	4.530	1.570	debris
12	WAA_SSS_400kHz_CaptainsBayArmyPier_0053	53.8493447	-166.5768146	0.000	8.540	3.150	0.000	debris
13	WAA_SSS_400kHz_CaptainsBayArmyPier_0045	53.8505418	-166.5771070	1.620	7.330	3.290	3.520	debris
14	WAA_SSS_400kHz_CaptainsBayArmyPier_0050	53.8501215	-166.5757453	1.320	9.700	3.320	4.500	debris
15	WAA_SSS_400kHz_CaptainsBayArmyPier_0051	53.8500955	-166.5756275	1.580	6.510	2.440	6.160	debris
16	WAA_SSS_400kHz_CaptainsBayArmyPier_0041	53.8509512	-166.5759117	0.850	53.670	3.920	1.640	piling
17	WAA_SSS_400kHz_CaptainsBayArmyPier_0044	53.8505585	-166.5753460	1.640	46.480	2.830	4.920	piling
18	WAA_SSS_400kHz_CaptainsBayArmyPier_0026	53.8517670	-166.5737989	5.330	12.220	4.520	7.770	debris cluster
19	WAA_SSS_400kHz_CaptainsBayArmyPier_0008	53.8526360	-166.5746176	1.220	19.530	3.760	2.220	Debris
20	WAA_SSS_400kHz_CaptainsBayArmyPier_0010	53.8524091	-166.5744418	4.350	11.580	6.700	5.690	debris
21	WAA_SSS_400kHz_CaptainsBayArmyPier_0011	53.8523581	-166.5743988	2.290	25.320	1.800	2.730	piling
22	WAA_SSS_400kHz_CaptainsBayArmyPier_0014	53.8521089	-166.5750456	1.660	9.930	8.700	2.550	Fish Trap
23	WAA_SSS_400kHz_CaptainsBayArmyPier_0021	53.8518963	-166.5749289	9.460	37.080	14.480	11.520	Unknown
24	WAA_SSS_400kHz_CaptainsBayArmyPier_0019	53.8519484	-166.5748538	5.100	9.480	7.880	5.870	Unknown
25	WAA_SSS_400kHz_CaptainsBayArmyPier_0017	53.8520032	-166.5748216	8.140	12.230	7.160	9.920	Fish Trap
26	WAA_SSS_400kHz_CaptainsBayArmyPier_0016	53.8520120	-166.5756011	2.760	13.060	10.760	6.910	Fish Trap
27	WAA_SSS_400kHz_CaptainsBayArmyPier_0025	53.8517740	-166.5753941	0.690	8.200	1.050	1.020	debris
28	WAA_SSS_400kHz_CaptainsBayArmyPier_0033	53.8513961	-166.5748256	1.160	11.200	1.610	2.040	Piling
29	WAA_SSS_400kHz_CaptainsBayArmyPier_0031	53.8514966	-166.5747526	1.160	35.550	1.300	1.790	piling
30	WAA_SSS_400kHz_CaptainsBayArmyPier_0037	53.8511941	-166.5753015	2.640	8.540	6.020	4.260	Fish Trap
31	WAA_SSS_400kHz_CaptainsBayArmyPier_0039	53.8510770	-166.5750579	1.130	69.240	12.580	2.760	debris cluster
32	WAA_SSS_400kHz_CaptainsBayArmyPier_0042	53.8508960	-166.5756832	1.010	61.730	12.100	1.760	Piling
33	WAA_SSS_400kHz_CaptainsBayArmyPier_0043	53.8506348	-166.5757209	0.930	16.680	1.600	2.280	piling
34	WAA_SSS_400kHz_CaptainsBayArmyPier_0036	53.8512235	-166.5770356	1.710	4.090	2.040	4.550	debris
35	WAA_SSS_400kHz_CaptainsBayArmyPier_0049	53.8501348	-166.5770343	0.940	5.560	3.180	1.510	debris
36	WAA_SSS_400kHz_CaptainsBayArmyPier_0048	53.8502501	-166.5790043	1.680	20.550	13.070	3.230	debris cluster
37	WAA_SSS_400kHz_CaptainsBayArmyPier_0047	53.8504393	-166.5772729	3.140	5.720	5.590	4.940	Fish Trap
38	WAA_SSS_400kHz_CaptainsBayArmyPier_0027	53.8517294	-166.5747953	1.030	14.710	7.860	1.750	debris cluster
39	WAA_SSS_400kHz_CaptainsBayArmyPier_0007	53.8528067	-166.5754366	0.000	23.290	11.530	0.000	Unknown
40	WAA_SSS_400kHz_CaptainsBayArmyPier_0013	53.8521794	-166.5744456	2.200	9.420	2.930	3.550	debris
41	WAA_SSS_400kHz_CaptainsBayArmyPier_0015	53.8520661	-166.5769811	2.590	5.690	4.870	5.940	debris
42	WAA_SSS_400kHz_CaptainsBayArmyPier_0034	53.8513736	-166.5782521	1.340	4.360	4.770	3.270	debris
43	WAA_SSS_400kHz_CaptainsBayArmyPier_0038	53.8511586	-166.5781052	1.280	46.790	1.370	2.190	piling
44	WAA_SSS_400kHz_CaptainsBayArmyPier_0018	53.8519900	-166.5779855	1.460	7.210	2.330	2.320	debris
45	WAA_SSS_400kHz_CaptainsBayArmyPier_0035	53.8513616	-166.5786229	2.910	9.190	6.690	3.580	debris
46	WAA_SSS_400kHz_CaptainsBayArmyPier_0028	53.8516952	-166.5793043	1.840	20.980	4.150	6.330	debris cluster
47	WAA_SSS_400kHz_CaptainsBayArmyPier_0046	53.8505201	-166.5754317	1.930	46.370	2.300	2.740	piling
48	WAA_SSS_400kHz_CaptainsBayArmyPier_0032	53.8514066	-166.5745598	1.290	33.400	4.450	2.100	piling
49	WAA_SSS_400kHz_CaptainsBayArmyPier_0030	53.8515679	-166.5746357	1.210	25.400	3.300	3.400	piling
50	WAA_SSS_400kHz_CaptainsBayArmyPier_0029	53.8516762	-166.5744459	2.960	9.610	9.130	8.430	Fish Trap
51	WAA_SSS_400kHz_CaptainsBayArmyPier_0022	53.8518337	-166.5744553	0.920	48.320	3.330	3.580	piling
52	WAA_SSS_400kHz_CaptainsBayArmyPier_0024	53.8517902	-166.5742457	0.830	25.730	2.750	2.290	piling
53	WAA_SSS_400kHz_CaptainsBayArmyPier_0023	53.8518242	-166.5740267	1.600	9.710	4.530	3.550	debris
54	WAA_SSS_400kHz_CaptainsBayArmyPier_0020	53.8519179	-166.5738073	0.950	16.730	1.620	1.770	piling
55	WAA_SSS_400kHz_CaptainsBayArmyPier_0012	53.8522543	-166.5736098	0.450	30.810	1.130	1.260	piling
56	WAA_SSS_400kHz_CaptainsBayArmyPier_0009	53.8525860	-166.5731907	0.850	34.180	1.780	2.010	piling
57	WAA_SSS_400kHz_CaptainsBayArmyPier_0006	53.8528510	-166.5730782	4.180	7.010	6.600	11.670	Fish Trap
58	WAA_SSS_400kHz_CaptainsBayArmyPier_0003	53.8543281	-166.5703160	2.730	15.780	4.330	4.710	Debris
59	WAA_SSS_400kHz_CaptainsBayArmyPier_0001	53.8546344	-166.5701464	1.840	11.410	3.220	3.720	debris
60	WAA_SSS_400kHz_CaptainsBayArmyPier_0004	53.8541409	-166.5703388	2.670	14.580	9.480	8.360	debris
61	WAA_SSS_400kHz_CaptainsBayArmyPier_0055	53.8491263	-166.5762747	3.820	5.470	4.960	6.220	debris
62	WAA_SSS_400kHz_CaptainsBayArmyPier_0056	53.8490099	-166.5764601	2.760	5.340	5.800	3.990	Fish Trap
63	WAA_SSS_400kHz_CaptainsBayArmyPier_0005	53.8541237	-166.5689776	1.590	5.720	5.090	3.790	debris
64	WAA_SSS_400kHz_CaptainsBayArmyPier_0002	53.8543938	-166.5667283	1.050	17.650	2.050	1.920	Piling
65	WAA_SSS_400kHz_CaptainsBayArmyPier_0040	53.8510180	-166.5752181	5.270	24.910	11.980	7.690	debris cluster
66	WAA_SSS_400kHz_Chernofski-r0023	53.3975685	-167.5066863	3.610	6.520	4.830	5.100	Unknown
67	WAA_SSS_400kHz_Chernofski-r0022	53.3975871	-167.5068295	4.590	23.860	4.690	7.250	Unknown
68	WAA_SSS_400kHz_Chernofski-r0019	53.3990614	-167.5078913	1.450	10.690	4.170	3.380	Unknown
69	WAA_SSS_400kHz_Chernofski-r0018	53.3991582	-167.5080071	2.880	8.330	2.150	5.730	Cluster of targets
70	WAA_SSS_400kHz_Chernofski-r0017	53.3991682	-167.5081061	2.500	24.060	3.500	3.910	Unknown

71	WAA_SSS_400kHz_Chernofski-r0014	53.4024151	-167.5104189	0.890	5.820	1.790	3.330	Unknown
72	WAA_SSS_400kHz_Chernofski-r0013	53.4025893	-167.5123488	1.020	4.110	3.160	7.300	Unknown
73	WAA_SSS_400kHz_Chernofski-r0002	53.4036583	-167.5137248	0.910	20.580	1.600	1.400	Piling
74	WAA_SSS_400kHz_Chernofski-r0004	53.4031762	-167.5116145	2.730	11.120	2.430	8.500	Unknown
75	WAA_SSS_400kHz_Chernofski-r0016	53.3991759	-167.5079578	2.110	4.760	3.920	2.870	Unknown
76	WAA_SSS_400kHz_Chernofski-r0029	53.3961601	-167.5028940	2.280	3.880	1.920	9.550	Unknown
77	WAA_SSS_400kHz_Chernofski-r0028	53.3967095	-167.5039202	2.580	2.870	4.510	11.270	Unknown
78	WAA_SSS_400kHz_Chernofski-r0039	53.3902763	-167.4918863	1.170	2.730	1.690	2.880	Unknown
79	WAA_SSS_400kHz_Chernofski-r0038	53.3905833	-167.4919627	1.310	1.750	2.310	5.520	Unknown
80	WAA_SSS_400kHz_Chernofski-r0032	53.3947957	-167.5016061	1.630	3.840	1.870	3.170	Unknown
81	WAA_SSS_400kHz_Chernofski-r0031	53.3951962	-167.5014643	1.250	56.250	1.330	2.920	Piling
82	WAA_SSS_400kHz_Chernofski-r0027	53.3969944	-167.5065812	4.540	8.490	7.650	18.620	Fish Trap
83	WAA_SSS_400kHz_Chernofski-r0033	53.3947347	-167.5009954	1.660	3.510	2.450	4.660	Unknown
84	WAA_SSS_400kHz_Chernofski-r0037	53.3912674	-167.4920337	0.750	9.920	3.730	3.190	Crate
85	WAA_SSS_400kHz_Chernofski-r0035	53.3918585	-167.4937843	0.770	2.350	1.100	3.310	Unknown
86	WAA_SSS_400kHz_Chernofski-r0036	53.3917950	-167.4940138	1.610	2.600	1.740	3.580	Unknown
87	WAA_SSS_400kHz_Chernofski-r0034	53.3923622	-167.4960761	0.790	7.680	1.930	3.590	Unknown
88	WAA_SSS_400kHz_Chernofski-r0030	53.3961111	-167.5007199	1.400	4.370	2.440	10.830	Unknown
89	WAA_SSS_400kHz_Chernofski-r0025	53.3972154	-167.5042245	5.400	30.500	5.670	26.120	Unknown
90	WAA_SSS_400kHz_Chernofski-r0026	53.3970943	-167.5042354	3.450	8.300	7.060	22.600	Possible Anchor
91	WAA_SSS_400kHz_Chernofski-r0024	53.3973833	-167.5044599	1.120	6.360	4.290	2.180	Possible Anchor
92	WAA_SSS_400kHz_Chernofski-r0021	53.3980797	-167.5066834	1.020	4.670	1.710	4.210	Unknown
93	WAA_SSS_400kHz_Chernofski-r0015	53.4014570	-167.5084831	1.070	3.480	3.290	5.200	Unknown
94	WAA_SSS_400kHz_Chernofski-r0010	53.4027704	-167.5096599	0.530	13.400	1.980	6.430	Unknown
95	WAA_SSS_400kHz_Chernofski-r0012	53.4026781	-167.5097906	0.540	14.940	1.580	4.940	Unknown
96	WAA_SSS_400kHz_Chernofski-r0011	53.4027608	-167.5101275	0.610	10.600	1.820	4.000	Unknown
97	WAA_SSS_400kHz_Chernofski-r0008	53.4028658	-167.5101388	0.720	10.360	1.350	6.510	Unknown
98	WAA_SSS_400kHz_Chernofski-r0009	53.4028549	-167.5103474	0.740	13.670	1.530	4.770	Unknown
99	WAA_SSS_400kHz_Chernofski-r0006	53.4030238	-167.5112554	2.350	2.520	1.540	37.100	Unknown
100	WAA_SSS_400kHz_Chernofski-r0003	53.4033765	-167.5121411	0.320	4.700	0.580	1.040	Unknown
101	WAA_SSS_400kHz_Chernofski-r0001	53.4037856	-167.5146333	1.240	2.590	2.760	4.190	Unknown
102	WAA_SSS_400kHz_Chernofski-r0005	53.4030687	-167.5136590	2.450	4.200	1.900	5.650	Unknown
103	WAA_SSS_400kHz_Chernofski-r0007	53.4029700	-167.5133587	1.870	11.790	3.050	8.880	Unknown
104	WAA_SSS_400kHz_Chernofski-r00205	53.3981641	-167.5059839	1.250	4.160	1.250	7.350	Crate
105	WAA_SSS_400kHz_Chernofski-r0040	53.3869395	-167.4996132	0.770	3.930	0.870	4.400	Unknown
106	WAA_SSS_400kHz_Chernofski-r0042	53.3860117	-167.4982235	0.810	9.140	2.090	1.300	Unknown
107	WAA_SSS_400kHz_Chernofski-r0041	53.3860822	-167.4970135	1.330	5.610	1.830	1.640	Unknown
108	WAA_SSS_400kHz_Chernofski-r29	53.4010585	-167.5104843	9.350	16.640	8.050	14.840	
109	WAA_SSS_400kHz_Chernofski-0130	53.3986434	-167.5073513	1.700	6.950	5.260	5.300	Unknown
110	WAA_SSS_400kHz_Chernofski-0156	53.4008575	-167.5095998	1.130	4.670	2.300	4.550	Unknown
111	WAA_SSS_400kHz_Chernofski-0162	53.4013345	-167.5099658	0.380	23.300	3.110	2.140	piling
112	WAA_SSS_400kHz_Chernofski-0160	53.4012505	-167.5103813	0.730	63.090	4.090	7.480	piling
113	WAA_SSS_400kHz_Chernofski-0165	53.4018056	-167.5085706	1.080	13.150	5.990	11.730	Unknown
114	WAA_SSS_400kHz_Chernofski-0167	53.4018780	-167.5102891	1.120	7.460	3.310	5.550	Unknown
115	WAA_SSS_400kHz_Chernofski-0168	53.4018988	-167.5104583	0.330	6.160	3.500	2.100	Unknown
116	WAA_SSS_400kHz_Chernofski-0164	53.4018045	-167.5109820	0.320	9.310	3.740	3.910	Unknown
117	WAA_SSS_400kHz_Chernofski-0169	53.4021310	-167.5107213	0.290	18.690	2.050	2.740	Unknown
118	WAA_SSS_400kHz_Chernofski-0040	53.3911629	-167.4932086	0.510	4.430	2.320	2.160	Unknown
119	WAA_SSS_400kHz_Chernofski-0050	53.3920913	-167.5005918	0.000	6.490	7.070	0.000	Unknown
120	WAA_SSS_400kHz_Chernofski-0074	53.3956849	-167.5024155	0.840	26.490	2.190	4.860	piling
121	WAA_SSS_400kHz_Chernofski-0075	53.3957422	-167.5025303	0.460	16.870	2.460	2.450	piling
122	WAA_SSS_400kHz_Chernofski-0076	53.3957600	-167.5023857	0.000	32.850	2.480	0.000	piling
123	WAA_SSS_400kHz_Chernofski-0084	53.3963007	-167.5043942	0.600	25.800	3.100	4.380	piling
124	WAA_SSS_400kHz_Chernofski-0045	53.3914202	-167.4943607	0.640	7.090	1.510	1.680	Unknown
125	WAA_SSS_400kHz_Chernofski-0035	53.3907619	-167.4944908	0.360	7.480	5.670	1.950	Unknown
126	WAA_SSS_400kHz_Chernofski-0200	53.4038576	-167.5141393	4.060	8.010	5.200	10.810	Fish Trap
127	WAA_SSS_400kHz_Chernofski-0136	53.3987180	-167.5074885	2.540	7.200	3.360	2.750	Unknown
128	WAA_SSS_400kHz_Chernofski-0127	53.3986293	-167.5069431	2.840	6.790	1.880	9.800	Unknown
129	WAA_SSS_400kHz_Chernofski-0126	53.3986186	-167.5062974	3.060	5.720	2.560	14.220	Unknown
130	WAA_SSS_400kHz_Chernofski-0090	53.3967587	-167.5042409	0.420	7.140	3.120	2.230	Unknown
131	WAA_SSS_400kHz_Chernofski-0093	53.3968403	-167.5042121	0.650	12.360	1.870	2.730	
132	WAA_SSS_400kHz_Chernofski-0087	53.3966292	-167.5044744	0.760	9.550	6.240	6.220	Unknown
133	WAA_SSS_400kHz_Chernofski-0092	53.3968089	-167.5041282	0.820	12.080	2.490	3.570	piling
134	WAA_SSS_400kHz_Chernofski-0072	53.3950979	-167.5018030	3.180	6.280	3.720	9.600	Unknown
135	WAA_SSS_400kHz_Chernofski-0066	53.3946421	-167.5022375	1.590	7.030	5.260	6.430	Unknown
136	WAA_SSS_400kHz_Chernofski-0061	53.3937423	-167.5022822	1.310	7.470	4.120	3.720	Unknown
137	WAA_SSS_400kHz_Chernofski-0046	53.3915292	-167.4957973	0.480	6.040	3.250	2.150	Unknown
138	WAA_SSS_400kHz_Chernofski-0041	53.3912417	-167.4957212	0.000	9.190	2.160	0.000	Unknown
139	WAA_SSS_400kHz_Chernofski-0034	53.3906989	-167.4939617	0.300	12.030	4.340	2.760	Unknown
140	WAA_SSS_400kHz_Chernofski-0037	53.3908351	-167.4941730	0.360	10.170	4.830	2.790	Unknown
141	WAA_SSS_400kHz_Chernofski-0032	53.3905196	-167.4904992	0.150	4.050	3.050	2.420	Unknown
142	WAA_SSS_400kHz_Chernofski-0051	53.3923288	-167.4944002	0.670	3.590	4.360	7.170	

143	WAA_SSS_400kHz_Chernofski-0057	53.3928628	-167.4966424	0.750	7.740	4.700	11.880	Unknown
144	WAA_SSS_400kHz_Chernofski-0056	53.3928275	-167.4964228	0.450	12.150	4.570	8.010	Unknown
145	WAA_SSS_400kHz_Chernofski-0064	53.3945535	-167.5019169	0.280	3.660	2.660	1.480	Unknown
146	WAA_SSS_400kHz_Chernofski-0071	53.3949729	-167.5013948	0.520	8.020	2.450	2.650	Unknown
147	WAA_SSS_400kHz_Chernofski-0091	53.3968005	-167.5008129	0.520	10.860	2.440	6.560	Unknown
148	WAA_SSS_400kHz_Chernofski-0083	53.3961824	-167.5023161	0.220	31.960	1.620	2.710	piling
149	WAA_SSS_400kHz_Chernofski-0086	53.3965484	-167.5034821	0.350	23.440	2.060	3.670	piling
150	WAA_SSS_400kHz_Chernofski-0099	53.3972234	-167.5025581	0.350	4.830	1.980	1.400	Unknown
151	WAA_SSS_400kHz_Chernofski-0107	53.3978385	-167.5063604	0.580	37.510	4.500	3.070	piling
152	WAA_SSS_400kHz_Chernofski-0139	53.3987923	-167.5060361	1.610	21.530	3.750	9.670	Unknown
153	WAA_SSS_400kHz_Chernofski-0134	53.3987053	-167.5081306	0.420	5.600	2.680	3.030	Unknown
154	WAA_SSS_400kHz_Chernofski-0175	53.4026655	-167.5093330	0.300	16.270	1.860	3.900	piling
155	WAA_SSS_400kHz_Chernofski-0171	53.4024188	-167.5108394	0.400	8.290	3.820	3.500	Unknown
156	WAA_SSS_400kHz_Chernofski-0190	53.4030459	-167.5132598	1.400	6.330	3.120	22.400	Unknown
157	WAA_SSS_400kHz_Chernofski-0202	53.4038804	-167.5139348	0.510	6.840	1.660	1.740	piling
158	WAA_SSS_400kHz_Chernofski-0203	53.4039070	-167.5150925	1.770	2.910	3.120	11.120	Unknown
159	WAA_SSS_400kHz_Chernofski-0201	53.4038679	-167.5145593	2.090	7.120	4.130	8.390	Fish Trap
160	WAA_SSS_400kHz_Chernofski-0204	53.4039070	-167.5143151	1.440	31.140	35.880	5.660	debris cluster
161	WAA_SSS_400kHz_Chernofski-0205	53.4039111	-167.5145803	1.290	56.320	1.800	5.870	piling
162	WAA_SSS_400kHz_Chernofski-0206	53.4039465	-167.5144618	0.500	37.760	1.930	2.310	piling
163	WAA_SSS_400kHz_Chernofski-0209	53.4039963	-167.5145149	0.470	27.760	1.790	2.520	debris cluster
164	WAA_SSS_400kHz_Chernofski-0207	53.4039576	-167.5143903	0.680	13.630	7.340	3.150	debris cluster
165	WAA_SSS_400kHz_Chernofski-0208	53.4039585	-167.5149931	0.450	39.670	1.730	2.730	Piling
166	WAA_SSS_400kHz_Chernofski-0210	53.4040134	-167.5148820	1.310	37.040	1.640	8.390	piling
167	WAA_SSS_400kHz_Chernofski-0192	53.4031547	-167.5134434	0.510	7.520	2.180	2.380	Unknown
168	WAA_SSS_400kHz_Chernofski-0009	53.3862993	-167.4987446	0.860	6.610	6.360	1.510	Fish Trap
169	WAA_SSS_400kHz_Chernofski-0028	53.3901830	-167.5054381	14.110	76.880	23.400	34.340	wreck
170	WAA_SSS_400kHz_Chernofski-0029	53.3902056	-167.5056386	14.060	39.450	24.310	37.970	Unknown
171	WAA_SSS_400kHz_Chernofski-0021	53.3884171	-167.5054760	3.580	14.170	8.950	10.810	Unknown
172	WAA_SSS_400kHz_Chernofski-0022	53.3884255	-167.5054964	4.300	12.150	5.250	12.750	Unknown
173	WAA_SSS_400kHz_Chernofski-0158	53.4010589	-167.5104712	8.500	15.070	9.110	13.280	Unknown
174	WAA_SSS_400kHz_Chernofski-0161	53.4012742	-167.5098885	1.150	9.390	1.230	2.730	Unknown
175	WAA_SSS_400kHz_Chernofski-0097	53.3971274	-167.5041910	6.940	6.320	5.600	9.310	Unknown
176	WAA_SSS_400kHz_Chernofski-0103	53.3975202	-167.5067956	3.700	24.670	6.710	5.310	Unknown
177	WAA_SSS_400kHz_Chernofski-0102	53.3974832	-167.5065946	4.530	4.530	4.200	7.700	Unknown
178	WAA_SSS_400kHz_Chernofski-0067	53.3947135	-167.5023164	3.100	10.960	6.500	7.970	Unknown
179	WAA_SSS_400kHz_Chernofski-0070	53.3948283	-167.5016394	3.770	20.780	4.180	4.170	Unknown
180	WAA_SSS_400kHz_Chernofski-0159	53.4011735	-167.5102880	1.120	35.450	6.910	4.690	piling
181	WAA_SSS_400kHz_Chernofski-0172	53.4025033	-167.5125540	0.970	6.750	2.690	3.700	Unknown
182	WAA_SSS_400kHz_Chernofski-0039	53.3910780	-167.4975378	3.200	11.290	8.640	4.730	Unknown
183	WAA_SSS_400kHz_Chernofski-0027	53.3900405	-167.4942261	0.000	9.920	9.400	0.000	Unknown
184	WAA_SSS_400kHz_Chernofski-0053	53.3927665	-167.4965985	1.870	4.900	4.050	14.200	Unknown
185	WAA_SSS_400kHz_Chernofski-0044	53.3914059	-167.5093391	1.370	4.780	3.110	5.070	Unknown
186	WAA_SSS_400kHz_Chernofski-0047	53.3917181	-167.5097889	0.000	5.260	5.080	0.000	Unknown
187	WAA_SSS_400kHz_Chernofski-0011	53.3871146	-167.4937093	0.310	6.950	1.110	1.110	piling
188	WAA_SSS_400kHz_Chernofski-0015	53.3878758	-167.4921494	0.590	7.880	0.980	1.850	Unknown
189	WAA_SSS_400kHz_Chernofski-0013	53.3876765	-167.4924617	0.470	10.930	0.930	1.550	Piling
190	WAA_SSS_400kHz_Chernofski-0012	53.3873237	-167.4950450	0.710	13.020	1.650	2.920	piling
191	WAA_SSS_400kHz_Chernofski-0008	53.3862763	-167.4985647	0.000	7.260	2.900	0.000	Unknown
192	WAA_SSS_400kHz_Chernofski-0003	53.3850962	-167.4996436	0.420	5.460	3.080	6.500	Unknown
193	WAA_SSS_400kHz_Chernofski-0004	53.3851055	-167.4998210	0.960	29.180	2.270	3.700	piling
194	WAA_SSS_400kHz_Chernofski-0135	53.3987092	-167.5108160	1.800	9.280	7.030	3.180	Fish Trap
195	WAA_SSS_400kHz_Chernofski-0154	53.4001907	-167.5126617	7.160	7.170	4.390	8.490	Unknown
196	WAA_SSS_400kHz_Chernofski-0155	53.4008513	-167.5140905	2.540	10.840	8.080	3.840	Unknown
197	WAA_SSS_400kHz_Chernofski-0109	53.3978551	-167.5110538	1.840	19.750	14.540	4.110	Fish Trap
198	WAA_SSS_400kHz_Chernofski-0026	53.3897380	-167.4987644	1.910	15.670	9.940	5.730	Unknown
199	WAA_SSS_400kHz_Chernofski-0024	53.3897257	-167.4987635	2.340	15.710	9.180	7.280	Unknown
200	WAA_SSS_400kHz_Chernofski-0025	53.3897309	-167.4986834	2.760	9.460	5.320	8.050	Unknown
201	WAA_SSS_400kHz_Chernofski-0023	53.3888770	-167.4955275	0.600	28.120	1.520	1.900	piling
202	WAA_SSS_400kHz_Chernofski-0065	53.3946243	-167.5106846	4.630	27.020	3.690	8.150	piling
203	WAA_SSS_400kHz_Chernofski-0062	53.3940603	-167.5106966	1.760	7.000	2.460	2.890	Unknown
204	WAA_SSS_400kHz_Chernofski-0060	53.3936766	-167.5198705	0.810	24.400	1.640	2.570	piling
205	WAA_SSS_400kHz_Chernofski-0085	53.3965277	-167.5180379	2.300	12.510	5.150	4.610	Unknown
206	WAA_SSS_400kHz_Chernofski-0112	53.3980127	-167.5211004	1.430	48.950	6.250	4.750	Piling
207	WAA_SSS_400kHz_Chernofski-0129	53.3986401	-167.5211078	5.100	10.420	5.610	17.330	Unknown
208	WAA_SSS_400kHz_Chernofski-0128	53.3986398	-167.5211066	4.380	19.360	6.470	14.270	Unknown
209	WAA_SSS_400kHz_Chernofski-0121	53.3984935	-167.5207613	3.310	4.090	2.900	3.740	Unknown
210	WAA_SSS_400kHz_Chernofski-0144	53.3991027	-167.5159951	3.140	8.570	7.400	7.400	Unknown
211	WAA_SSS_400kHz_Chernofski-0137	53.3987296	-167.5206168	2.500	3.200	2.210	6.290	Unknown
212	WAA_SSS_400kHz_Chernofski-0150	53.3995551	-167.5184135	1.560	2.430	2.710	4.300	Unknown
213	WAA_SSS_400kHz_Chernofski-0141	53.3989445	-167.5143697	0.000	19.850	8.040	0.000	Unknown
214	WAA_SSS_400kHz_Chernofski-0077	53.3957957	-167.5125886	2.460	8.810	2.170	3.470	Unknown

215	WAA_SSS_400kHz_Chernofski-0120	53.3984857	-167.5209637	1.310	5.120	2.050	7.780	Unknown
216	WAA_SSS_400kHz_Chernofski-0116	53.3984212	-167.5210251	0.980	3.330	2.220	6.450	Unknown
217	WAA_SSS_400kHz_Chernofski-0117	53.3984307	-167.5210030	1.430	5.780	7.460	10.670	Unknown
218	WAA_SSS_400kHz_Chernofski-0118	53.3984358	-167.5210048	1.400	4.720	4.150	10.890	Unknown
219	WAA_SSS_400kHz_Chernofski-0119	53.3984451	-167.5210051	1.540	2.990	2.850	12.450	Unknown
220	WAA_SSS_400kHz_Chernofski-0122	53.3984994	-167.5209677	1.600	3.300	3.470	11.340	Unknown
221	WAA_SSS_400kHz_Chernofski-0125	53.3986154	-167.5208613	2.020	5.850	3.340	13.070	Unknown
222	WAA_SSS_400kHz_Chernofski-0131	53.3986500	-167.5205576	2.470	5.390	6.060	25.180	Unknown
223	WAA_SSS_400kHz_Chernofski-0138	53.3987623	-167.5206982	0.860	5.330	2.220	4.440	Unknown
224	WAA_SSS_400kHz_Chernofski-0140	53.3989297	-167.5206756	1.560	14.180	7.510	5.770	Unknown
225	WAA_SSS_400kHz_Chernofski-0143	53.3990677	-167.5203520	1.030	6.740	3.260	10.250	Unknown
226	WAA_SSS_400kHz_Chernofski-0152	53.3997107	-167.5198243	1.230	8.270	2.450	2.060	Unknown
227	WAA_SSS_400kHz_Chernofski-0153	53.3997228	-167.5198145	1.110	3.660	1.180	1.850	Unknown
228	WAA_SSS_400kHz_Chernofski-0149	53.3994337	-167.5190810	2.310	140.910	23.290	5.880	Unknown
229	WAA_SSS_400kHz_Chernofski-0106	53.3978071	-167.5112761	2.160	25.260	7.710	5.500	Unknown
230	WAA_SSS_400kHz_Chernofski-0147	53.3991719	-167.5163512	3.140	7.110	3.240	6.490	Unknown
231	WAA_SSS_400kHz_Chernofski-0151	53.3995694	-167.5185769	1.380	3.550	3.370	2.180	Unknown
232	WAA_SSS_400kHz_Chernofski-0193	53.4031627	-167.5116806	0.360	17.920	3.320	4.530	piling
233	WAA_SSS_400kHz_Chernofski-0197	53.4035865	-167.5107587	0.430	8.680	2.840	5.030	Unknown
234	WAA_SSS_400kHz_Chernofski-0194	53.4031743	-167.5116705	0.630	7.070	6.460	7.880	Unknown
235	WAA_SSS_400kHz_Chernofski-0185	53.4028673	-167.5104534	0.370	10.160	3.130	5.940	Unknown
236	WAA_SSS_400kHz_Chernofski-0188	53.4030167	-167.5105117	1.390	5.370	5.380	16.720	Unknown
237	WAA_SSS_400kHz_Chernofski-0182	53.4028585	-167.5102076	0.430	43.090	4.200	6.740	piling
238	WAA_SSS_400kHz_Chernofski-0183	53.4028625	-167.5092896	1.570	8.400	2.080	3.190	Unknown
239	WAA_SSS_400kHz_Chernofski-0180	53.4028085	-167.5092386	0.850	4.270	1.270	2.390	Unknown
240	WAA_SSS_400kHz_Chernofski-0179	53.4027937	-167.5096956	0.610	6.700	4.520	5.790	Unknown
241	WAA_SSS_400kHz_Chernofski-0174	53.4026536	-167.5093566	0.410	11.290	2.040	4.160	Unknown
242	WAA_SSS_400kHz_Chernofski-0186	53.4029523	-167.5085028	0.400	17.080	1.980	5.130	piling
243	WAA_SSS_400kHz_Chernofski-0113	53.3980672	-167.5034681	0.340	7.450	3.760	1.320	Unknown
244	WAA_SSS_400kHz_Chernofski-0110	53.3979229	-167.5030149	0.680	4.850	1.860	1.850	Unknown
245	WAA_SSS_400kHz_Chernofski-0111	53.3979841	-167.5027085	0.460	15.130	0.770	2.420	Unknown
246	WAA_SSS_400kHz_Chernofski-0108	53.3978451	-167.5023552	0.850	4.330	1.560	4.270	Unknown
247	WAA_SSS_400kHz_Chernofski-0100	53.3972578	-167.5026817	0.340	13.430	3.780	3.210	Unknown
248	WAA_SSS_400kHz_Chernofski-0095	53.3970544	-167.5009736	0.350	17.890	2.480	1.830	piling
249	WAA_SSS_400kHz_Chernofski-0080	53.3961456	-167.5007664	1.010	4.820	2.680	5.790	Unknown
250	WAA_SSS_400kHz_Chernofski-0079	53.3961449	-167.5007572	0.340	3.610	3.180	1.760	Unknown
251	WAA_SSS_400kHz_Chernofski-0081	53.3961514	-167.5007456	1.780	4.310	3.780	9.440	Unknown
252	WAA_SSS_400kHz_Chernofski-0063	53.3941148	-167.4994123	3.820	55.390	13.270	14.440	Unknown
253	WAA_SSS_400kHz_Chernofski-0059	53.3931879	-167.4985681	0.610	3.520	2.410	1.120	Unknown
254	WAA_SSS_400kHz_Chernofski-0058	53.3929656	-167.4973133	0.840	1.100	0.770	4.040	Unknown
255	WAA_SSS_400kHz_Chernofski-0055	53.3928052	-167.4965733	2.810	6.540	6.480	24.980	Unknown
256	WAA_SSS_400kHz_Chernofski-0038	53.3908805	-167.4900741	0.820	4.580	2.470	7.940	Unknown
257	WAA_SSS_400kHz_Chernofski-0036	53.3908116	-167.4902336	1.160	11.990	1.980	6.200	Unknown
258	WAA_SSS_400kHz_Chernofski-0043	53.3912955	-167.5108111	1.170	5.290	3.040	2.810	Unknown
259	WAA_SSS_400kHz_Chernofski-0018	53.3880075	-167.5059381	2.520	5.860	1.960	4.630	Unknown
260	WAA_SSS_400kHz_Chernofski-0019	53.3882439	-167.5052651	3.870	10.880	6.370	8.720	Unknown
261	WAA_SSS_400kHz_Chernofski-0020	53.3883710	-167.5052593	5.290	13.050	3.220	6.570	Unknown
262	WAA_SSS_400kHz_Chernofski-0031	53.3903708	-167.5099126	2.400	3.460	2.810	4.740	Unknown
263	WAA_SSS_400kHz_Chernofski-0016	53.3879218	-167.5062293	1.900	5.000	2.900	3.780	Unknown
264	WAA_SSS_400kHz_Chernofski-0017	53.3879531	-167.5063232	3.840	5.960	1.850	9.850	Unknown
265	WAA_SSS_400kHz_Chernofski-0014	53.3878575	-167.5062243	1.860	4.460	3.880	3.940	Fish Trap
266	WAA_SSS_400kHz_Chernofski-0005	53.3851313	-167.5022346	0.830	13.350	1.560	6.910	piling
267	WAA_SSS_400kHz_Chernofski-0001	53.3847952	-167.5014660	1.070	5.580	1.370	9.870	Unknown
268	WAA_SSS_400kHz_Chernofski-0002	53.3848262	-167.5008983	0.700	58.520	1.540	3.650	piling
269	WAA_SSS_400kHz_Chernofski-0054	53.3928025	-167.4965963	3.280	7.110	5.930	24.580	Unknown
270	WAA_SSS_400kHz_Chernofski-0088	53.3966522	-167.5006807	1.030	10.580	2.330	4.090	Unknown
271	WAA_SSS_400kHz_Chernofski-0166	53.4018310	-167.5085680	1.840	13.350	3.540	8.720	Unknown
272	WAA_SSS_400kHz_Chernofski-0133	53.3986621	-167.5212313	5.440	10.470	5.430	15.560	Unknown
273	WAA_SSS_400kHz_Chernofski-0132	53.3986544	-167.5212813	1.430	9.410	1.730	3.460	Unknown
274	WAA_SSS_400kHz_Chernofski-0123	53.3985545	-167.5208879	2.060	3.980	3.950	7.410	Fish Trap
275	WAA_SSS_400kHz_Chernofski-0124	53.3985788	-167.5205584	2.000	7.650	5.550	16.550	Unknown
276	WAA_SSS_400kHz_DutchHarborDock1_3	53.8911626	-166.5343680	0.430	3.480	1.510	1.030	unknown
277	WAA_SSS_400kHz_DutchHarborDock1_4	53.8903457	-166.5323892	0.450	4.780	1.130	1.360	unknown
278	WAA_SSS_400kHz_DutchHarborDock1_5	53.8894969	-166.5292066	5.210	25.000	15.600	16.660	unknown
279	WAA_SSS_400kHz_DutchHarborDock1_2	53.8942181	-166.5360660	1.590	5.980	2.330	7.240	unknown
280	WAA_SSS_400kHz_DutchHarborDock1_1	53.8962038	-166.5368948	1.310	6.270	3.180	6.790	unknown
281	WAA_SSS_400kHz_DutchHarborDock1_0110	53.8892802	-166.5301748	0.460	10.750	0.990	2.200	piling
282	WAA_SSS_400kHz_DutchHarborDock1_0105	53.8893677	-166.5299569	0.180	4.600	1.610	1.160	unknown
283	WAA_SSS_400kHz_DutchHarborDock1_0113	53.8891443	-166.5305068	1.250	3.120	0.780	6.150	unknown
284	WAA_SSS_400kHz_DutchHarborDock1_0111	53.8892133	-166.5302558	0.750	8.190	1.180	4.060	unknown
285	WAA_SSS_400kHz_DutchHarborDock1_0098	53.8895744	-166.5303043	2.400	1.560	1.160	10.670	unknown
286	WAA_SSS_400kHz_DutchHarborDock1_0107	53.8893028	-166.5305635	1.560	1.610	1.620	3.480	unknown

287	WAA_SSS_400kHz_DutchHarborDock1_0109	53.8892998	-166.5305482	1.490	1.870	1.050	3.480	unknown
288	WAA_SSS_400kHz_DutchHarborDock1_0108	53.8893000	-166.5305248	1.490	2.510	2.420	3.600	unknown
289	WAA_SSS_400kHz_DutchHarborDock1_0102	53.8894713	-166.5307882	1.720	2.390	1.350	4.640	unknown
290	WAA_SSS_400kHz_DutchHarborDock1_0101	53.8894807	-166.5307396	1.890	2.990	0.820	8.120	unknown
291	WAA_SSS_400kHz_DutchHarborDock1_0104	53.8894459	-166.5307623	1.830	2.580	1.600	8.720	unknown
292	WAA_SSS_400kHz_DutchHarborDock1_0100	53.8894915	-166.5316699	1.190	3.740	2.200	3.460	tire
293	WAA_SSS_400kHz_DutchHarborDock1_0094	53.8898312	-166.5318235	1.200	2.660	1.050	5.890	unknown
294	WAA_SSS_400kHz_DutchHarborDock1_0090	53.8906402	-166.5336824	0.500	21.380	1.120	2.020	piling
295	WAA_SSS_400kHz_DutchHarborDock1_0091	53.8901897	-166.5339587	0.260	11.120	0.940	3.000	piling
296	WAA_SSS_400kHz_DutchHarborDock1_0087	53.8908916	-166.5341412	1.720	9.070	7.540	3.620	unknown
297	WAA_SSS_400kHz_DutchHarborDock1_0071	53.8913056	-166.5342728	0.410	3.800	4.660	0.560	debris
298	WAA_SSS_400kHz_DutchHarborDock1_0068	53.8914104	-166.5336590	0.890	12.800	0.680	2.250	piling
299	WAA_SSS_400kHz_DutchHarborDock1_0078	53.8910757	-166.5337078	0.710	18.870	1.510	2.630	piling
300	WAA_SSS_400kHz_DutchHarborDock1_0070	53.8913185	-166.5337953	0.480	14.080	1.500	1.130	piling
301	WAA_SSS_400kHz_DutchHarborDock1_0069	53.8913185	-166.5335637	1.940	1.310	2.070	7.510	unknown
302	WAA_SSS_400kHz_DutchHarborDock1_0072	53.8912574	-166.5335418	0.950	8.800	4.300	3.610	unknown
303	WAA_SSS_400kHz_DutchHarborDock1_0076	53.8911570	-166.5332927	0.910	47.550	2.450	3.970	piling
304	WAA_SSS_400kHz_DutchHarborDock1_0081	53.8910144	-166.5335430	1.230	3.970	1.760	2.190	unknown
305	WAA_SSS_400kHz_DutchHarborDock1_0073	53.8911741	-166.5334660	0.280	19.700	1.070	1.070	piling
306	WAA_SSS_400kHz_DutchHarborDock1_0085	53.8909531	-166.5338524	0.970	12.990	1.740	1.470	piling
307	WAA_SSS_400kHz_DutchHarborDock1_0084	53.8909552	-166.5339008	0.750	15.180	0.840	1.310	piling
308	WAA_SSS_400kHz_DutchHarborDock1_0079	53.8910722	-166.5338987	1.260	3.070	2.060	4.280	unknown
309	WAA_SSS_400kHz_DutchHarborDock1_0082	53.8910143	-166.5338746	1.120	9.350	1.700	3.350	debris
310	WAA_SSS_400kHz_DutchHarborDock1_0077	53.8911325	-166.5341648	0.870	15.710	3.120	1.280	debris
311	WAA_SSS_400kHz_DutchHarborDock1_0075	53.8911576	-166.5344127	0.420	5.400	1.030	1.450	debris
312	WAA_SSS_400kHz_DutchHarborDock1_0080	53.8910596	-166.5342009	1.020	9.860	2.240	3.080	debris
313	WAA_SSS_400kHz_DutchHarborDock1_0088	53.8908663	-166.5341431	0.270	6.610	0.910	0.430	unknown
314	WAA_SSS_400kHz_DutchHarborDock1_0086	53.8909370	-166.5338940	3.690	10.300	3.640	27.200	debris
315	WAA_SSS_400kHz_DutchHarborDock1_0089	53.8908603	-166.5338920	0.000	11.610	1.300	0.000	piling
316	WAA_SSS_400kHz_DutchHarborDock1_0103	53.8894703	-166.5316662	1.280	6.030	2.570	4.180	unknown
317	WAA_SSS_400kHz_DutchHarborDock1_0097	53.8895824	-166.5310864	0.550	3.510	4.120	1.860	tire
318	WAA_SSS_400kHz_DutchHarborDock1_0052	53.8919736	-166.5356158	1.330	4.350	3.830	2.840	tire
319	WAA_SSS_400kHz_DutchHarborDock1_0050	53.8920099	-166.5354085	1.750	34.840	2.660	3.010	piling
320	WAA_SSS_400kHz_DutchHarborDock1_0049	53.8920149	-166.5360852	0.180	36.930	1.630	1.240	piling
321	WAA_SSS_400kHz_DutchHarborDock1_0036	53.8925055	-166.5362208	1.180	2.650	1.470	11.470	unknown
322	WAA_SSS_400kHz_DutchHarborDock1_0026	53.8933202	-166.5357008	0.690	20.870	1.680	3.750	piling
323	WAA_SSS_400kHz_DutchHarborDock1_0028	53.8932647	-166.5357352	0.310	7.630	2.820	1.410	debris
324	WAA_SSS_400kHz_DutchHarborDock1_0025	53.8934079	-166.5356799	1.380	1.730	1.470	8.440	unknown
325	WAA_SSS_400kHz_DutchHarborDock1_0023	53.8934470	-166.5357028	0.650	1.870	1.930	3.870	unknown
326	WAA_SSS_400kHz_DutchHarborDock1_0029	53.8931739	-166.5357733	0.810	3.390	1.830	2.930	tire
327	WAA_SSS_400kHz_DutchHarborDock1_0030	53.8931382	-166.5358488	0.630	3.090	1.640	1.450	debris
328	WAA_SSS_400kHz_DutchHarborDock1_0032	53.8926917	-166.5364371	0.830	5.090	1.890	8.400	unknown
329	WAA_SSS_400kHz_DutchHarborDock1_0039	53.8922424	-166.5347819	0.860	2.750	1.140	4.570	unknown
330	WAA_SSS_400kHz_DutchHarborDock1_0043	53.8920695	-166.5350246	1.540	17.280	8.010	3.850	debris cluster
331	WAA_SSS_400kHz_DutchHarborDock1_0047	53.8920259	-166.5347685	0.340	7.240	1.370	1.580	debris
332	WAA_SSS_400kHz_DutchHarborDock1_0041	53.8921055	-166.5351003	1.840	4.250	3.360	3.650	debris
333	WAA_SSS_400kHz_DutchHarborDock1_0053	53.8918998	-166.5351182	1.130	10.100	2.870	1.700	debris
334	WAA_SSS_400kHz_DutchHarborDock1_0055	53.8918594	-166.5350453	0.940	9.530	3.430	2.090	debris
335	WAA_SSS_400kHz_DutchHarborDock1_0058	53.8917315	-166.5349479	0.440	24.310	1.370	1.330	piling
336	WAA_SSS_400kHz_DutchHarborDock1_0061	53.8916668	-166.5349516	0.720	18.810	2.260	2.090	piling
337	WAA_SSS_400kHz_DutchHarborDock1_0063	53.8916309	-166.5349217	0.200	14.070	1.000	0.660	piling
338	WAA_SSS_400kHz_DutchHarborDock1_0057	53.8917397	-166.5350345	0.380	9.720	2.680	0.760	kayak
339	WAA_SSS_400kHz_DutchHarborDock1_0067	53.8915677	-166.5349915	1.240	37.310	1.860	2.630	piling
340	WAA_SSS_400kHz_DutchHarborDock1_0114	53.8890027	-166.5300841	2.000	8.280	4.810	13.060	unknown
341	WAA_SSS_400kHz_DutchHarborDock1_0115	53.8889372	-166.5299694	2.330	6.130	2.490	17.680	unknown
342	WAA_SSS_400kHz_DutchHarborDock1_0083	53.8909601	-166.5322777	0.670	28.310	1.850	1.590	piling
343	WAA_SSS_400kHz_DutchHarborDock1_0064	53.8916024	-166.5336491	0.890	16.410	1.910	1.060	
344	WAA_SSS_400kHz_DutchHarborDock1_0059	53.8917042	-166.5336222	0.550	23.540	1.090	0.790	piling
345	WAA_SSS_400kHz_DutchHarborDock1_0056	53.8917693	-166.5338099	1.050	11.620	2.510	1.320	piling
346	WAA_SSS_400kHz_DutchHarborDock1_0060	53.8916863	-166.5334227	1.300	6.360	4.480	2.380	fish trap
347	WAA_SSS_400kHz_DutchHarborDock1_0062	53.8916581	-166.5332314	1.100	9.400	0.960	2.390	piling
348	WAA_SSS_400kHz_DutchHarborDock1_0044	53.8920606	-166.5338743	1.090	22.600	1.600	2.140	piling
349	WAA_SSS_400kHz_DutchHarborDock1_0045	53.8920331	-166.5342687	1.920	60.130	3.000	2.410	piling
350	WAA_SSS_400kHz_DutchHarborDock1_0042	53.8921019	-166.5341867	0.510	21.580	1.900	0.800	piling
351	WAA_SSS_400kHz_DutchHarborDock1_0040	53.8921989	-166.5342536	0.850	44.300	1.630	1.610	piling
352	WAA_SSS_400kHz_DutchHarborDock1_0038	53.8922652	-166.5344629	2.250	41.600	54.160	3.990	debris cluster
353	WAA_SSS_400kHz_DutchHarborDock1_0037	53.8923629	-166.5345801	0.950	26.440	2.530	1.870	piling
354	WAA_SSS_400kHz_DutchHarborDock1_0022	53.8938915	-166.5363277	1.220	5.840	1.660	2.300	unknown
355	WAA_SSS_400kHz_DutchHarborDock1_0027	53.8932757	-166.5349011	0.350	46.470	1.810	1.280	piling
356	WAA_SSS_400kHz_DutchHarborDock1_0033	53.8926519	-166.5345573	1.200	18.610	1.730	1.490	piling
357	WAA_SSS_400kHz_DutchHarborDock1_0046	53.8920303	-166.5344228	1.410	17.020	11.220	1.870	debris cluster
358	WAA_SSS_400kHz_DutchHarborDock1_0051	53.8919979	-166.5342757	0.860	26.000	2.640	1.080	piling

359	WAA_SSS_400kHz_DutchHarborDock1_0048	53.8920216	-166.5346616	1.740	15.760	7.930	2.930	unknown
360	WAA_SSS_400kHz_DutchHarborDock1_0106	53.8893621	-166.5300666	0.930	22.010	1.580	1.760	piling
361	WAA_SSS_400kHz_DutchHarborDock1_0112	53.8891476	-166.5287941	0.760	17.170	13.850	5.360	unknown
362	WAA_SSS_400kHz_DutchHarborDock1_0096	53.8897073	-166.5303524	2.210	5.310	4.180	5.310	unknown
363	WAA_SSS_400kHz_DutchHarborDock1_0074	53.8911615	-166.5324674	1.450	4.790	5.050	2.340	unknown
364	WAA_SSS_400kHz_DutchHarborDock1_0020	53.8941325	-166.5364410	1.310	6.470	6.130	3.900	unknown
365	WAA_SSS_400kHz_DutchHarborDock1_0018	53.8943662	-166.5356881	1.710	1.960	1.550	10.310	unknown
366	WAA_SSS_400kHz_DutchHarborDock1_0016	53.8944427	-166.5356749	0.330	3.320	1.540	2.180	debris
367	WAA_SSS_400kHz_DutchHarborDock1_0017	53.8944129	-166.5356056	0.910	5.660	1.850	2.920	unknown
368	WAA_SSS_400kHz_DutchHarborDock1_0019	53.8942543	-166.5352579	1.000	3.620	2.860	2.690	unknown
369	WAA_SSS_400kHz_DutchHarborDock1_0092	53.8899515	-166.5289881	2.840	37.220	2.570	3.200	piling
370	WAA_SSS_400kHz_DutchHarborDock1_0099	53.8895126	-166.5289847	0.570	8.800	2.050	2.450	unknown
371	WAA_SSS_400kHz_DutchHarborDock1_0054	53.8918615	-166.5324008	2.020	8.410	6.990	3.570	unknown
372	WAA_SSS_400kHz_DutchHarborDock1_0035	53.8925324	-166.5324593	1.430	9.730	7.040	1.810	unknown
373	WAA_SSS_400kHz_DutchHarborDock1_0010	53.8959401	-166.5367456	0.590	7.240	1.300	2.430	unknown
374	WAA_SSS_400kHz_DutchHarborDock1_0011	53.8958287	-166.5362170	0.300	10.170	1.800	1.640	piling
375	WAA_SSS_400kHz_DutchHarborDock1_0014	53.8955094	-166.5369823	2.550	5.550	3.950	7.120	unknown
376	WAA_SSS_400kHz_DutchHarborDock1_0015	53.8948607	-166.5353626	6.200	26.670	9.200	9.650	unknown
377	WAA_SSS_400kHz_DutchHarborDock1_0031	53.8929817	-166.5325463	2.490	12.390	8.560	3.010	unknown
378	WAA_SSS_400kHz_DutchHarborDock1_0034	53.8925886	-166.5329329	1.010	9.640	2.030	1.760	unknown
379	WAA_SSS_400kHz_DutchHarborDock1_0065	53.8915823	-166.5304569	0.000	10.940	6.590	0.000	unknown
380	WAA_SSS_400kHz_DutchHarborDock1_0066	53.8915759	-166.5301736	1.840	11.480	9.410	2.790	fish trap
381	WAA_SSS_400kHz_DutchHarborDock1_0095	53.8898010	-166.5281216	0.720	7.870	1.240	3.480	unknown
382	WAA_SSS_400kHz_DutchHarborDock1_0012	53.8956503	-166.5368406	0.700	10.300	1.970	1.640	unknown
383	WAA_SSS_400kHz_DutchHarborDock1_0013	53.8955733	-166.5370478	1.710	8.610	4.490	6.960	unknown
384	WAA_SSS_400kHz_DutchHarborDock1_0009	53.8960839	-166.5362026	0.580	12.410	2.830	3.540	unknown
385	WAA_SSS_400kHz_DutchHarborDock1_0004	53.8962723	-166.5365870	3.980	23.290	8.080	7.500	wreck
386	WAA_SSS_400kHz_DutchHarborDock1_0007	53.8961910	-166.5366652	0.920	17.570	0.820	1.160	piling
387	WAA_SSS_400kHz_DutchHarborDock1_0006	53.8962191	-166.5364638	1.110	7.090	2.610	1.620	unknown
388	WAA_SSS_400kHz_DutchHarborDock1_0002	53.8963168	-166.5364169	0.000	12.270	1.070	0.000	piling
389	WAA_SSS_400kHz_DutchHarborDock1_0093	53.8898489	-166.5265839	0.700	12.830	3.760	2.820	unknown
390	WAA_SSS_400kHz_DutchHarborDock1_0021	53.8939018	-166.5327859	0.000	9.490	6.480	0.000	unknown
391	WAA_SSS_400kHz_DutchHarborDock1_0008	53.8961695	-166.5363217	1.210	9.930	1.900	2.320	piling
392	WAA_SSS_400kHz_DutchHarborDock1_0003	53.8962817	-166.5367995	0.560	23.310	2.750	2.400	piling
393	WAA_SSS_400kHz_DutchHarborDock1_0001	53.8967665	-166.5359722	5.770	10.150	4.280	10.730	unknown
394	WAA_SSS_400kHz_DutchHarborDock1_0005	53.8962506	-166.5346078	0.600	6.000	3.090	1.310	unknown
395	WAA_SSS_400kHz_DutchHarborDock1_0024	53.8934193	-166.5305653	1.540	20.460	1.490	2.240	piling
396	WAA_SSS_400kHz_DutchHarborFuelDock_1	53.8847169	-166.5276597	4.110	3.580	1.510	6.410	Unknown
397	WAA_SSS_400kHz_DutchHarborFuelDock_2	53.8846155	-166.5276534	1.770	1.090	1.060	2.120	Unknown
398	WAA_SSS_400kHz_DutchHarborFuelDock_3	53.8845163	-166.5279253	4.160	2.040	1.010	4.810	Unknown
399	WAA_SSS_400kHz_DutchHarborFuelDock_5	53.8835638	-166.5296482	1.320	4.740	2.740	1.490	Box
400	WAA_SSS_400kHz_DutchHarborFuelDock_4	53.8842994	-166.5291761	0.000	4.210	1.720	0.000	Unknown
401	WAA_SSS_400kHz_DutchHarborFuelDock_6	53.8825086	-166.5317987	2.680	5.690	1.500	3.340	Unknown
402	WAA_SSS_400kHz_DutchHarborFuelDock_0050	53.8820658	-166.5329502	1.330	4.320	2.790	4.290	Unknown
403	WAA_SSS_400kHz_DutchHarborFuelDock_0046	53.8824662	-166.5326699	1.080	3.220	1.650	1.430	Unknown
404	WAA_SSS_400kHz_DutchHarborFuelDock_0043	53.8826141	-166.5319110	1.800	4.160	3.540	5.200	Unknown
405	WAA_SSS_400kHz_DutchHarborFuelDock_0042	53.8826248	-166.5317098	1.720	6.380	8.210	7.140	fish trap
406	WAA_SSS_400kHz_DutchHarborFuelDock_0001	53.8853056	-166.5283695	2.740	9.370	4.420	15.420	Unknown
407	WAA_SSS_400kHz_DutchHarborFuelDock_0006	53.8846423	-166.5283102	1.240	10.250	3.170	14.950	Unknown
408	WAA_SSS_400kHz_DutchHarborFuelDock_0004	53.8847524	-166.5288986	0.810	21.070	1.360	1.070	piling
409	WAA_SSS_400kHz_DutchHarborFuelDock_0005	53.8846927	-166.5287487	0.660	14.570	7.590	1.500	Unknown
410	WAA_SSS_400kHz_DutchHarborFuelDock_0013	53.8841488	-166.5289440	0.810	3.740	1.920	3.860	Unknown
411	WAA_SSS_400kHz_DutchHarborFuelDock_0016	53.8840616	-166.5291637	1.170	3.720	1.820	3.420	Unknown
412	WAA_SSS_400kHz_DutchHarborFuelDock_0021	53.8838005	-166.5297039	4.410	7.900	8.430	9.460	fish trap
413	WAA_SSS_400kHz_DutchHarborFuelDock_0023	53.8837648	-166.5297182	1.920	11.450	4.120	3.910	Unknown
414	WAA_SSS_400kHz_DutchHarborFuelDock_0028	53.8834320	-166.5303918	4.010	7.600	7.740	7.090	fish trap
415	WAA_SSS_400kHz_DutchHarborFuelDock_0030	53.8833216	-166.5302409	0.650	5.710	2.690	1.720	Unknown
416	WAA_SSS_400kHz_DutchHarborFuelDock_0031	53.8833016	-166.5307799	2.440	5.980	4.020	2.760	fish trap
417	WAA_SSS_400kHz_DutchHarborFuelDock_0033	53.8832387	-166.5305078	1.950	7.690	7.280	3.830	fish trap
418	WAA_SSS_400kHz_DutchHarborFuelDock_0037	53.8829933	-166.5308959	0.850	37.220	1.690	1.680	piling
419	WAA_SSS_400kHz_DutchHarborFuelDock_0034	53.8831140	-166.5311146	4.360	6.380	5.740	5.170	fish trap
420	WAA_SSS_400kHz_DutchHarborFuelDock_0039	53.8829400	-166.5310816	0.700	25.130	1.930	1.220	piling
421	WAA_SSS_400kHz_DutchHarborFuelDock_0040	53.8828033	-166.5309925	0.490	14.170	4.240	1.210	Unknown
422	WAA_SSS_400kHz_DutchHarborFuelDock_0011	53.8842902	-166.5295168	2.290	8.220	8.480	3.680	fish trap
423	WAA_SSS_400kHz_DutchHarborFuelDock_0012	53.8842663	-166.5295690	2.600	6.780	6.360	4.990	fish trap
424	WAA_SSS_400kHz_DutchHarborFuelDock_0008	53.8845819	-166.5294819	1.670	11.120	4.320	5.730	debris
425	WAA_SSS_400kHz_DutchHarborFuelDock_0002	53.8849151	-166.5288383	1.740	17.790	1.320	4.090	piling
426	WAA_SSS_400kHz_DutchHarborFuelDock_0015	53.8840651	-166.5274622	1.470	7.510	2.640	7.460	Unknown
427	WAA_SSS_400kHz_DutchHarborFuelDock_0020	53.8838372	-166.5277695	2.900	7.840	3.320	18.270	debris
428	WAA_SSS_400kHz_DutchHarborFuelDock_0022	53.8837926	-166.5278756	2.540	11.320	8.960	16.040	fish trap
429	WAA_SSS_400kHz_DutchHarborFuelDock_0024	53.8837227	-166.5280458	2.600	7.650	5.560	14.100	fish trap
430	WAA_SSS_400kHz_DutchHarborFuelDock_0009	53.8843858	-166.5290377	1.590	19.300	5.410	5.880	debris

431	WAA_SSS_400kHz_DutchHarborFuelDock_0014	53.8840671	-166.5293195	1.920	10.090	4.560	4.230	debris
432	WAA_SSS_400kHz_DutchHarborFuelDock_0018	53.8839530	-166.5297480	1.880	9.040	4.520	4.990	debris
433	WAA_SSS_400kHz_DutchHarborFuelDock_0032	53.8832834	-166.5289971	3.480	10.010	4.500	8.240	fish trap
434	WAA_SSS_400kHz_DutchHarborFuelDock_0036	53.8830472	-166.5292661	0.740	13.040	2.670	1.570	debris
435	WAA_SSS_400kHz_DutchHarborFuelDock_0051	53.8819939	-166.5312033	1.330	23.420	2.500	1.470	piling
436	WAA_SSS_400kHz_DutchHarborFuelDock_0035	53.8831005	-166.5303045	0.480	10.540	5.110	1.020	Unknown
437	WAA_SSS_400kHz_DutchHarborFuelDock_0029	53.8833474	-166.5303823	2.770	8.950	6.190	8.240	fish trap
438	WAA_SSS_400kHz_DutchHarborFuelDock_0003	53.8848288	-166.5263276	1.670	5.020	1.960	1.760	Unknown
439	WAA_SSS_400kHz_DutchHarborFuelDock_0010	53.8843072	-166.5269973	1.110	21.610	11.000	1.560	Unknown
440	WAA_SSS_400kHz_DutchHarborFuelDock_0038	53.8829850	-166.5287202	2.350	12.160	8.130	2.740	Unknown
441	WAA_SSS_400kHz_DutchHarborFuelDock_0047	53.8822820	-166.5286121	0.480	79.060	3.120	1.430	piling
442	WAA_SSS_400kHz_DutchHarborFuelDock_0044	53.8825198	-166.5304474	0.450	67.800	2.310	1.030	piling
443	WAA_SSS_400kHz_DutchHarborFuelDock_0053	53.8815560	-166.5294527	1.290	4.400	2.990	2.970	Unknown
444	WAA_SSS_400kHz_DutchHarborFuelDock_0045	53.8825193	-166.5301428	1.370	7.140	4.010	3.580	Unknown
445	WAA_SSS_400kHz_DutchHarborFuelDock_0026	53.8835608	-166.5267379	0.670	12.910	7.070	1.490	Unknown
446	WAA_SSS_400kHz_DutchHarborFuelDock_0054	53.8811212	-166.5312019	1.170	4.670	1.700	2.790	Unknown
447	WAA_SSS_400kHz_DutchHarborFuelDock_0052	53.8816275	-166.5309841	0.510	5.670	1.290	1.550	Unknown
448	WAA_SSS_400kHz_DutchHarborFuelDock_0019	53.8838459	-166.5253328	1.080	9.370	3.310	3.620	Unknown
449	WAA_SSS_400kHz_DutchHarborFuelDock_0007	53.8846041	-166.5248568	0.500	4.220	2.490	1.280	Unknown
450	WAA_SSS_400kHz_DutchHarborFuelDock_0017	53.8839678	-166.5253445	2.610	5.440	5.160	2.920	debris
451	WAA_SSS_400kHz_DutchHarborFuelDock_0025	53.8837037	-166.5252426	2.870	8.870	2.060	4.950	Unknown
452	WAA_SSS_400kHz_DutchHarborFuelDock_0027	53.8835194	-166.5253056	2.390	7.120	2.490	5.130	Unknown
453	WAA_SSS_400kHz_DutchHarborFuelDock_0041	53.8826414	-166.5284540	0.830	17.470	4.220	1.770	Unknown
454	WAA_SSS_400kHz_DutchHarborFuelDock_0049	53.8821406	-166.5280028	1.340	36.230	2.320	1.490	piling
455	WAA_SSS_400kHz_DutchHarborFuelDock_0048	53.8822080	-166.5287695	0.400	32.060	1.190	0.590	piling
456	WAA_SSS_400kHz_DutchHarborLandFill_3	53.8851927	-166.5161838	1.360	6.840	1.920	2.740	Cylinder
457	WAA_SSS_400kHz_DutchHarborLandFill_5	53.8841440	-166.5190715	1.610	6.230	2.830	2.550	Box
458	WAA_SSS_400kHz_DutchHarborLandFill_7	53.8832338	-166.5145227	3.290	2.700	4.820	4.810	Unknown
459	WAA_SSS_400kHz_DutchHarborLandFill_8	53.8830972	-166.5143348	1.050	8.100	4.210	2.100	Unknown
460	WAA_SSS_400kHz_DutchHarborLandFill_4	53.8851787	-166.5104110	1.880	3.780	2.770	7.640	Unknown
461	WAA_SSS_400kHz_DutchHarborLandFill_2	53.8854436	-166.5102595	0.570	3.250	1.860	1.830	Unknown
462	WAA_SSS_400kHz_DutchHarborLandFill_1	53.8855012	-166.5102018	0.590	2.770	1.260	1.840	Unknown
463	WAA_SSS_400kHz_DutchHarborLandFill_9	53.8822245	-166.5155306	1.950	2.130	3.200	4.520	Unknown
464	WAA_SSS_400kHz_DutchHarborLandFill_6	53.8833078	-166.5120654	1.770	2.920	2.190	3.720	Unknown
465	WAA_SSS_400kHz_DutchHarborLandFill_10	53.8820286	-166.5133595	6.460	3.180	2.050	10.200	Unknown
466	WAA_SSS_400kHz_DutchHarborLandFill_12	53.8799752	-166.5160378	1.050	2.270	1.590	1.860	Unknown
467	WAA_SSS_400kHz_DutchHarborLandFill_11	53.8804139	-166.5145120	1.350	2.060	1.400	3.060	Unknown
468	WAA_SSS_400kHz_DutchHarborLandFill_0002	53.8921982	-166.5062703	2.100	8.620	4.950	2.200	debris
469	WAA_SSS_400kHz_DutchHarborLandFill_0001	53.8922770	-166.5072318	0.720	7.310	4.470	1.460	debris
470	WAA_SSS_400kHz_DutchHarborLandFill_0008	53.8916044	-166.5064985	0.980	7.210	4.610	2.080	debris
471	WAA_SSS_400kHz_DutchHarborLandFill_0005	53.8917904	-166.5082252	0.000	12.920	9.740	0.000	fish trap
472	WAA_SSS_400kHz_DutchHarborLandFill_0009	53.8915481	-166.5079537	3.600	11.680	11.710	5.560	debris
473	WAA_SSS_400kHz_DutchHarborLandFill_0026	53.8903887	-166.5087094	0.000	13.660	10.130	0.000	debris
474	WAA_SSS_400kHz_DutchHarborLandFill_0022	53.8906368	-166.5097757	1.730	12.220	7.980	2.400	debris
475	WAA_SSS_400kHz_DutchHarborLandFill_0020	53.8907137	-166.5100866	1.320	7.980	3.330	2.880	debris
476	WAA_SSS_400kHz_DutchHarborLandFill_0018	53.8907653	-166.5104117	0.000	15.730	5.560	0.000	debris
477	WAA_SSS_400kHz_DutchHarborLandFill_0041	53.8895601	-166.5119085	2.720	8.960	3.930	4.370	debris
478	WAA_SSS_400kHz_DutchHarborLandFill_0042	53.8893965	-166.5124034	1.840	11.750	7.340	3.470	debris
479	WAA_SSS_400kHz_DutchHarborLandFill_0047	53.8891037	-166.5123348	4.730	21.300	6.000	5.310	debris
480	WAA_SSS_400kHz_DutchHarborLandFill_0046	53.8892179	-166.5131984	0.000	10.920	6.940	0.000	debris
481	WAA_SSS_400kHz_DutchHarborLandFill_0051	53.8888809	-166.5134346	3.090	8.020	7.710	6.200	fish trap
482	WAA_SSS_400kHz_DutchHarborLandFill_0052	53.8887370	-166.5130651	2.030	9.450	5.790	2.290	fish trap
483	WAA_SSS_400kHz_DutchHarborLandFill_0056	53.8882473	-166.5129260	0.000	7.610	5.420	0.000	debris
484	WAA_SSS_400kHz_DutchHarborLandFill_0054	53.8882990	-166.5139370	0.000	36.930	9.790	0.000	debris
485	WAA_SSS_400kHz_DutchHarborLandFill_0055	53.8882931	-166.5142351	2.860	9.730	8.640	4.350	debris
486	WAA_SSS_400kHz_DutchHarborLandFill_0060	53.8880411	-166.5143441	2.950	30.060	15.630	3.200	debris cluster
487	WAA_SSS_400kHz_DutchHarborLandFill_0068	53.8878052	-166.5141581	6.480	14.490	7.040	9.580	debris
488	WAA_SSS_400kHz_DutchHarborLandFill_0069	53.8877684	-166.5137754	1.460	4.570	6.750	2.970	fish trap
489	WAA_SSS_400kHz_DutchHarborLandFill_0076	53.8875016	-166.5143565	0.000	20.470	6.170	0.000	debris cluster
490	WAA_SSS_400kHz_DutchHarborLandFill_0061	53.8880108	-166.5154339	2.410	6.340	7.700	5.180	fish trap
491	WAA_SSS_400kHz_DutchHarborLandFill_0062	53.8879497	-166.5157199	0.970	8.650	3.540	2.260	Unknown
492	WAA_SSS_400kHz_DutchHarborLandFill_0081	53.8874013	-166.5164491	2.460	10.820	10.090	5.220	debris
493	WAA_SSS_400kHz_DutchHarborLandFill_0086	53.8870345	-166.5153184	0.000	8.250	8.700	0.000	fish trap
494	WAA_SSS_400kHz_DutchHarborLandFill_0085	53.8870750	-166.5150750	0.000	7.180	2.380	0.000	debris
495	WAA_SSS_400kHz_DutchHarborLandFill_0091	53.8865167	-166.5164485	3.490	14.370	11.500	6.270	debris
496	WAA_SSS_400kHz_DutchHarborLandFill_0089	53.8865641	-166.5179299	3.000	7.540	4.650	5.540	debris
497	WAA_SSS_400kHz_DutchHarborLandFill_0088	53.8868128	-166.5181954	0.000	7.170	4.160	0.000	fish trap
498	WAA_SSS_400kHz_DutchHarborLandFill_0092	53.8863547	-166.5169277	0.000	8.620	5.200	0.000	debris
499	WAA_SSS_400kHz_DutchHarborLandFill_0096	53.8859449	-166.5184356	4.270	10.730	4.550	5.220	debris
500	WAA_SSS_400kHz_DutchHarborLandFill_0097	53.8858884	-166.5191878	1.750	8.210	8.730	2.980	fish trap
501	WAA_SSS_400kHz_DutchHarborLandFill_0100	53.8855622	-166.5189691	3.510	10.970	4.700	3.880	debris
502	WAA_SSS_400kHz_DutchHarborLandFill_0095	53.8860988	-166.5191739	0.000	8.760	3.690	0.000	debris

503	WAA_SSS_400kHz_DutchHarborLandFill_0101	53.8854500	-166.5198675	2.380	6.270	3.540	3.170	debris
504	WAA_SSS_400kHz_DutchHarborLandFill_0103	53.8852791	-166.5193360	0.000	7.050	5.830	0.000	debris
505	WAA_SSS_400kHz_DutchHarborLandFill_0110	53.8847420	-166.5193563	0.000	11.500	3.490	0.000	debris
506	WAA_SSS_400kHz_DutchHarborLandFill_0109	53.8847640	-166.5198078	4.180	7.050	7.050	8.510	debris
507	WAA_SSS_400kHz_DutchHarborLandFill_0105	53.8852114	-166.5207856	1.790	7.270	7.130	4.150	debris
508	WAA_SSS_400kHz_DutchHarborLandFill_0115	53.8842306	-166.5207705	0.960	6.590	3.430	1.570	debris
509	WAA_SSS_400kHz_DutchHarborLandFill_0124	53.8835841	-166.5233518	0.000	22.070	3.290	0.000	piling
510	WAA_SSS_400kHz_DutchHarborLandFill_0112	53.8843944	-166.5236344	0.000	5.920	4.780	0.000	debris
511	WAA_SSS_400kHz_DutchHarborLandFill_0119	53.8840804	-166.5219928	3.480	8.620	5.630	6.290	debris
512	WAA_SSS_400kHz_DutchHarborLandFill_0118	53.8841304	-166.5224053	3.210	22.670	6.600	3.520	Unknown
513	WAA_SSS_400kHz_DutchHarborLandFill_0104	53.8852221	-166.5217201	0.000	9.930	8.260	0.000	Unknown
514	WAA_SSS_400kHz_DutchHarborLandFill_0080	53.8874497	-166.5155077	1.870	8.810	7.830	2.710	fish trap
515	WAA_SSS_400kHz_DutchHarborLandFill_0079	53.8874576	-166.5157101	0.000	15.140	8.470	0.000	fish trap
516	WAA_SSS_400kHz_DutchHarborLandFill_0072	53.8876500	-166.5160510	2.100	9.640	8.440	2.690	debris
517	WAA_SSS_400kHz_DutchHarborLandFill_0084	53.8871135	-166.5159172	2.580	14.700	3.800	5.110	debris cluster
518	WAA_SSS_400kHz_DutchHarborLandFill_0050	53.8889216	-166.5141551	0.900	5.900	5.000	1.780	debris
519	WAA_SSS_400kHz_DutchHarborLandFill_0025	53.8905023	-166.5113588	0.000	8.120	6.460	0.000	fish trap
520	WAA_SSS_400kHz_DutchHarborLandFill_0019	53.8907537	-166.5093363	5.060	13.030	10.180	6.830	fish trap
521	WAA_SSS_400kHz_DutchHarborLandFill_0016	53.8907969	-166.5088653	1.720	12.780	6.990	3.290	debris
522	WAA_SSS_400kHz_DutchHarborLandFill_0011	53.8912564	-166.5076722	0.000	7.300	6.610	0.000	fish trap
523	WAA_SSS_400kHz_DutchHarborLandFill_0013	53.8912090	-166.5068093	1.230	47.170	2.360	2.000	piling
524	WAA_SSS_400kHz_DutchHarborLandFill_0017	53.8907797	-166.5076154	0.000	7.620	4.980	0.000	debris
525	WAA_SSS_400kHz_DutchHarborLandFill_0030	53.8901981	-166.5083653	0.000	9.450	6.970	0.000	debris
526	WAA_SSS_400kHz_DutchHarborLandFill_0027	53.8903837	-166.5087426	1.720	13.560	7.920	2.200	debris
527	WAA_SSS_400kHz_DutchHarborLandFill_0024	53.8906042	-166.5091644	1.890	5.470	3.410	2.450	debris
528	WAA_SSS_400kHz_DutchHarborLandFill_0045	53.8892431	-166.5105151	6.610	16.740	8.120	12.190	debris
529	WAA_SSS_400kHz_DutchHarborLandFill_0098	53.8857505	-166.5170955	5.070	11.720	7.760	10.240	fish trap
530	WAA_SSS_400kHz_DutchHarborLandFill_0099	53.8856526	-166.5174765	2.400	19.810	8.490	3.860	debris cluster
531	WAA_SSS_400kHz_DutchHarborLandFill_0117	53.8841557	-166.5212869	1.530	11.300	8.680	1.840	debris
532	WAA_SSS_400kHz_DutchHarborLandFill_0125	53.8835541	-166.5222058	1.050	6.530	2.210	1.680	debris
533	WAA_SSS_400kHz_DutchHarborLandFill_0123	53.8836429	-166.5202244	2.800	7.960	7.400	7.340	fish trap
534	WAA_SSS_400kHz_DutchHarborLandFill_0121	53.8838414	-166.5199130	2.110	6.050	4.390	4.940	debris
535	WAA_SSS_400kHz_DutchHarborLandFill_0107	53.8849681	-166.5179560	1.420	6.130	4.380	2.770	debris
536	WAA_SSS_400kHz_DutchHarborLandFill_0108	53.8848189	-166.5175672	0.000	15.560	14.370	0.000	debris
537	WAA_SSS_400kHz_DutchHarborLandFill_0083	53.8872809	-166.5129568	2.190	9.190	4.860	5.670	debris
538	WAA_SSS_400kHz_DutchHarborLandFill_0064	53.8878700	-166.5123708	3.030	5.450	7.860	5.420	debris
539	WAA_SSS_400kHz_DutchHarborLandFill_0065	53.8878145	-166.5122122	5.250	28.120	7.670	12.050	debris cluster
540	WAA_SSS_400kHz_DutchHarborLandFill_0071	53.8876974	-166.5119202	0.000	17.640	10.410	0.000	debris cluster
541	WAA_SSS_400kHz_DutchHarborLandFill_0067	53.8878055	-166.5119417	0.000	6.340	6.030	0.000	fish trap
542	WAA_SSS_400kHz_DutchHarborLandFill_0059	53.8880451	-166.5119286	2.080	12.170	8.630	4.450	debris
543	WAA_SSS_400kHz_DutchHarborLandFill_0038	53.8899338	-166.5081282	2.280	6.690	6.830	5.340	fish trap
544	WAA_SSS_400kHz_DutchHarborLandFill_0039	53.8898110	-166.5084855	1.400	5.930	4.270	2.980	debris
545	WAA_SSS_400kHz_DutchHarborLandFill_0033	53.8901283	-166.5078004	2.510	6.490	6.130	5.570	debris
546	WAA_SSS_400kHz_DutchHarborLandFill_0028	53.8903765	-166.5071495	2.420	11.250	5.960	6.540	debris
547	WAA_SSS_400kHz_DutchHarborLandFill_0006	53.8916378	-166.5051511	2.080	5.110	3.930	3.510	debris
548	WAA_SSS_400kHz_DutchHarborLandFill_0007	53.8916134	-166.5049499	1.520	24.170	3.920	3.230	debris
549	WAA_SSS_400kHz_DutchHarborLandFill_0004	53.8918835	-166.5058958	1.210	5.170	5.290	3.860	debris
550	WAA_SSS_400kHz_DutchHarborLandFill_0063	53.8878726	-166.5113005	1.840	11.780	8.570	4.920	debris
551	WAA_SSS_400kHz_DutchHarborLandFill_0106	53.8850914	-166.5186599	2.510	19.150	8.620	5.420	Unknown
552	WAA_SSS_400kHz_DutchHarborLandFill_0114	53.8842932	-166.5199327	1.110	7.650	4.950	1.790	debris
553	WAA_SSS_400kHz_DutchHarborLandFill_0120	53.8839501	-166.5210135	0.000	7.140	3.230	0.000	debris
554	WAA_SSS_400kHz_DutchHarborLandFill_0122	53.8837454	-166.5215976	1.540	6.720	4.780	4.840	debris
555	WAA_SSS_400kHz_DutchHarborLandFill_0087	53.8869007	-166.5126464	1.640	8.680	8.050	4.020	debris
556	WAA_SSS_400kHz_DutchHarborLandFill_0066	53.8878110	-166.5110277	2.230	9.740	7.620	4.190	debris
557	WAA_SSS_400kHz_DutchHarborLandFill_0058	53.8881205	-166.5107762	2.670	8.840	3.450	4.010	debris
558	WAA_SSS_400kHz_DutchHarborLandFill_0035	53.8900350	-166.5073435	1.820	9.820	4.630	2.470	
559	WAA_SSS_400kHz_DutchHarborLandFill_0037	53.8899414	-166.5070349	1.360	8.100	5.710	3.100	debris
560	WAA_SSS_400kHz_DutchHarborLandFill_0031	53.8901975	-166.5070616	1.040	3.880	3.060	1.240	debris
561	WAA_SSS_400kHz_DutchHarborLandFill_0014	53.8909251	-166.5055017	5.520	14.400	7.160	8.050	wreck
562	WAA_SSS_400kHz_DutchHarborLandFill_0003	53.8919422	-166.5043495	1.390	5.670	5.510	4.090	debris
563	WAA_SSS_400kHz_DutchHarborLandFill_0015	53.8908122	-166.5049060	2.740	5.700	6.650	3.620	fish trap
564	WAA_SSS_400kHz_DutchHarborLandFill_0012	53.8912498	-166.5055134	1.100	4.230	3.050	2.680	debris
565	WAA_SSS_400kHz_DutchHarborLandFill_0032	53.8901552	-166.5060056	1.340	16.760	4.820	3.140	debris cluster
566	WAA_SSS_400kHz_DutchHarborLandFill_0029	53.8902802	-166.5077289	1.880	5.310	2.800	5.130	debris
567	WAA_SSS_400kHz_DutchHarborLandFill_0034	53.8900370	-166.5079899	2.490	5.840	2.570	6.480	fish trap
568	WAA_SSS_400kHz_DutchHarborLandFill_0036	53.8899966	-166.5080639	2.270	7.520	8.740	6.200	fish trap
569	WAA_SSS_400kHz_DutchHarborLandFill_0043	53.8893431	-166.5071711	2.280	10.510	4.960	4.780	debris
570	WAA_SSS_400kHz_DutchHarborLandFill_0077	53.8874959	-166.5125640	2.220	15.000	5.870	3.340	debris
571	WAA_SSS_400kHz_DutchHarborLandFill_0075	53.8875047	-166.5129849	0.000	22.400	0.000	0.000	debris
572	WAA_SSS_400kHz_DutchHarborLandFill_0070	53.8877644	-166.5116660	2.810	12.670	8.710	3.660	fish trap
573	WAA_SSS_400kHz_DutchHarborLandFill_0093	53.8863474	-166.5150556	7.180	28.030	11.880	13.280	Unknown
574	WAA_SSS_400kHz_DutchHarborLandFill_0102	53.8853538	-166.5171849	1.520	10.880	2.240	3.150	debris

575	WAA_SSS_400kHz_DutchHarborLandFill_0113	53.8843814	-166.5180106	0.000	17.410	12.600	0.000	debris
576	WAA_SSS_400kHz_DutchHarborLandFill_0111	53.8845892	-166.5188655	1.080	8.550	5.380	2.540	Unknown
577	WAA_SSS_400kHz_DutchHarborLandFill_0133	53.8827757	-166.5203649	0.430	11.850	4.140	0.550	debris
578	WAA_SSS_400kHz_DutchHarborLandFill_0074	53.8875157	-166.5103036	4.040	26.080	8.990	7.060	debris cluster
579	WAA_SSS_400kHz_DutchHarborLandFill_0021	53.8906951	-166.5052552	1.850	9.660	9.950	3.770	fish trap
580	WAA_SSS_400kHz_DutchHarborLandFill_0010	53.8914584	-166.5042038	0.380	8.680	4.480	2.680	debris
581	WAA_SSS_400kHz_DutchHarborLandFill_0044	53.8892708	-166.5079383	1.600	5.170	3.910	4.320	debris
582	WAA_SSS_400kHz_DutchHarborLandFill_0048	53.8890597	-166.5080458	1.420	3.940	2.500	2.800	debris
583	WAA_SSS_400kHz_DutchHarborLandFill_0057	53.8882228	-166.5085667	1.090	7.940	2.930	1.750	debris
584	WAA_SSS_400kHz_DutchHarborLandFill_0094	53.8863377	-166.5130969	4.360	26.460	11.600	5.590	debris cluster
585	WAA_SSS_400kHz_DutchHarborLandFill_0116	53.8842059	-166.5173825	0.000	0.000	0.000	0.000	
586	WAA_SSS_400kHz_DutchHarborLandFill_0128	53.8833402	-166.5193180	0.000	0.000	0.000	0.000	
587	WAA_SSS_400kHz_DutchHarborLandFill_0126	53.8834724	-166.5188282	0.000	0.000	0.000	0.000	
588	WAA_SSS_400kHz_DutchHarborLandFill_0134	53.8822585	-166.5190715	0.000	0.000	0.000	0.000	
589	WAA_SSS_400kHz_DutchHarborLandFill_0129	53.8832962	-166.5165077	0.000	0.000	0.000	0.000	
590	WAA_SSS_400kHz_DutchHarborLandFill_0082	53.8873005	-166.5116234	0.000	0.000	0.000	0.000	
591	WAA_SSS_400kHz_DutchHarborLandFill_0090	53.8865586	-166.5106698	0.000	0.000	0.000	0.000	
592	WAA_SSS_400kHz_DutchHarborLandFill_0078	53.8874686	-166.5112513	0.000	0.000	0.000	0.000	
593	WAA_SSS_400kHz_DutchHarborLandFill_0053	53.8885474	-166.5091716	0.000	0.000	0.000	0.000	
594	WAA_SSS_400kHz_DutchHarborLandFill_0049	53.8889230	-166.5083645	0.000	0.000	0.000	0.000	
595	WAA_SSS_400kHz_DutchHarborLandFill_0023	53.8906366	-166.5049860	0.000	0.000	0.000	0.000	
596	WAA_SSS_400kHz_DutchHarborLandFill_0040	53.8897364	-166.5065051	0.000	0.000	0.000	0.000	
597	WAA_SSS_400kHz_DutchHarborLandFill_0073	53.8876332	-166.5100026	0.000	0.000	0.000	0.000	
598	WAA_SSS_400kHz_DutchHarborLandFill_0127	53.8833514	-166.5174392	0.000	0.000	0.000	0.000	
599	WAA_SSS_400kHz_DutchHarborLandFill_0139	53.8815584	-166.5191940	0.000	0.000	0.000	0.000	
600	WAA_SSS_400kHz_DutchHarborLandFill_0140	53.8815433	-166.5195910	0.000	0.000	0.000	0.000	
601	WAA_SSS_400kHz_DutchHarborLandFill_0136	53.8819832	-166.5187327	0.000	0.000	0.000	0.000	
602	WAA_SSS_400kHz_DutchHarborLandFill_0138	53.8819166	-166.5192341	0.000	0.000	0.000	0.000	
603	WAA_SSS_400kHz_DutchHarborLandFill_0132	53.8830174	-166.5156202	0.000	15.500	10.740	0.000	Unknown
604	WAA_SSS_400kHz_DutchHarborLandFill_0135	53.8820058	-166.5155539	1.200	5.980	4.200	1.650	
605	WAA_SSS_400kHz_DutchHarborLandFill_0137	53.8819639	-166.5158705	1.180	6.140	5.020	1.370	debris
606	WAA_SSS_400kHz_DutchHarborLandFill_0130	53.8832696	-166.5143987	2.770	7.610	4.920	8.850	Unknown
607	WAA_SSS_400kHz_DutchHarborLandFill_0131	53.8831353	-166.5142191	1.160	14.310	10.450	2.700	Unknown
608	WAA_SSS_400kHz_DutchHarborLandFill_0141	53.8814358	-166.5150500	2.840	9.550	5.960	5.070	Unknown
609	WAA_SSS_400kHz_DutchHarborSpit_0001	53.9123547	-166.5086393	3.640	6.160	2.410	15.400	unknown
610	WAA_SSS_400kHz_DutchHarborSpit_0002	53.9123437	-166.5084808	3.380	6.890	4.220	12.800	unknown
611	WAA_SSS_400kHz_DutchHarborSpit_0003	53.9123055	-166.5080742	3.400	8.350	4.900	7.490	debris
612	WAA_SSS_400kHz_DutchHarborSpit_0004	53.9122968	-166.5084436	2.140	9.390	7.580	2.910	debris
613	WAA_SSS_400kHz_DutchHarborSpit_0005	53.9122857	-166.5082373	3.160	27.160	0.000	6.150	debris cluster
614	WAA_SSS_400kHz_DutchHarborSpit_0006	53.9122663	-166.5078297	1.890	8.830	3.610	5.620	debris
615	WAA_SSS_400kHz_DutchHarborSpit_0007	53.9122622	-166.5079173	0.860	18.220	3.690	2.810	debris
616	WAA_SSS_400kHz_DutchHarborSpit_0008	53.9122600	-166.5079165	1.700	29.470	1.900	6.220	debris
617	WAA_SSS_400kHz_DutchHarborSpit_0009	53.9122582	-166.5076863	1.920	9.990	3.250	3.630	debris
618	WAA_SSS_400kHz_DutchHarborSpit_0010	53.9122575	-166.5083588	3.400	8.300	3.940	7.060	unknown
619	WAA_SSS_400kHz_DutchHarborSpit_0011	53.9122572	-166.5083860	0.460	5.650	1.780	0.830	debris
620	WAA_SSS_400kHz_DutchHarborSpit_0012	53.9122510	-166.5087300	4.960	8.860	5.110	19.200	unknown
621	WAA_SSS_400kHz_DutchHarborSpit_0013	53.9122508	-166.5084214	3.200	5.860	4.100	6.250	fish trap
622	WAA_SSS_400kHz_DutchHarborSpit_0014	53.9122415	-166.5079782	0.670	3.620	1.420	2.210	unknown
623	WAA_SSS_400kHz_DutchHarborSpit_0015	53.9122312	-166.5086326	2.870	4.260	3.450	4.350	debris
624	WAA_SSS_400kHz_DutchHarborSpit_0016	53.9122167	-166.5079576	0.580	33.360	2.410	2.410	piling
625	WAA_SSS_400kHz_DutchHarborSpit_0017	53.9121925	-166.5080672	0.880	28.120	4.220	3.230	debris
626	WAA_SSS_400kHz_DutchHarborSpit_0018	53.9121912	-166.5085200	4.560	11.510	9.200	11.630	debris
627	WAA_SSS_400kHz_DutchHarborSpit_0019	53.9121910	-166.5079769	0.780	16.880	2.870	3.610	debris
628	WAA_SSS_400kHz_DutchHarborSpit_0020	53.9121892	-166.5078364	1.140	6.690	2.010	3.630	debris
629	WAA_SSS_400kHz_DutchHarborSpit_0021	53.9121742	-166.5088194	2.390	10.500	6.450	3.090	fish trap
630	WAA_SSS_400kHz_DutchHarborSpit_0022	53.9121709	-166.5076888	0.950	10.400	2.880	2.030	piling
631	WAA_SSS_400kHz_DutchHarborSpit_0023	53.9121585	-166.5070682	3.550	6.030	3.040	4.740	
632	WAA_SSS_400kHz_DutchHarborSpit_0024	53.9121535	-166.5080759	0.290	14.910	0.810	1.210	piling
633	WAA_SSS_400kHz_DutchHarborSpit_0025	53.9121515	-166.5078677	0.480	10.030	2.530	1.620	debris
634	WAA_SSS_400kHz_DutchHarborSpit_0026	53.9121512	-166.5076657	2.660	9.110	4.620	5.870	debris
635	WAA_SSS_400kHz_DutchHarborSpit_0027	53.9121499	-166.5086139	1.690	4.460	2.040	4.140	debris
636	WAA_SSS_400kHz_DutchHarborSpit_0028	53.9121346	-166.5075414	3.490	6.160	3.700	6.090	debris
637	WAA_SSS_400kHz_DutchHarborSpit_0029	53.9121337	-166.5085198	0.770	18.540	2.320	3.210	piling
638	WAA_SSS_400kHz_DutchHarborSpit_0030	53.9121243	-166.5082214	1.600	19.380	7.120	6.150	unknown
639	WAA_SSS_400kHz_DutchHarborSpit_0031	53.9121055	-166.5087662	1.600	28.210	4.410	3.500	debris
640	WAA_SSS_400kHz_DutchHarborSpit_0032	53.9120861	-166.5080638	1.710	8.580	2.440	5.530	debris
641	WAA_SSS_400kHz_DutchHarborSpit_0033	53.9120815	-166.5085703	1.280	6.010	2.230	4.550	debris
642	WAA_SSS_400kHz_DutchHarborSpit_0034	53.9120810	-166.5079715	1.340	9.630	4.660	2.170	debris
643	WAA_SSS_400kHz_DutchHarborSpit_0035	53.9120639	-166.5083340	0.650	7.510	1.210	2.700	piling
644	WAA_SSS_400kHz_DutchHarborSpit_0036	53.9120554	-166.5089558	1.660	8.150	6.200	3.300	fish trap
645	WAA_SSS_400kHz_DutchHarborSpit_0037	53.9120459	-166.5087103	3.420	8.040	4.700	7.400	fish trap
646	WAA_SSS_400kHz_DutchHarborSpit_0038	53.9120412	-166.5089901	1.630	9.720	6.950	3.310	debris

647	WAA_SSS_400kHz_DutchHarborSpit_0039	53.9120322	-166.5069820	3.230	5.030	2.530	3.570	fish trap
648	WAA_SSS_400kHz_DutchHarborSpit_0040	53.9120322	-166.5085161	1.480	9.350	7.120	5.410	fish trap
649	WAA_SSS_400kHz_DutchHarborSpit_0041	53.9120321	-166.5083255	0.540	11.710	1.270	2.500	piling
650	WAA_SSS_400kHz_DutchHarborSpit_0042	53.9120266	-166.5090572	4.770	10.290	5.060	10.540	debris
651	WAA_SSS_400kHz_DutchHarborSpit_0043	53.9120264	-166.5075152	1.680	5.960	2.990	3.280	debris
652	WAA_SSS_400kHz_DutchHarborSpit_0044	53.9119973	-166.5087667	2.950	6.430	4.090	5.100	debris
653	WAA_SSS_400kHz_DutchHarborSpit_0045	53.9119969	-166.5089518	2.890	5.860	5.950	8.880	fish trap
654	WAA_SSS_400kHz_DutchHarborSpit_0046	53.9119466	-166.5084785	1.030	5.470	2.820	6.010	debris
655	WAA_SSS_400kHz_DutchHarborSpit_0047	53.9119320	-166.5089374	0.380	14.980	4.550	1.450	debris
656	WAA_SSS_400kHz_DutchHarborSpit_0048	53.9119318	-166.5075315	1.440	1.380	0.980	2.850	unknown
657	WAA_SSS_400kHz_DutchHarborSpit_0049	53.9119287	-166.5086878	2.610	5.040	3.720	13.810	debris
658	WAA_SSS_400kHz_DutchHarborSpit_0050	53.9118859	-166.5093203	5.470	11.540	4.530	19.730	debris
659	WAA_SSS_400kHz_DutchHarborSpit_0051	53.9118830	-166.5089456	2.660	9.840	8.880	13.220	fish trap
660	WAA_SSS_400kHz_DutchHarborSpit_0052	53.9118729	-166.5072314	1.390	5.730	3.450	2.680	debris
661	WAA_SSS_400kHz_DutchHarborSpit_0053	53.9118718	-166.5070405	1.270	8.000	3.740	2.850	unknown
662	WAA_SSS_400kHz_DutchHarborSpit_0054	53.9118705	-166.5070017	0.520	15.040	0.960	2.320	piling
663	WAA_SSS_400kHz_DutchHarborSpit_0055	53.9118650	-166.5087746	1.010	11.460	1.910	1.480	piling
664	WAA_SSS_400kHz_DutchHarborSpit_0056	53.9118597	-166.5087582	2.820	7.750	3.230	6.450	debris
665	WAA_SSS_400kHz_DutchHarborSpit_0057	53.9118550	-166.5091370	8.460	5.510	4.820	15.760	debris
666	WAA_SSS_400kHz_DutchHarborSpit_0058	53.9118374	-166.5072035	1.120	9.500	3.750	3.060	unknown
667	WAA_SSS_400kHz_DutchHarborSpit_0059	53.9118311	-166.5089397	0.440	16.190	2.520	2.270	piling
668	WAA_SSS_400kHz_DutchHarborSpit_0060	53.9118306	-166.5069006	3.640	10.930	8.930	4.820	debris
669	WAA_SSS_400kHz_DutchHarborSpit_0061	53.9118065	-166.5095169	3.250	6.380	3.920	9.230	debris
670	WAA_SSS_400kHz_DutchHarborSpit_0062	53.9117984	-166.5086254	0.900	8.040	1.790	2.460	unknown
671	WAA_SSS_400kHz_DutchHarborSpit_0063	53.9117931	-166.5094104	2.200	9.500	5.620	8.260	debris
672	WAA_SSS_400kHz_DutchHarborSpit_0064	53.9117812	-166.5089534	0.320	16.840	16.170	1.860	debris cluster
673	WAA_SSS_400kHz_DutchHarborSpit_0065	53.9117755	-166.5093202	3.190	8.330	7.650	17.190	fish trap
674	WAA_SSS_400kHz_DutchHarborSpit_0066	53.9117589	-166.5096629	1.580	6.910	4.360	2.840	debris
675	WAA_SSS_400kHz_DutchHarborSpit_0067	53.9117459	-166.5094258	5.680	9.570	3.900	9.980	debris
676	WAA_SSS_400kHz_DutchHarborSpit_0068	53.9117416	-166.5088066	0.370	7.240	1.240	2.690	debris
677	WAA_SSS_400kHz_DutchHarborSpit_0069	53.9117272	-166.5093768	2.110	26.200	4.980	11.540	debris cluster
678	WAA_SSS_400kHz_DutchHarborSpit_0070	53.9117252	-166.5092460	4.510	11.230	6.960	7.240	debris
679	WAA_SSS_400kHz_DutchHarborSpit_0071	53.9117243	-166.5092340	3.930	35.930	12.210	30.650	debris cluster
680	WAA_SSS_400kHz_DutchHarborSpit_0072	53.9117221	-166.5090804	1.050	6.010	6.010	7.460	tires
681	WAA_SSS_400kHz_DutchHarborSpit_0073	53.9117078	-166.5083748	0.740	12.960	1.670	1.250	piling
682	WAA_SSS_400kHz_DutchHarborSpit_0074	53.9117059	-166.5090331	1.150	8.410	5.260	3.730	unknown
683	WAA_SSS_400kHz_DutchHarborSpit_0075	53.9116904	-166.5095199	1.800	7.130	1.680	7.730	debris
684	WAA_SSS_400kHz_DutchHarborSpit_0076	53.9116752	-166.5096295	4.780	5.270	3.000	19.190	debris
685	WAA_SSS_400kHz_DutchHarborSpit_0077	53.9116657	-166.5094292	4.340	8.960	4.980	31.700	unknown
686	WAA_SSS_400kHz_DutchHarborSpit_0078	53.9116532	-166.5093772	2.490	10.590	2.560	9.930	debris
687	WAA_SSS_400kHz_DutchHarborSpit_0079	53.9115786	-166.5101698	3.300	10.470	3.160	9.410	debris
688	WAA_SSS_400kHz_DutchHarborSpit_0080	53.9115615	-166.5103670	3.070	8.320	4.470	11.730	unknown
689	WAA_SSS_400kHz_DutchHarborSpit_0081	53.9115479	-166.5092368	0.560	19.570	4.740	5.360	debris
690	WAA_SSS_400kHz_DutchHarborSpit_0082	53.9115051	-166.5098040	1.430	4.360	1.740	6.360	debris
691	WAA_SSS_400kHz_DutchHarborSpit_0083	53.9115017	-166.5095892	1.180	14.920	3.450	7.070	debris cluster
692	WAA_SSS_400kHz_DutchHarborSpit_0084	53.9114997	-166.5096590	0.870	10.790	5.530	4.660	debris
693	WAA_SSS_400kHz_DutchHarborSpit_0085	53.9114568	-166.5075227	1.750	8.070	2.200	2.850	debris
694	WAA_SSS_400kHz_DutchHarborSpit_0086	53.9114336	-166.5095277	0.580	8.070	3.060	4.240	debris
695	WAA_SSS_400kHz_DutchHarborSpit_0087	53.9114155	-166.5101198	1.050	11.910	2.200	2.800	piling
696	WAA_SSS_400kHz_DutchHarborSpit_0088	53.9113635	-166.5092789	2.270	12.850	2.600	3.110	debris
697	WAA_SSS_400kHz_DutchHarborSpit_0089	53.9113511	-166.5097690	4.120	5.780	2.600	5.790	unknown
698	WAA_SSS_400kHz_DutchHarborSpit_0090	53.9113350	-166.5079952	1.900	14.660	5.220	6.710	unknown
699	WAA_SSS_400kHz_DutchHarborSpit_0091	53.9113186	-166.5092870	1.510	13.550	4.850	3.640	debris
700	WAA_SSS_400kHz_DutchHarborSpit_0092	53.9113126	-166.5071688	1.470	13.540	4.430	2.950	debris
701	WAA_SSS_400kHz_DutchHarborSpit_0093	53.9112919	-166.5102027	0.700	15.310	1.700	1.680	piling
702	WAA_SSS_400kHz_DutchHarborSpit_0094	53.9112888	-166.5099950	0.000	16.160	0.000	0.000	
703	WAA_SSS_400kHz_DutchHarborSpit_0095	53.9112734	-166.5101143	1.570	41.620	24.800	7.080	debris cluster
704	WAA_SSS_400kHz_DutchHarborSpit_0096	53.9112669	-166.5102646	0.660	8.740	1.860	2.100	debris
705	WAA_SSS_400kHz_DutchHarborSpit_0097	53.9112523	-166.5103230	1.060	13.240	2.450	3.200	piling
706	WAA_SSS_400kHz_DutchHarborSpit_0098	53.9112329	-166.5075297	1.190	8.240	2.680	3.520	unknown
707	WAA_SSS_400kHz_DutchHarborSpit_0099	53.9112187	-166.5101550	2.100	10.490	6.020	4.470	fish trap
708	WAA_SSS_400kHz_DutchHarborSpit_0100	53.9112108	-166.5101025	4.820	6.950	6.810	6.910	fish trap
709	WAA_SSS_400kHz_DutchHarborSpit_0101	53.9111827	-166.5102948	2.850	6.460	4.820	12.060	fish trap
710	WAA_SSS_400kHz_DutchHarborSpit_0102	53.9111785	-166.5104000	3.220	7.150	2.160	9.140	unknown
711	WAA_SSS_400kHz_DutchHarborSpit_0103	53.9111641	-166.5075447	1.020	17.920	3.880	5.710	unknown
712	WAA_SSS_400kHz_DutchHarborSpit_0104	53.9111558	-166.5099016	0.000	0.000	0.000	0.000	
713	WAA_SSS_400kHz_DutchHarborSpit_0105	53.9111156	-166.5076585	0.820	4.600	4.540	3.940	unknown
714	WAA_SSS_400kHz_DutchHarborSpit_0106	53.9111077	-166.5103827	0.620	18.150	2.220	2.490	piling
715	WAA_SSS_400kHz_DutchHarborSpit_0107	53.9111022	-166.5067944	2.320	19.250	4.920	5.550	debris
716	WAA_SSS_400kHz_DutchHarborSpit_0108	53.9110966	-166.5104351	0.930	13.470	2.210	2.470	piling
717	WAA_SSS_400kHz_DutchHarborSpit_0109	53.9110936	-166.5078290	0.600	33.420	3.470	3.630	piling
718	WAA_SSS_400kHz_DutchHarborSpit_0110	53.9110710	-166.5107008	1.090	12.710	2.940	2.820	debris

719	WAA_SSS_400kHz_DutchHarborSpit_0111	53.9110663	-166.5106178	4.270	12.020	7.490	8.560	unknown
720	WAA_SSS_400kHz_DutchHarborSpit_0112	53.9110648	-166.5106502	2.690	7.070	5.780	9.000	debris
721	WAA_SSS_400kHz_DutchHarborSpit_0113	53.9110087	-166.5094715	0.610	5.670	1.810	1.280	debris
722	WAA_SSS_400kHz_DutchHarborSpit_0114	53.9110055	-166.5081201	1.290	7.930	3.570	3.600	debris
723	WAA_SSS_400kHz_DutchHarborSpit_0115	53.9110044	-166.5105669	1.230	32.430	3.900	5.060	piling
724	WAA_SSS_400kHz_DutchHarborSpit_0116	53.9109895	-166.5111912	2.580	12.410	6.000	8.200	unknown
725	WAA_SSS_400kHz_DutchHarborSpit_0117	53.9109521	-166.5103619	0.380	28.740	0.980	0.810	piling
726	WAA_SSS_400kHz_DutchHarborSpit_0118	53.9109397	-166.5102929	3.170	31.720	4.150	3.450	piling
727	WAA_SSS_400kHz_DutchHarborSpit_0119	53.9108693	-166.5077251	2.180	16.810	11.020	5.950	debris
728	WAA_SSS_400kHz_DutchHarborSpit_0120	53.9108693	-166.5109460	1.730	21.810	2.840	3.270	piling
729	WAA_SSS_400kHz_DutchHarborSpit_0121	53.9108689	-166.5110292	1.280	14.290	1.670	3.010	debris
730	WAA_SSS_400kHz_DutchHarborSpit_0122	53.9108139	-166.5108855	1.330	14.040	4.170	1.930	debris
731	WAA_SSS_400kHz_DutchHarborSpit_0123	53.9108118	-166.5110813	2.860	22.450	6.740	6.880	debris
732	WAA_SSS_400kHz_DutchHarborSpit_0124	53.9108079	-166.5105802	4.010	4.460	5.310	10.790	debris
733	WAA_SSS_400kHz_DutchHarborSpit_0125	53.9107911	-166.5092337	0.000	10.050	6.060	0.000	debris
734	WAA_SSS_400kHz_DutchHarborSpit_0126	53.9107900	-166.5109519	0.670	27.460	2.410	2.430	piling
735	WAA_SSS_400kHz_DutchHarborSpit_0127	53.9107806	-166.5093386	1.930	5.470	4.260	4.080	unknown
736	WAA_SSS_400kHz_DutchHarborSpit_0128	53.9107757	-166.5104893	2.760	14.450	5.180	3.000	unknown
737	WAA_SSS_400kHz_DutchHarborSpit_0129	53.9107314	-166.5110627	1.160	17.840	1.980	1.630	piling
738	WAA_SSS_400kHz_DutchHarborSpit_0130	53.9107005	-166.5106471	2.690	17.670	6.270	8.720	wreck
739	WAA_SSS_400kHz_DutchHarborSpit_0131	53.9105973	-166.5110564	5.100	3.300	3.900	6.850	unknown
740	WAA_SSS_400kHz_DutchHarborSpit_0132	53.9105959	-166.5103828	0.800	4.790	2.500	1.350	debris
741	WAA_SSS_400kHz_DutchHarborSpit_0133	53.9104402	-166.5101015	2.740	5.520	2.540	5.790	debris
742	WAA_SSS_400kHz_DutchHarborSpit_0134	53.9103704	-166.5117818	1.130	42.470	2.950	3.300	piling
743	WAA_SSS_400kHz_DutchHarborSpit_0135	53.9103235	-166.5102105	3.030	5.490	5.030	5.020	debris
744	WAA_SSS_400kHz_DutchHarborSpit_0136	53.9102216	-166.5100528	0.510	22.150	3.640	2.420	debris
745	WAA_SSS_400kHz_DutchHarborSpit_0137	53.9102203	-166.5102453	0.580	14.890	3.230	2.330	unknown
746	WAA_SSS_400kHz_DutchHarborSpit_0138	53.9101035	-166.5122094	1.810	13.040	8.220	6.040	debris
747	WAA_SSS_400kHz_DutchHarborSpit_0139	53.9100999	-166.5117830	2.370	13.400	6.370	6.910	debris
748	WAA_SSS_400kHz_DutchHarborSpit_0140	53.9100824	-166.5086915	1.770	5.000	5.000	3.050	unknown
749	WAA_SSS_400kHz_DutchHarborSpit_0141	53.9100780	-166.5121499	6.110	12.450	9.400	8.460	debris
750	WAA_SSS_400kHz_DutchHarborSpit_0142	53.9100717	-166.5107541	1.440	7.060	6.280	1.710	debris
751	WAA_SSS_400kHz_DutchHarborSpit_0143	53.9100582	-166.5122272	0.610	23.990	7.510	1.550	unknown
752	WAA_SSS_400kHz_DutchHarborSpit_0144	53.9099656	-166.5122748	0.350	8.530	1.940	1.100	debris
753	WAA_SSS_400kHz_DutchHarborSpit_0145	53.9099207	-166.5119725	0.870	19.810	3.850	1.890	debris
754	WAA_SSS_400kHz_DutchHarborSpit_0146	53.9099128	-166.5122666	0.830	21.480	4.530	1.820	debris
755	WAA_SSS_400kHz_DutchHarborSpit_0147	53.9098611	-166.5125159	0.970	7.920	4.950	3.570	fish trap
756	WAA_SSS_400kHz_DutchHarborSpit_0148	53.9098301	-166.5122197	1.460	4.450	1.750	5.250	debris
757	WAA_SSS_400kHz_DutchHarborSpit_0149	53.9097877	-166.5098315	1.310	5.870	2.190	3.270	debris
758	WAA_SSS_400kHz_DutchHarborSpit_0150	53.9097627	-166.5117825	0.890	5.870	3.310	2.990	debris
759	WAA_SSS_400kHz_DutchHarborSpit_0151	53.9097364	-166.5117709	0.680	10.760	4.650	1.450	unknown
760	WAA_SSS_400kHz_DutchHarborSpit_0152	53.9096230	-166.5086050	1.760	3.460	2.030	5.440	debris
761	WAA_SSS_400kHz_DutchHarborSpit_0153	53.9096053	-166.5122903	0.550	12.730	2.270	1.740	debris
762	WAA_SSS_400kHz_DutchHarborSpit_0154	53.9096011	-166.5111557	0.880	10.860	2.260	1.650	debris
763	WAA_SSS_400kHz_DutchHarborSpit_0155	53.9092778	-166.5094348	0.560	4.850	4.650	0.820	unknown
764	WAA_SSS_400kHz_DutchHarborSpit_0156	53.9092522	-166.5124827	2.860	4.030	2.350	6.830	debris
765	WAA_SSS_400kHz_DutchHarborSpit_0157	53.9092256	-166.5093955	1.470	31.370	1.980	1.920	piling
766	WAA_SSS_400kHz_DutchHarborSpit_0158	53.9091199	-166.5130975	4.420	28.270	13.130	12.760	fish trap
767	WAA_SSS_400kHz_DutchHarborSpit_0159	53.9091032	-166.5091215	3.970	7.250	6.500	6.830	fish trap
768	WAA_SSS_400kHz_DutchHarborSpit_0160	53.9090930	-166.5115506	2.380	3.280	3.550	3.830	unknown
769	WAA_SSS_400kHz_DutchHarborSpit_0161	53.9090661	-166.5110521	0.320	7.870	1.980	0.840	unknown
770	WAA_SSS_400kHz_DutchHarborSpit_0162	53.9090090	-166.5125730	1.630	8.270	3.520	4.330	unknown
771	WAA_SSS_400kHz_DutchHarborSpit_0163	53.9090027	-166.5130447	1.060	5.240	2.690	3.550	debris
772	WAA_SSS_400kHz_DutchHarborSpit_0164	53.9090017	-166.5108369	1.070	15.040	4.030	2.890	unknown
773	WAA_SSS_400kHz_DutchHarborSpit_0165	53.9089655	-166.5107948	3.040	12.300	7.530	3.820	debris
774	WAA_SSS_400kHz_DutchHarborSpit_0166	53.9089423	-166.5107400	2.900	11.900	6.390	5.040	debris
775	WAA_SSS_400kHz_DutchHarborSpit_0167	53.9089108	-166.5114664	2.110	8.020	8.160	2.890	unknown
776	WAA_SSS_400kHz_DutchHarborSpit_0168	53.9089017	-166.5126689	3.600	6.500	5.560	10.130	debris
777	WAA_SSS_400kHz_DutchHarborSpit_0169	53.9088290	-166.5133156	1.560	22.100	6.280	3.820	debris
778	WAA_SSS_400kHz_DutchHarborSpit_0170	53.9087818	-166.5135853	0.360	10.890	2.080	1.090	piling
779	WAA_SSS_400kHz_DutchHarborSpit_0171	53.9087535	-166.5130857	0.620	13.170	2.450	1.900	piling
780	WAA_SSS_400kHz_DutchHarborSpit_0172	53.9087101	-166.5132825	0.550	9.320	0.990	1.090	piling
781	WAA_SSS_400kHz_DutchHarborSpit_0173	53.9086528	-166.5123837	3.160	5.840	3.140	4.280	debris
782	WAA_SSS_400kHz_DutchHarborSpit_0174	53.9086346	-166.5143392	3.530	6.110	2.260	4.160	debris
783	WAA_SSS_400kHz_DutchHarborSpit_0175	53.9086007	-166.5124470	3.800	5.770	3.100	6.990	unknown
784	WAA_SSS_400kHz_DutchHarborSpit_0176	53.9085266	-166.5100701	1.060	19.030	2.410	1.340	piling
785	WAA_SSS_400kHz_DutchHarborSpit_0177	53.9084509	-166.5101064	0.630	18.940	1.970	1.080	piling
786	WAA_SSS_400kHz_DutchHarborSpit_0178	53.9084299	-166.5101056	0.940	12.660	4.040	1.120	debris
787	WAA_SSS_400kHz_DutchHarborSpit_0179	53.9083485	-166.5101579	1.100	9.070	1.350	1.880	piling
788	WAA_SSS_400kHz_DutchHarborSpit_0180	53.9083200	-166.5143332	0.960	13.580	1.320	2.960	piling
789	WAA_SSS_400kHz_DutchHarborSpit_0181	53.9083106	-166.5101899	1.680	10.800	2.890	2.950	debris
790	WAA_SSS_400kHz_DutchHarborSpit_0182	53.9082731	-166.5099293	0.240	8.720	1.610	1.140	piling

791	WAA_SSS_400kHz_DutchHarborSpit_0183	53.9082270	-166.5140309	0.850	28.030	1.560	1.510	piling
792	WAA_SSS_400kHz_DutchHarborSpit_0184	53.9082192	-166.5143715	0.730	31.090	2.740	2.970	piling
793	WAA_SSS_400kHz_DutchHarborSpit_0185	53.9082163	-166.5142847	1.330	7.120	3.200	5.330	debris
794	WAA_SSS_400kHz_DutchHarborSpit_0186	53.9082026	-166.5102249	0.830	5.930	1.360	1.340	unknown
795	WAA_SSS_400kHz_DutchHarborSpit_0187	53.9081660	-166.5146581	0.580	9.330	1.420	1.970	debris
796	WAA_SSS_400kHz_DutchHarborSpit_0188	53.9081618	-166.5148116	0.480	6.940	1.810	1.090	debris
797	WAA_SSS_400kHz_DutchHarborSpit_0189	53.9081554	-166.5115348	0.530	8.260	6.540	1.130	debris
798	WAA_SSS_400kHz_DutchHarborSpit_0190	53.9081071	-166.5149870	1.000	17.240	1.260	9.270	piling
799	WAA_SSS_400kHz_DutchHarborSpit_0191	53.9080948	-166.5102256	0.830	17.720	1.730	2.210	piling
800	WAA_SSS_400kHz_DutchHarborSpit_0192	53.9080767	-166.5097717	0.600	13.200	2.060	1.530	piling
801	WAA_SSS_400kHz_DutchHarborSpit_0193	53.9080668	-166.5149441	1.060	3.130	1.990	11.640	debris
802	WAA_SSS_400kHz_DutchHarborSpit_0194	53.9080043	-166.5104323	1.080	16.160	2.260	1.870	piling
803	WAA_SSS_400kHz_DutchHarborSpit_0195	53.9079792	-166.5137632	1.790	7.050	2.320	5.410	debris
804	WAA_SSS_400kHz_DutchHarborSpit_0196	53.9079244	-166.5104134	2.480	3.590	2.460	3.740	unknown
805	WAA_SSS_400kHz_DutchHarborSpit_0197	53.9079099	-166.5161610	1.570	5.490	4.610	8.570	debris
806	WAA_SSS_400kHz_DutchHarborSpit_0198	53.9078757	-166.5107836	8.660	23.490	7.470	23.480	unknown
807	WAA_SSS_400kHz_DutchHarborSpit_0199	53.9078044	-166.5096710	8.070	6.420	5.330	21.610	unknown
808	WAA_SSS_400kHz_DutchHarborSpit_0200	53.9077915	-166.5105799	0.710	10.260	1.690	1.070	debris
809	WAA_SSS_400kHz_DutchHarborSpit_0201	53.9077505	-166.5164628	1.480	6.590	3.720	7.720	debris
810	WAA_SSS_400kHz_DutchHarborSpit_0202	53.9076768	-166.5150983	0.900	18.610	4.490	3.230	debris
811	WAA_SSS_400kHz_DutchHarborSpit_0203	53.9076622	-166.5104876	2.000	11.960	5.320	2.510	debris
812	WAA_SSS_400kHz_DutchHarborSpit_0204	53.9076609	-166.5105521	2.060	4.000	2.290	2.400	unknown
813	WAA_SSS_400kHz_DutchHarborSpit_0205	53.9076308	-166.5167947	2.130	7.990	6.880	12.640	debris
814	WAA_SSS_400kHz_DutchHarborSpit_0206	53.9076279	-166.5101656	1.920	6.790	2.950	2.400	debris
815	WAA_SSS_400kHz_DutchHarborSpit_0207	53.9075781	-166.5106180	3.000	15.490	5.170	3.730	unknown
816	WAA_SSS_400kHz_DutchHarborSpit_0208	53.9075723	-166.5099342	3.330	5.850	3.260	6.670	unknown
817	WAA_SSS_400kHz_DutchHarborSpit_0209	53.9075481	-166.5106299	4.970	23.080	5.250	5.610	unknown
818	WAA_SSS_400kHz_DutchHarborSpit_0210	53.9074227	-166.5105385	2.490	6.250	5.380	2.890	debris
819	WAA_SSS_400kHz_DutchHarborSpit_0211	53.9073405	-166.5100626	2.880	3.320	2.490	5.780	unknown
820	WAA_SSS_400kHz_DutchHarborSpit_0212	53.9073101	-166.5166397	3.420	6.980	2.340	8.790	debris
821	WAA_SSS_400kHz_DutchHarborSpit_0213	53.9072719	-166.5167373	3.380	8.710	2.380	18.880	debris
822	WAA_SSS_400kHz_DutchHarborSpit_0214	53.9072017	-166.5101200	2.390	4.730	3.720	4.990	debris
823	WAA_SSS_400kHz_DutchHarborSpit_0215	53.9071128	-166.5105986	1.880	5.290	2.480	2.410	debris
824	WAA_SSS_400kHz_DutchHarborSpit_0216	53.9070714	-166.5145205	0.680	9.890	2.400	2.080	unknown
825	WAA_SSS_400kHz_DutchHarborSpit_0217	53.9070135	-166.5145587	1.770	12.750	3.160	5.450	unknown
826	WAA_SSS_400kHz_DutchHarborSpit_0218	53.9068968	-166.5146141	1.340	8.020	2.950	3.880	debris
827	WAA_SSS_400kHz_DutchHarborSpit_0219	53.9068553	-166.5112992	1.140	2.770	2.680	1.600	unknown
828	WAA_SSS_400kHz_DutchHarborSpit_0220	53.9067062	-166.5169383	1.190	13.590	3.580	5.100	debris
829	WAA_SSS_400kHz_DutchHarborSpit_0221	53.9066141	-166.5197724	2.690	3.530	3.230	11.470	debris
830	WAA_SSS_400kHz_DutchHarborSpit_0222	53.9066108	-166.5184576	0.450	5.120	2.070	3.440	debris
831	WAA_SSS_400kHz_DutchHarborSpit_0223	53.9065282	-166.5199560	0.000	9.080	3.920	0.000	debris
832	WAA_SSS_400kHz_DutchHarborSpit_0224	53.9064654	-166.5196992	1.600	50.210	4.460	3.380	debris cluster
833	WAA_SSS_400kHz_DutchHarborSpit_0225	53.9064369	-166.5150104	1.780	3.970	2.830	3.390	debris
834	WAA_SSS_400kHz_DutchHarborSpit_0226	53.9064360	-166.5189579	0.000	10.460	0.000	0.000	debris
835	WAA_SSS_400kHz_DutchHarborSpit_0227	53.9064246	-166.5108440	1.150	8.630	6.740	2.380	unknown
836	WAA_SSS_400kHz_DutchHarborSpit_0228	53.9063671	-166.5112975	2.750	10.470	4.760	3.170	debris
837	WAA_SSS_400kHz_DutchHarborSpit_0229	53.9063527	-166.5123566	1.360	7.040	2.940	4.110	debris
838	WAA_SSS_400kHz_DutchHarborSpit_0230	53.9062824	-166.5114248	1.720	17.840	2.550	2.820	piling
839	WAA_SSS_400kHz_DutchHarborSpit_0231	53.9062739	-166.5193251	0.880	6.830	4.120	2.880	debris
840	WAA_SSS_400kHz_DutchHarborSpit_0232	53.9061617	-166.5198830	2.820	22.390	9.190	4.300	debris
841	WAA_SSS_400kHz_DutchHarborSpit_0233	53.9061517	-166.5110240	10.570	11.560	4.530	24.540	debris
842	WAA_SSS_400kHz_DutchHarborSpit_0234	53.9061342	-166.5115316	0.700	7.780	6.530	1.170	fish trap
843	WAA_SSS_400kHz_DutchHarborSpit_0235	53.9061174	-166.5195085	3.620	7.130	4.930	11.750	debris
844	WAA_SSS_400kHz_DutchHarborSpit_0236	53.9061058	-166.5204775	1.310	4.050	2.030	4.170	debris
845	WAA_SSS_400kHz_DutchHarborSpit_0237	53.9061057	-166.5113496	0.900	32.810	1.840	1.320	piling
846	WAA_SSS_400kHz_DutchHarborSpit_0238	53.9060762	-166.5196496	5.110	5.640	2.570	15.940	debris
847	WAA_SSS_400kHz_DutchHarborSpit_0239	53.9060502	-166.5113618	1.790	14.190	2.970	3.670	debris
848	WAA_SSS_400kHz_DutchHarborSpit_0240	53.9060489	-166.5110802	1.060	37.450	1.570	2.920	piling
849	WAA_SSS_400kHz_DutchHarborSpit_0241	53.9060416	-166.5111147	1.250	31.890	5.310	2.900	timber
850	WAA_SSS_400kHz_DutchHarborSpit_0242	53.9059505	-166.5207642	0.730	8.480	9.290	1.480	debris cluster
851	WAA_SSS_400kHz_DutchHarborSpit_0243	53.9058473	-166.5123746	0.950	6.270	1.770	2.110	unknown
852	WAA_SSS_400kHz_DutchHarborSpit_0244	53.9058391	-166.5115042	3.910	8.370	6.950	6.320	fish trap
853	WAA_SSS_400kHz_DutchHarborSpit_0245	53.9058354	-166.5114791	0.940	6.440	5.390	2.050	fish trap
854	WAA_SSS_400kHz_DutchHarborSpit_0246	53.9058227	-166.5129063	1.070	5.910	3.200	3.200	unknown
855	WAA_SSS_400kHz_DutchHarborSpit_0247	53.9058173	-166.5208135	1.100	4.660	1.490	2.980	debris
856	WAA_SSS_400kHz_DutchHarborSpit_0248	53.9057724	-166.5199123	11.030	42.880	10.050	33.520	unknown
857	WAA_SSS_400kHz_DutchHarborSpit_0249	53.9057477	-166.5115487	2.650	9.930	7.160	4.210	fish trap
858	WAA_SSS_400kHz_DutchHarborSpit_0250	53.9057079	-166.5119903	2.700	7.650	7.970	4.450	fish trap
859	WAA_SSS_400kHz_DutchHarborSpit_0251	53.9057050	-166.5118209	0.000	6.430	4.690	0.000	fish trap
860	WAA_SSS_400kHz_DutchHarborSpit_0252	53.9056984	-166.5116242	0.860	6.870	5.310	1.760	debris
861	WAA_SSS_400kHz_DutchHarborSpit_0253	53.9056961	-166.5119298	4.500	4.070	2.730	5.080	unknown
862	WAA_SSS_400kHz_DutchHarborSpit_0254	53.9056953	-166.5115148	3.520	10.140	8.180	6.330	fish trap

863	WAA_SSS_400kHz_DutchHarborSpit_0255	53.9056695	-166.5117715	2.570	6.520	5.870	4.700	fish trap
864	WAA_SSS_400kHz_DutchHarborSpit_0256	53.9056656	-166.5116070	2.710	6.860	5.860	4.220	fish trap
865	WAA_SSS_400kHz_DutchHarborSpit_0257	53.9056608	-166.5118158	3.690	7.950	6.950	4.230	fish trap
866	WAA_SSS_400kHz_DutchHarborSpit_0258	53.9056515	-166.5196991	0.000	6.390	2.490	0.000	debris
867	WAA_SSS_400kHz_DutchHarborSpit_0259	53.9056231	-166.5120060	6.570	7.980	7.750	7.470	fish trap
868	WAA_SSS_400kHz_DutchHarborSpit_0260	53.9056014	-166.5120419	1.060	14.950	1.720	1.650	piling
869	WAA_SSS_400kHz_DutchHarborSpit_0261	53.9055987	-166.5113317	2.610	14.900	8.620	6.600	debris
870	WAA_SSS_400kHz_DutchHarborSpit_0262	53.9055856	-166.5142083	0.740	15.780	1.040	0.780	piling
871	WAA_SSS_400kHz_DutchHarborSpit_0263	53.9055811	-166.5212769	5.890	118.250	84.530	12.070	large debris field
872	WAA_SSS_400kHz_DutchHarborSpit_0264	53.9054309	-166.5209265	0.640	4.760	3.030	2.800	debris
873	WAA_SSS_400kHz_DutchHarborSpit_0265	53.9054035	-166.5123673	1.060	31.390	1.540	1.930	piling
874	WAA_SSS_400kHz_DutchHarborSpit_0266	53.9053591	-166.5119471	1.100	5.070	3.740	1.330	debris
875	WAA_SSS_400kHz_DutchHarborSpit_0267	53.9053588	-166.5220764	4.270	8.450	2.580	6.450	debris
876	WAA_SSS_400kHz_DutchHarborSpit_0268	53.9053244	-166.5224469	1.510	13.810	2.800	3.300	piling
877	WAA_SSS_400kHz_DutchHarborSpit_0269	53.9053125	-166.5124769	1.990	26.560	4.360	2.410	timber
878	WAA_SSS_400kHz_DutchHarborSpit_0270	53.9053071	-166.5216021	0.600	11.820	3.880	1.040	debris
879	WAA_SSS_400kHz_DutchHarborSpit_0271	53.9052838	-166.5121030	2.190	36.960	1.630	2.410	piling
880	WAA_SSS_400kHz_DutchHarborSpit_0272	53.9052655	-166.5119275	1.580	5.670	1.710	2.140	unknown
881	WAA_SSS_400kHz_DutchHarborSpit_0273	53.9052372	-166.5214630	0.300	13.810	1.330	0.780	piling
882	WAA_SSS_400kHz_DutchHarborSpit_0274	53.9052250	-166.5119133	2.050	11.550	8.180	2.940	unknown
883	WAA_SSS_400kHz_DutchHarborSpit_0275	53.9052229	-166.5223770	2.140	23.860	4.630	3.560	debris
884	WAA_SSS_400kHz_DutchHarborSpit_0276	53.9051670	-166.5213559	0.570	9.850	1.310	2.100	piling
885	WAA_SSS_400kHz_DutchHarborSpit_0277	53.9051216	-166.5120638	3.970	17.180	7.320	6.500	debris
886	WAA_SSS_400kHz_DutchHarborSpit_0278	53.9050970	-166.5225440	2.810	16.230	8.280	4.870	debris cluster
887	WAA_SSS_400kHz_DutchHarborSpit_0279	53.9050634	-166.5225564	1.720	10.710	6.270	2.720	debris cluster
888	WAA_SSS_400kHz_DutchHarborSpit_0280	53.9050624	-166.5214978	0.610	15.610	1.360	1.520	piling
889	WAA_SSS_400kHz_DutchHarborSpit_0281	53.9049016	-166.5137491	1.010	7.040	1.940	1.740	unknown
890	WAA_SSS_400kHz_DutchHarborSpit_0282	53.9048475	-166.5121232	1.790	7.150	4.620	2.140	debris
891	WAA_SSS_400kHz_DutchHarborSpit_0283	53.9048397	-166.5219059	1.730	7.420	1.780	3.270	debris
892	WAA_SSS_400kHz_DutchHarborSpit_0284	53.9048225	-166.5126188	3.370	11.260	7.290	4.050	debris
893	WAA_SSS_400kHz_DutchHarborSpit_0285	53.9048000	-166.5163767	0.000	0.000	0.000	0.000	
894	WAA_SSS_400kHz_DutchHarborSpit_0286	53.9047761	-166.5220380	3.670	8.160	4.560	6.840	debris
895	WAA_SSS_400kHz_DutchHarborSpit_0287	53.9047588	-166.5210865	2.210	5.660	5.280	4.050	debris
896	WAA_SSS_400kHz_DutchHarborSpit_0288	53.9047457	-166.5223921	2.540	6.640	4.530	3.460	debris
897	WAA_SSS_400kHz_DutchHarborSpit_0289	53.9046956	-166.5121352	2.080	9.400	2.240	3.960	unknown
898	WAA_SSS_400kHz_DutchHarborSpit_0290	53.9046835	-166.5212801	1.830	6.120	4.980	3.270	debris
899	WAA_SSS_400kHz_DutchHarborSpit_0291	53.9046813	-166.5121096	1.750	11.200	6.390	3.380	unknown
900	WAA_SSS_400kHz_DutchHarborSpit_0292	53.9046290	-166.5228264	1.860	8.010	1.440	2.600	debris
901	WAA_SSS_400kHz_DutchHarborSpit_0293	53.9045959	-166.5231284	1.820	11.210	2.410	2.560	debris
902	WAA_SSS_400kHz_DutchHarborSpit_0294	53.9045946	-166.5226455	3.900	16.520	7.070	6.860	debris
903	WAA_SSS_400kHz_DutchHarborSpit_0295	53.9045622	-166.5179681	1.250	6.780	4.290	2.300	debris
904	WAA_SSS_400kHz_DutchHarborSpit_0296	53.9045192	-166.5206422	1.840	6.600	4.560	4.500	unknown
905	WAA_SSS_400kHz_DutchHarborSpit_0297	53.9044976	-166.5128654	2.830	10.070	7.180	4.300	fish trap
906	WAA_SSS_400kHz_DutchHarborSpit_0298	53.9044790	-166.5239336	2.550	6.860	4.730	7.080	fish trap
907	WAA_SSS_400kHz_DutchHarborSpit_0299	53.9044678	-166.5232961	0.400	11.320	2.990	0.830	piling
908	WAA_SSS_400kHz_DutchHarborSpit_0300	53.9044199	-166.5128513	5.270	7.470	6.580	6.580	fish trap
909	WAA_SSS_400kHz_DutchHarborSpit_0301	53.9043588	-166.5124185	4.500	10.210	8.870	5.980	debris
910	WAA_SSS_400kHz_DutchHarborSpit_0302	53.9043487	-166.5124132	3.660	7.500	7.380	7.220	fish trap
911	WAA_SSS_400kHz_DutchHarborSpit_0303	53.9043378	-166.5123052	1.240	8.970	4.930	1.910	debris
912	WAA_SSS_400kHz_DutchHarborSpit_0304	53.9043341	-166.5239115	2.030	16.090	7.380	16.890	unknown
913	WAA_SSS_400kHz_DutchHarborSpit_0305	53.9043210	-166.5146222	1.660	12.710	3.450	2.910	debris
914	WAA_SSS_400kHz_DutchHarborSpit_0306	53.9043116	-166.5123456	2.080	8.880	6.970	3.110	debris
915	WAA_SSS_400kHz_DutchHarborSpit_0307	53.9043074	-166.5123477	1.670	10.840	12.460	3.610	unknown
916	WAA_SSS_400kHz_DutchHarborSpit_0308	53.9043020	-166.5126227	3.850	6.640	7.920	6.840	debris
917	WAA_SSS_400kHz_DutchHarborSpit_0309	53.9042693	-166.5131712	2.110	8.930	8.790	4.270	fish trap
918	WAA_SSS_400kHz_DutchHarborSpit_0310	53.9042688	-166.5129058	1.280	12.760	1.810	1.670	piling
919	WAA_SSS_400kHz_DutchHarborSpit_0311	53.9041566	-166.5132418	3.020	9.710	7.570	4.080	fish trap
920	WAA_SSS_400kHz_DutchHarborSpit_0312	53.9040869	-166.5236882	2.660	28.600	4.640	6.380	debris
921	WAA_SSS_400kHz_DutchHarborSpit_0313	53.9040673	-166.5128105	1.250	9.200	5.700	1.530	fish trap
922	WAA_SSS_400kHz_DutchHarborSpit_0314	53.9040476	-166.5125353	2.380	8.230	7.140	4.590	fish trap
923	WAA_SSS_400kHz_DutchHarborSpit_0315	53.9039853	-166.5133382	2.120	4.610	3.080	3.070	unknown
924	WAA_SSS_400kHz_DutchHarborSpit_0316	53.9039362	-166.5240187	1.350	4.220	5.000	4.860	debris
925	WAA_SSS_400kHz_DutchHarborSpit_0317	53.9039238	-166.5170704	0.910	10.660	4.110	1.990	unknown
926	WAA_SSS_400kHz_DutchHarborSpit_0318	53.9038894	-166.5126774	1.760	3.100	1.950	2.820	unknown
927	WAA_SSS_400kHz_DutchHarborSpit_0319	53.9038122	-166.5128145	1.390	4.380	3.360	1.800	unknown
928	WAA_SSS_400kHz_DutchHarborSpit_0320	53.9037420	-166.5204463	6.640	22.010	11.580	18.950	debris
929	WAA_SSS_400kHz_DutchHarborSpit_0321	53.9037326	-166.5181142	3.460	8.280	3.750	8.620	debris
930	WAA_SSS_400kHz_DutchHarborSpit_0322	53.9037147	-166.5128433	1.670	9.190	5.620	2.080	debris
931	WAA_SSS_400kHz_DutchHarborSpit_0323	53.9037052	-166.5126118	1.010	7.760	5.260	1.820	fish trap
932	WAA_SSS_400kHz_DutchHarborSpit_0324	53.9036484	-166.5212036	1.980	9.360	6.470	4.530	debris
933	WAA_SSS_400kHz_DutchHarborSpit_0325	53.9036405	-166.5257550	4.840	7.320	3.330	6.420	debris
934	WAA_SSS_400kHz_DutchHarborSpit_0326	53.9036294	-166.5136709	7.600	5.740	5.760	19.630	unknown

935	WAA_SSS_400kHz_DutchHarborSpit_0327	53.9036244	-166.5246639	0.740	12.740	2.060	1.700	piling
936	WAA_SSS_400kHz_DutchHarborSpit_0328	53.9035379	-166.5225382	1.410	12.240	10.190	2.630	debris
937	WAA_SSS_400kHz_DutchHarborSpit_0329	53.9032473	-166.5161997	0.720	10.960	1.150	1.150	piling
938	WAA_SSS_400kHz_DutchHarborSpit_0330	53.9032173	-166.5162502	0.410	9.240	1.020	0.770	debris
939	WAA_SSS_400kHz_DutchHarborSpit_0331	53.9030961	-166.5147528	0.840	42.610	1.970	2.060	piling
940	WAA_SSS_400kHz_DutchHarborSpit_0332	53.9030843	-166.5147273	1.180	48.330	2.290	1.800	piling
941	WAA_SSS_400kHz_DutchHarborSpit_0333	53.9030222	-166.5262321	0.740	43.470	1.680	1.880	piling
942	WAA_SSS_400kHz_DutchHarborSpit_0334	53.9029677	-166.5267838	0.490	13.010	2.210	1.980	piling
943	WAA_SSS_400kHz_DutchHarborSpit_0335	53.9029303	-166.5267120	0.710	30.620	2.710	2.860	piling
944	WAA_SSS_400kHz_DutchHarborSpit_0336	53.9028005	-166.5179725	0.500	10.970	4.050	1.440	debris
945	WAA_SSS_400kHz_DutchHarborSpit_0337	53.9027898	-166.5138725	7.440	4.570	6.010	24.220	unknown
946	WAA_SSS_400kHz_DutchHarborSpit_0338	53.9027831	-166.5137091	9.800	5.110	3.780	27.450	unknown
947	WAA_SSS_400kHz_DutchHarborSpit_0339	53.9027049	-166.5178884	0.670	7.270	3.480	1.740	debris
948	WAA_SSS_400kHz_DutchHarborSpit_0340	53.9026494	-166.5216467	1.350	6.960	4.450	3.800	debris
949	WAA_SSS_400kHz_DutchHarborSpit_0341	53.9026212	-166.5276336	0.250	11.400	1.180	0.570	piling
950	WAA_SSS_400kHz_DutchHarborSpit_0342	53.9026014	-166.5272873	0.670	18.860	4.290	3.140	debris
951	WAA_SSS_400kHz_DutchHarborSpit_0343	53.9024652	-166.5264928	1.710	19.430	1.790	2.400	piling
952	WAA_SSS_400kHz_DutchHarborSpit_0344	53.9023750	-166.5278129	0.520	9.560	3.600	1.130	piling
953	WAA_SSS_400kHz_DutchHarborSpit_0345	53.9023723	-166.5275482	0.310	12.550	1.140	1.140	piling
954	WAA_SSS_400kHz_DutchHarborSpit_0346	53.9021813	-166.5224302	1.480	6.330	5.410	2.850	debris
955	WAA_SSS_400kHz_DutchHarborSpit_0347	53.9021469	-166.5274274	1.010	15.500	1.820	1.830	piling
956	WAA_SSS_400kHz_DutchHarborSpit_0348	53.9021024	-166.5254802	0.860	21.280	6.720	1.860	debris
957	WAA_SSS_400kHz_DutchHarborSpit_0349	53.9020962	-166.5198671	2.230	10.630	9.220	4.360	fish trap
958	WAA_SSS_400kHz_DutchHarborSpit_0350	53.9020296	-166.5174098	0.870	5.370	1.250	1.120	debris
959	WAA_SSS_400kHz_DutchHarborSpit_1	53.9091059	-166.5088909	1.340	4.430	1.130	2.200	unknown
960	WAA_SSS_400kHz_DutchHarborSpit_10	53.8997699	-166.5145585	0.800	9.640	2.430	1.770	unknown
961	WAA_SSS_400kHz_DutchHarborSpit_11	53.8997894	-166.5150973	4.690	3.590	2.080	10.320	unknown
962	WAA_SSS_400kHz_DutchHarborSpit_12	53.9001181	-166.5148609	1.420	4.010	3.340	6.380	unknown
963	WAA_SSS_400kHz_DutchHarborSpit_13	53.9001406	-166.5144529	1.150	3.820	2.070	2.570	unknown
964	WAA_SSS_400kHz_DutchHarborSpit_14	53.9005017	-166.5308937	1.810	12.820	2.420	2.790	unknown
965	WAA_SSS_400kHz_DutchHarborSpit_15	53.9036258	-166.5128107	2.560	4.960	3.160	3.400	unknown
966	WAA_SSS_400kHz_DutchHarborSpit_16	53.9037460	-166.5127366	0.610	3.890	2.090	0.890	unknown
967	WAA_SSS_400kHz_DutchHarborSpit_17	53.9039088	-166.5129321	1.420	3.370	1.870	1.540	unknown
968	WAA_SSS_400kHz_DutchHarborSpit_18	53.9068570	-166.5102161	1.540	2.290	1.690	2.940	unknown
969	WAA_SSS_400kHz_DutchHarborSpit_19	53.9071587	-166.5101523	1.110	2.400	1.570	2.340	unknown
970	WAA_SSS_400kHz_DutchHarborSpit_2	53.8988646	-166.5157805	1.370	6.120	3.510	3.700	unknown
971	WAA_SSS_400kHz_DutchHarborSpit_20	53.9072022	-166.5102948	2.490	6.550	2.350	4.380	unknown
972	WAA_SSS_400kHz_DutchHarborSpit_21	53.9072246	-166.5179801	0.720	4.450	2.020	3.430	unknown
973	WAA_SSS_400kHz_DutchHarborSpit_22	53.9076384	-166.5160877	2.140	3.830	1.510	5.330	unknown
974	WAA_SSS_400kHz_DutchHarborSpit_23	53.9077034	-166.5160360	1.030	2.380	2.870	2.840	unknown
975	WAA_SSS_400kHz_DutchHarborSpit_3	53.8988942	-166.5162819	1.190	2.850	1.960	4.810	unknown
976	WAA_SSS_400kHz_DutchHarborSpit_4	53.8989053	-166.5162057	0.230	3.330	3.390	0.890	unknown
977	WAA_SSS_400kHz_DutchHarborSpit_5	53.8991203	-166.5158033	0.000	7.660	5.070	0.000	unknown
978	WAA_SSS_400kHz_DutchHarborSpit_6	53.8991334	-166.5161558	1.260	6.150	3.090	1.840	unknown
979	WAA_SSS_400kHz_DutchHarborSpit_7	53.8991906	-166.5159846	0.000	5.060	4.200	0.000	unknown
980	WAA_SSS_400kHz_DutchHarborSpit_8	53.8991921	-166.5156828	1.890	4.930	2.340	2.850	unknown
981	WAA_SSS_400kHz_DutchHarborSpit_9	53.8996514	-166.5147431	2.170	5.910	3.490	4.500	unknown
982	WAA_SSS_400kHz_EiderPointDock_1	53.9455637	-166.6250734	2.600	4.060	3.940	6.330	Unknown
983	WAA_SSS_400kHz_EiderPointDock_6	53.9456203	-166.6244033	6.290	37.500	10.400	55.420	Wreck
984	WAA_SSS_400kHz_EiderPointDock_2	53.9465181	-166.6249626	1.880	8.880	5.490	7.580	Unknown
985	WAA_SSS_400kHz_EiderPointDock_3	53.9458973	-166.6249156	1.480	4.740	3.370	3.630	Unknown
986	WAA_SSS_400kHz_EiderPointDock_4	53.9466425	-166.6247381	0.300	4.380	3.360	1.720	Unknown
987	WAA_SSS_400kHz_EiderPointDock_7	53.9484366	-166.6242438	0.330	3.510	2.090	2.770	Cylindrical Target
988	WAA_SSS_400kHz_EiderPointDock_9	53.9506868	-166.6226019	0.550	3.900	1.080	1.300	Cylindrical target
989	WAA_SSS_400kHz_EiderPointDock_10	53.9511653	-166.6225801	0.540	2.330	1.910	1.900	Unknown
990	WAA_SSS_400kHz_EiderPointDock_11	53.9511864	-166.6225213	0.370	1.940	2.080	1.270	Unknown
991	WAA_SSS_400kHz_EiderPointDock_14	53.9506448	-166.6218874	1.080	6.360	2.110	4.860	Unknown
992	WAA_SSS_400kHz_EiderPointDock_12	53.9505375	-166.6221915	0.610	5.950	2.400	2.940	Unknown
993	WAA_SSS_400kHz_EiderPointDock_5	53.9472065	-166.6247075	1.700	2.600	1.930	4.760	Box
994	WAA_SSS_400kHz_EiderPointDock_8	53.9477886	-166.6235363	0.840	5.990	2.480	2.720	Unknown box
995	WAA_SSS_400kHz_EiderPointDock_15	53.9507413	-166.6216209	1.880	5.120	1.360	2.720	Cylinder
996	WAA_SSS_400kHz_EiderPointDock_16	53.9525359	-166.6166890	1.040	8.210	1.740	1.800	Unknown
997	WAA_SSS_400kHz_EiderPointDock_17	53.9525277	-166.6166511	0.550	5.410	1.520	0.890	Unknown
998	WAA_SSS_400kHz_EiderPointDock_13	53.9510677	-166.6219073	3.080	12.700	5.890	11.100	Unknown
999	WAA_SSS_400kHz_EiderPointDock_0082	53.9533955	-166.6090637	4.470	6.750	3.020	8.970	Unknown
1000	WAA_SSS_400kHz_EiderPointDock_0090	53.9528629	-166.6072161	2.970	7.930	4.790	4.350	Unknown
1001	WAA_SSS_400kHz_EiderPointDock_0088	53.9530009	-166.6066293	6.550	14.910	5.710	9.660	Unknown
1002	WAA_SSS_400kHz_EiderPointDock_0058	53.9543419	-166.6016107	1.200	12.910	2.220	1.300	piling
1003	WAA_SSS_400kHz_EiderPointDock_0055	53.9546935	-166.6016416	3.900	4.090	3.120	6.930	Unknown
1004	WAA_SSS_400kHz_EiderPointDock_0054	53.9547032	-166.6016357	4.170	2.530	3.130	7.390	Unknown
1005	WAA_SSS_400kHz_EiderPointDock_0052	53.9547325	-166.6016016	3.230	3.890	3.510	5.670	Unknown
1006	WAA_SSS_400kHz_EiderPointDock_0034	53.9563162	-166.5900925	2.270	4.390	2.690	3.470	Unknown

1007	WAA_SSS_400kHz_EiderPointDock_0038	53.9561777	-166.5902039	1.890	5.740	2.160	3.210	Unknown
1008	WAA_SSS_400kHz_EiderPointDock_0032	53.9563638	-166.5900948	1.660	11.260	4.110	4.100	Unknown
1009	WAA_SSS_400kHz_EiderPointDock_0031	53.9563782	-166.5900798	1.970	4.050	3.970	4.260	Unknown
1010	WAA_SSS_400kHz_EiderPointDock_0021	53.9576581	-166.5918484	6.420	13.440	6.850	12.610	Unknown
1011	WAA_SSS_400kHz_EiderPointDock_0022	53.9576101	-166.5919375	3.510	7.380	3.830	6.170	Unknown
1012	WAA_SSS_400kHz_EiderPointDock_0023	53.9574450	-166.5927823	1.590	6.050	1.780	1.780	Unknown
1013	WAA_SSS_400kHz_EiderPointDock_0017	53.9578425	-166.5926421	2.040	7.170	3.580	4.280	Unknown
1014	WAA_SSS_400kHz_EiderPointDock_0041	53.9560177	-166.5990609	3.090	5.060	3.830	4.650	Unknown
1015	WAA_SSS_400kHz_EiderPointDock_0040	53.9561059	-166.5991399	1.580	12.220	3.230	2.970	piling
1016	WAA_SSS_400kHz_EiderPointDock_0036	53.9562319	-166.5995235	6.080	11.990	2.140	18.000	Unknown
1017	WAA_SSS_400kHz_EiderPointDock_0047	53.9549635	-166.6019756	1.700	17.680	2.410	2.290	piling
1018	WAA_SSS_400kHz_EiderPointDock_0049	53.9548899	-166.6022958	2.870	6.340	3.740	3.740	Unknown
1019	WAA_SSS_400kHz_EiderPointDock_0048	53.9549190	-166.6023267	2.630	9.160	4.170	3.730	Unknown
1020	WAA_SSS_400kHz_EiderPointDock_0057	53.9546016	-166.6049138	3.750	10.750	7.960	4.790	Unknown
1021	WAA_SSS_400kHz_EiderPointDock_0053	53.9547217	-166.6050001	5.070	7.470	3.100	11.110	Unknown
1022	WAA_SSS_400kHz_EiderPointDock_0081	53.9536853	-166.6084510	3.310	9.670	4.130	4.620	Unknown
1023	WAA_SSS_400kHz_EiderPointDock_0072	53.9539937	-166.6083528	4.400	5.390	4.320	10.770	Unknown
1024	WAA_SSS_400kHz_EiderPointDock_0071	53.9540361	-166.6084871	3.130	9.120	5.050	8.370	Unknown
1025	WAA_SSS_400kHz_EiderPointDock_0068	53.9540447	-166.6085584	1.540	14.730	3.400	4.210	piling
1026	WAA_SSS_400kHz_EiderPointDock_0070	53.9540396	-166.6086220	5.390	5.920	3.410	15.640	Unknown
1027	WAA_SSS_400kHz_EiderPointDock_0073	53.9539842	-166.6106329	1.820	6.130	2.920	5.170	Unknown
1028	WAA_SSS_400kHz_EiderPointDock_0075	53.9539083	-166.6104101	3.390	3.970	3.030	7.720	Unknown
1029	WAA_SSS_400kHz_EiderPointDock_0074	53.9539582	-166.6104398	0.890	9.700	1.930	2.250	piling
1030	WAA_SSS_400kHz_EiderPointDock_0086	53.9533005	-166.6102298	1.440	5.430	3.220	3.840	Unknown
1031	WAA_SSS_400kHz_EiderPointDock_0065	53.9540882	-166.6099404	0.580	23.510	8.740	1.610	debris
1032	WAA_SSS_400kHz_EiderPointDock_0083	53.9533849	-166.6094468	2.740	8.910	6.900	8.530	fish trap
1033	WAA_SSS_400kHz_EiderPointDock_0077	53.9538239	-166.6078736	1.920	6.410	2.580	3.390	Unknown
1034	WAA_SSS_400kHz_EiderPointDock_0061	53.9542694	-166.6080658	2.920	15.320	4.460	6.440	debris
1035	WAA_SSS_400kHz_EiderPointDock_0062	53.9542455	-166.6079996	1.670	10.010	2.370	3.050	Unknown
1036	WAA_SSS_400kHz_EiderPointDock_0059	53.9543198	-166.6080794	1.760	14.670	4.120	4.410	debris
1037	WAA_SSS_400kHz_EiderPointDock_0051	53.9547344	-166.6019514	2.050	5.340	3.780	14.710	Unknown
1038	WAA_SSS_400kHz_EiderPointDock_0050	53.9548423	-166.6018114	1.190	4.790	2.590	6.910	debris
1039	WAA_SSS_400kHz_EiderPointDock_0046	53.9555089	-166.5998818	0.650	3.860	2.100	4.070	debris
1040	WAA_SSS_400kHz_EiderPointDock_0045	53.9555373	-166.5999174	1.070	3.490	2.000	5.640	debris
1041	WAA_SSS_400kHz_EiderPointDock_0042	53.9560103	-166.5999609	3.470	18.740	6.640	14.090	Unknown
1042	WAA_SSS_400kHz_EiderPointDock_0039	53.9561552	-166.5995130	0.860	6.120	1.820	1.870	Unknown
1043	WAA_SSS_400kHz_EiderPointDock_0044	53.9559009	-166.5982813	0.560	13.940	1.260	3.150	piling
1044	WAA_SSS_400kHz_EiderPointDock_0037	53.9562309	-166.5981190	1.160	11.370	2.780	4.630	Unknown
1045	WAA_SSS_400kHz_EiderPointDock_0043	53.9559483	-166.5980934	0.770	5.070	2.090	6.550	Unknown
1046	WAA_SSS_400kHz_EiderPointDock_0035	53.9563053	-166.5979132	1.190	8.460	6.660	2.430	Unknown
1047	WAA_SSS_400kHz_EiderPointDock_0033	53.9563284	-166.5973949	0.570	16.230	8.930	1.520	Unknown
1048	WAA_SSS_400kHz_EiderPointDock_0029	53.9570250	-166.5957431	1.280	9.610	4.180	4.250	Unknown box
1049	WAA_SSS_400kHz_EiderPointDock_0028	53.9570703	-166.5956685	1.060	8.830	4.270	3.280	Unknown box
1050	WAA_SSS_400kHz_EiderPointDock_0030	53.9570097	-166.5956198	1.620	7.800	3.480	6.230	Unknown box
1051	WAA_SSS_400kHz_EiderPointDock_0025	53.9572116	-166.5952965	1.140	4.670	3.920	3.890	Unknown
1052	WAA_SSS_400kHz_EiderPointDock_0020	53.9577712	-166.5916920	1.640	8.450	3.750	2.160	Unknown box
1053	WAA_SSS_400kHz_EiderPointDock_0018	53.9578299	-166.5915286	2.130	7.810	3.440	3.390	Unknown
1054	WAA_SSS_400kHz_EiderPointDock_0013	53.9581311	-166.5915087	3.710	12.540	1.990	5.350	Unknown
1055	WAA_SSS_400kHz_EiderPointDock_0009	53.9581551	-166.5915558	5.890	15.210	4.210	10.160	Unknown box
1056	WAA_SSS_400kHz_EiderPointDock_0007	53.9583087	-166.5934548	1.390	5.960	2.890	2.840	Unknown box
1057	WAA_SSS_400kHz_EiderPointDock_0014	53.9581046	-166.5939949	2.710	9.360	5.530	3.780	Unknown box
1058	WAA_SSS_400kHz_EiderPointDock_0015	53.9581043	-166.5941079	2.840	6.910	3.970	4.090	Unknown box
1059	WAA_SSS_400kHz_EiderPointDock_0011	53.9581485	-166.5940708	2.880	6.950	3.910	4.670	Unknown box
1060	WAA_SSS_400kHz_EiderPointDock_0012	53.9581404	-166.5942020	2.970	8.360	3.970	4.960	Unknown box
1061	WAA_SSS_400kHz_EiderPointDock_0019	53.9577992	-166.5950393	2.520	8.080	5.980	3.700	Unknown
1062	WAA_SSS_400kHz_EiderPointDock_0027	53.9571949	-166.5956812	2.600	15.590	6.870	4.860	wreck
1063	WAA_SSS_400kHz_EiderPointDock_0024	53.9572381	-166.5952815	1.300	6.440	2.360	4.860	Unknown
1064	WAA_SSS_400kHz_EiderPointDock_0026	53.9572108	-166.5952676	1.550	3.440	1.140	6.000	Unknown
1065	WAA_SSS_400kHz_EiderPointDock_0008	53.9582013	-166.5913355	0.840	4.890	2.140	2.680	Unknown box
1066	WAA_SSS_400kHz_EiderPointDock_0002	53.9585932	-166.5917567	0.500	20.190	0.790	1.120	piling
1067	WAA_SSS_400kHz_EiderPointDock_0001	53.9585988	-166.5918481	0.560	14.480	1.390	1.390	piling
1068	WAA_SSS_400kHz_EiderPointDock_0003	53.9585448	-166.5919569	0.600	5.860	1.720	2.170	Unknown
1069	WAA_SSS_400kHz_EiderPointDock_0010	53.9581521	-166.5938832	0.950	14.170	0.890	3.640	piling
1070	WAA_SSS_400kHz_EiderPointDock_0016	53.9580774	-166.5937513	0.440	5.340	1.820	2.280	Unknown
1071	WAA_SSS_400kHz_EiderPointDock_0004	53.9584871	-166.5934905	1.210	7.450	3.440	1.710	Unknown
1072	WAA_SSS_400kHz_EiderPointDock_0006	53.9583456	-166.5936560	1.930	4.940	1.810	4.880	Unknown
1073	WAA_SSS_400kHz_EiderPointDock_0005	53.9583906	-166.5937659	3.390	5.500	2.170	6.270	Unknown
1074	WAA_SSS_400kHz_EiderPointDock_0060	53.9542705	-166.6067235	1.050	4.950	1.540	5.530	Unknown
1075	WAA_SSS_400kHz_EiderPointDock_0056	53.9546068	-166.6075362	1.710	9.780	2.580	3.670	Unknown
1076	WAA_SSS_400kHz_EiderPointDock_0078	53.9537657	-166.6087174	1.310	6.820	1.990	13.850	Unknown
1077	WAA_SSS_400kHz_EiderPointDock_0066	53.9540606	-166.6088852	5.980	9.340	3.910	12.970	Unknown
1078	WAA_SSS_400kHz_EiderPointDock_0063	53.9541277	-166.6102095	3.340	1.660	2.090	8.890	Unknown

1079	WAA_SSS_400kHz_EiderPointDock_0064	53.9541128	-166.6104541	1.130	21.770	2.600	2.790	piling
1080	WAA_SSS_400kHz_EiderPointDock_0069	53.9540409	-166.6107733	1.790	15.030	2.690	4.480	Unknown
1081	WAA_SSS_400kHz_EiderPointDock_0067	53.9540491	-166.6107579	2.270	8.440	2.690	6.260	Unknown
1082	WAA_SSS_400kHz_EiderPointDock_0087	53.9532935	-166.6160532	1.670	12.580	5.270	2.200	Unknown
1083	WAA_SSS_400kHz_EiderPointDock_0091	53.9528248	-166.6167446	5.570	10.720	5.810	9.480	Unknown
1084	WAA_SSS_400kHz_EiderPointDock_0093	53.9525326	-166.6193983	1.300	4.540	4.100	9.930	fish trap
1085	WAA_SSS_400kHz_EiderPointDock_0089	53.9528867	-166.6192057	1.490	11.440	4.520	2.850	Unknown
1086	WAA_SSS_400kHz_EiderPointDock_0095	53.9524846	-166.6213232	2.200	43.460	4.220	29.060	piling
1087	WAA_SSS_400kHz_EiderPointDock_0103	53.9512751	-166.6233196	0.320	47.780	24.690	4.040	Unknown structure
1088	WAA_SSS_400kHz_EiderPointDock_0105	53.9509330	-166.6232198	0.710	7.940	2.870	1.810	Unknown
1089	WAA_SSS_400kHz_EiderPointDock_0112	53.9492104	-166.6256516	0.000	14.200	12.790	0.000	Unknown structure
1090	WAA_SSS_400kHz_EiderPointDock_0114	53.9474764	-166.6251054	2.620	11.290	5.520	25.710	Unknown box
1091	WAA_SSS_400kHz_EiderPointDock_0115	53.9471628	-166.6250909	3.200	10.050	5.640	30.540	Unknown box
1092	WAA_SSS_400kHz_EiderPointDock_0116	53.9459458	-166.6251421	8.530	18.980	10.250	20.020	Unknown structure
1093	WAA_SSS_400kHz_EiderPointDock_0117	53.9456368	-166.6249820	3.050	5.960	3.340	4.170	Unknown box
1094	WAA_SSS_400kHz_EiderPointDock_0121	53.9449368	-166.6243033	1.190	4.840	2.420	4.470	Unknown box
1095	WAA_SSS_400kHz_EiderPointDock_0076	53.9538558	-166.6112678	1.880	23.750	2.600	2.200	piling
1096	WAA_SSS_400kHz_EiderPointDock_0085	53.9533625	-166.6124148	1.800	4.340	2.700	9.160	Unknown
1097	WAA_SSS_400kHz_EiderPointDock_0080	53.9537294	-166.6147194	3.070	39.220	2.900	11.900	piling
1098	WAA_SSS_400kHz_EiderPointDock_0079	53.9537437	-166.6149717	1.670	18.400	4.130	6.290	Unknown box
1099	WAA_SSS_400kHz_EiderPointDock_0084	53.9533722	-166.6154582	6.860	16.210	9.800	9.240	Unknown structure
1100	WAA_SSS_400kHz_EiderPointDock_0096	53.9524567	-166.6179234	2.240	7.080	5.560	3.370	Unknown box
1101	WAA_SSS_400kHz_EiderPointDock_0092	53.9527739	-166.6189983	1.460	8.140	2.820	3.640	Unknown
1102	WAA_SSS_400kHz_EiderPointDock_0094	53.9525118	-166.6193518	1.680	9.680	3.970	2.520	Unknown
1103	WAA_SSS_400kHz_EiderPointDock_0100	53.9516299	-166.6212244	1.230	13.350	8.900	1.570	cluster of targets
1104	WAA_SSS_400kHz_EiderPointDock_0106	53.9508182	-166.6215309	0.920	12.680	1.840	3.670	Unknown
1105	WAA_SSS_400kHz_EiderPointDock_0107	53.9508063	-166.6225123	0.810	21.600	1.070	1.070	piling
1106	WAA_SSS_400kHz_EiderPointDock_0109	53.9503669	-166.6229191	0.260	12.650	5.150	1.810	Unknown
1107	WAA_SSS_400kHz_EiderPointDock_0108	53.9503944	-166.6229672	0.290	3.810	3.830	1.800	Unknown
1108	WAA_SSS_400kHz_EiderPointDock_0111	53.9492983	-166.6239141	0.470	7.300	1.290	1.370	Unknown
1109	WAA_SSS_400kHz_EiderPointDock_0097	53.9524441	-166.6175400	0.840	11.050	1.800	1.780	piling
1110	WAA_SSS_400kHz_EiderPointDock_0099	53.9524310	-166.6175438	0.850	5.040	0.940	1.780	debris
1111	WAA_SSS_400kHz_EiderPointDock_0098	53.9524353	-166.6177229	1.730	5.060	3.190	3.850	Unknown
1112	WAA_SSS_400kHz_EiderPointDock_0104	53.9512412	-166.6179830	2.710	8.900	6.860	5.570	fish trap
1113	WAA_SSS_400kHz_EiderPointDock_0113	53.9479773	-166.6229736	2.240	6.600	5.840	3.930	fish trap
1114	WAA_SSS_400kHz_EiderPointDock_0101	53.9514258	-166.6155221	2.270	19.850	8.420	3.530	Unknown box
1115	WAA_SSS_400kHz_EiderPointDock_0110	53.9503424	-166.6158993	2.650	11.720	8.310	3.330	Unknown box
1116	WAA_SSS_400kHz_EiderPointDock_0102	53.9513997	-166.6215417	0.850	5.060	3.440	1.980	Unknown
1117	WAA_SSS_400kHz_EiderPointDock_0122	53.9446309	-166.6245029	1.470	16.130	3.010	8.180	Unknown
1118	WAA_SSS_400kHz_EiderPointDock_0119	53.9450176	-166.6249496	2.040	16.810	3.980	9.730	Unknown
1119	WAA_SSS_400kHz_EiderPointDock_0120	53.9449550	-166.6247966	2.530	36.520	6.420	11.500	Unknown structure
1120	WAA_SSS_400kHz_EiderPointDock_0118	53.9455159	-166.6231370	2.170	2.940	2.190	2.590	Unknown
1121	WAA_SSS_400kHz_HogIsland-0001	53.9000545	-166.5669704	1.740	24.140	4.520	4.100	unknown
1122	WAA_SSS_400kHz_HogIsland-0002	53.9000428	-166.5651011	1.260	18.120	6.770	4.300	unknown
1123	WAA_SSS_400kHz_HogIsland-0003	53.8989456	-166.5666814	1.100	6.070	3.240	5.540	unknown
1124	WAA_SSS_400kHz_HogIsland-0004	53.8982702	-166.5662874	0.570	10.360	8.390	5.510	unknown
1125	WAA_SSS_400kHz_HogIsland-0005	53.8971352	-166.5700305	8.280	109.160	34.670	73.110	debris cluster
1126	WAA_SSS_400kHz_HogIsland-0006	53.8965829	-166.5660754	1.640	4.370	0.000	3.090	unknown
1127	WAA_SSS_400kHz_HogIsland-0007	53.8964382	-166.5658670	1.730	14.740	2.880	1.980	unknown
1128	WAA_SSS_400kHz_HogIsland-0008	53.8960183	-166.5680052	1.250	18.530	8.430	3.920	unknown
1129	WAA_SSS_400kHz_HogIsland-0009	53.8958427	-166.5684567	0.800	8.500	3.430	2.740	unknown
1130	WAA_SSS_400kHz_HogIsland-0010	53.8958178	-166.5686280	0.000	42.630	9.700	0.000	debris cluster
1131	WAA_SSS_400kHz_HogIsland-0011	53.8957536	-166.5684027	2.640	30.600	15.210	8.210	debris cluster
1132	WAA_SSS_400kHz_HogIsland-0012	53.8957013	-166.5685183	0.340	13.650	2.320	1.090	piling
1133	WAA_SSS_400kHz_HogIsland-0013	53.8956712	-166.5686783	0.290	8.260	1.590	1.090	unknown
1134	WAA_SSS_400kHz_HogIsland-0014	53.8956320	-166.5667619	0.350	43.530	1.180	1.470	piling
1135	WAA_SSS_400kHz_HogIsland-0015	53.8956225	-166.5681393	1.770	26.350	3.450	3.280	piling
1136	WAA_SSS_400kHz_HogIsland-0016	53.8955768	-166.5687881	0.630	9.330	2.510	2.450	unknown
1137	WAA_SSS_400kHz_HogIsland-0017	53.8954840	-166.5686831	1.360	28.620	28.790	4.630	debris cluster
1138	WAA_SSS_400kHz_HogIsland-0018	53.8952738	-166.5665789	0.390	35.830	2.180	1.240	piling
1139	WAA_SSS_400kHz_HogIsland-0019	53.8950470	-166.5647305	2.010	33.330	15.810	5.940	unknown
1140	WAA_SSS_400kHz_IliukHarborEast-0001	53.8803330	-166.5459827	9.500	10.520	6.950	29.780	unknown
1141	WAA_SSS_400kHz_IliukHarborEast-0002	53.8805178	-166.5455694	1.610	5.750	2.350	2.350	unknown
1142	WAA_SSS_400kHz_IliukHarborEast-0003	53.8778880	-166.5453735	3.640	12.600	6.430	4.400	unknown
1143	WAA_SSS_400kHz_IliukHarborEast-0004	53.8799307	-166.5453426	3.170	43.800	20.730	8.610	wreck
1144	WAA_SSS_400kHz_IliukHarborEast-0005	53.8780267	-166.5452923	0.760	13.760	2.470	3.880	unknown
1145	WAA_SSS_400kHz_IliukHarborEast-0006	53.8777503	-166.5451367	1.630	21.320	1.090	2.250	piling
1146	WAA_SSS_400kHz_IliukHarborEast-0007	53.8780583	-166.5450411	2.070	4.540	3.200	3.410	unknown
1147	WAA_SSS_400kHz_IliukHarborEast-0008	53.8781446	-166.5450343	4.670	66.750	31.670	30.650	debris cluster
1148	WAA_SSS_400kHz_IliukHarborEast-0009	53.8780050	-166.5450106	7.480	66.200	19.460	13.060	wreck
1149	WAA_SSS_400kHz_IliukHarborEast-0010	53.8781000	-166.5448188	7.930	13.250	11.900	38.690	debris cluster
1150	WAA_SSS_400kHz_IliukHarborEast-0011	53.8809062	-166.5444733	0.000	20.930	1.320	0.000	piling

1151	WAA_SSS_400kHz_IliukHarborEast-0012	53.8777436	-166.5444645	1.650	6.540	3.840	8.930	unknown
1152	WAA_SSS_400kHz_IliukHarborEast-0013	53.8814220	-166.5444429	1.770	4.270	3.580	7.390	unknown
1153	WAA_SSS_400kHz_IliukHarborEast-0014	53.8792791	-166.5441015	1.530	4.460	5.590	2.890	unknown
1154	WAA_SSS_400kHz_IliukHarborEast-0015	53.8809344	-166.5439468	1.000	4.140	2.850	2.850	unknown
1155	WAA_SSS_400kHz_IliukHarborEast-0016	53.8788965	-166.5439447	1.450	9.250	2.670	2.830	unknown
1156	WAA_SSS_400kHz_IliukHarborEast-0017	53.8788302	-166.5437599	1.260	8.100	1.640	2.370	unknown
1157	WAA_SSS_400kHz_IliukHarborEast-0018	53.8801149	-166.5434132	0.580	11.290	2.700	1.610	unknown
1158	WAA_SSS_400kHz_IliukHarborEast-0019	53.8790537	-166.5428195	1.250	12.560	3.300	3.990	unknown
1159	WAA_SSS_400kHz_IliukHarborEast-0020	53.8806548	-166.5426567	1.470	5.890	5.710	3.500	unknown
1160	WAA_SSS_400kHz_IliukHarborEast-0021	53.8790788	-166.5423925	0.840	15.050	1.880	2.200	piling
1161	WAA_SSS_400kHz_IliukHarborEast-0022	53.8800743	-166.5422382	0.000	7.850	6.040	0.000	fish trap
1162	WAA_SSS_400kHz_IliukHarborEast-0023	53.8795811	-166.5421924	2.890	8.210	6.640	7.910	barrelsish trap
1163	WAA_SSS_400kHz_IliukHarborEast-0024	53.8796227	-166.5420926	0.750	8.170	1.730	1.730	unknown
1164	WAA_SSS_400kHz_IliukHarborEast-0025	53.8792297	-166.5419672	3.130	36.600	11.780	8.110	fish traps
1165	WAA_SSS_400kHz_IliukHarborEast-0026	53.8788977	-166.5419586	4.570	4.710	2.120	7.290	unknown
1166	WAA_SSS_400kHz_IliukHarborEast-0027	53.8796542	-166.5419510	2.800	4.880	3.370	11.600	fish trap
1167	WAA_SSS_400kHz_IliukHarborEast-0028	53.8810468	-166.5419500	3.130	10.910	2.770	4.430	unknown
1168	WAA_SSS_400kHz_IliukHarborEast-0029	53.8797555	-166.5419395	1.190	5.540	2.520	1.730	unknown
1169	WAA_SSS_400kHz_IliukHarborEast-0030	53.8793530	-166.5418788	1.000	13.480	4.540	2.260	unknown
1170	WAA_SSS_400kHz_IliukHarborEast-0031	53.8789119	-166.5418575	0.710	28.660	1.790	1.250	piling
1171	WAA_SSS_400kHz_IliukHarborEast-0032	53.8792374	-166.5418563	1.780	30.580	1.960	2.980	piling
1172	WAA_SSS_400kHz_IliukHarborEast-0033	53.8798420	-166.5418255	1.350	3.840	2.630	3.150	unknown
1173	WAA_SSS_400kHz_IliukHarborEast-0034	53.8788249	-166.5417966	2.820	7.640	6.800	8.170	unknown
1174	WAA_SSS_400kHz_IliukHarborEast-0035	53.8807462	-166.5417753	2.370	40.290	4.620	2.720	piling
1175	WAA_SSS_400kHz_IliukHarborEast-0036	53.8803693	-166.5417567	5.240	9.140	7.710	7.070	fish trap
1176	WAA_SSS_400kHz_IliukHarborEast-0037	53.8807424	-166.5413207	0.000	119.990	44.990	0.000	debris cluster
1177	WAA_SSS_400kHz_IliukHarborEast-0038	53.8808784	-166.5411313	4.370	4.230	5.330	8.930	fish trap
1178	WAA_SSS_400kHz_IliukHarborEast-0039	53.8809024	-166.5408292	1.340	24.520	1.910	3.510	piling
1179	WAA_SSS_400kHz_IliukHarborEast-0040	53.8809552	-166.5407968	0.990	56.450	3.180	2.650	piling
1180	WAA_SSS_400kHz_IliukHarborEast-0041	53.8806622	-166.5402710	1.580	9.510	6.250	3.540	debris cluster
1181	WAA_SSS_400kHz_IliukHarborEast-0042	53.8802902	-166.5402544	4.470	11.570	1.330	6.120	unknown
1182	WAA_SSS_400kHz_IliukHarborEast-0043	53.8802003	-166.5402423	2.040	6.570	4.360	2.440	unknown
1183	WAA_SSS_400kHz_IliukHarborEast-0044	53.8807591	-166.5401975	0.730	9.650	2.090	2.030	unknown
1184	WAA_SSS_400kHz_IliukHarborEast-0045	53.8797675	-166.5401743	0.700	7.580	1.140	2.340	unknown
1185	WAA_SSS_400kHz_IliukHarborEast-0046	53.8800175	-166.5401425	3.390	22.390	2.670	3.780	piling
1186	WAA_SSS_400kHz_IliukHarborEast-0047	53.8796645	-166.5401399	1.060	4.540	5.540	2.330	unknown
1187	WAA_SSS_400kHz_IliukHarborEast-0048	53.8801535	-166.5399865	0.810	28.900	4.800	1.350	unknown
1188	WAA_SSS_400kHz_IliukHarborEast-0049	53.8800672	-166.5399602	1.740	4.490	3.160	2.700	unknown
1189	WAA_SSS_400kHz_IliukHarborEast-0050	53.8803291	-166.5399546	0.950	39.500	18.040	2.110	debris cluster
1190	WAA_SSS_400kHz_IliukHarborEast-0051	53.8794985	-166.5394430	0.990	23.400	1.510	2.340	piling
1191	WAA_SSS_400kHz_IliukHarborEast-0052	53.8795165	-166.5393432	0.640	11.960	1.300	1.820	piling
1192	WAA_SSS_400kHz_IliukHarborEast-0053	53.8792089	-166.5391655	3.430	9.890	5.420	4.200	fish trap
1193	WAA_SSS_400kHz_IliukHarborEast-0054	53.8792716	-166.5391032	0.910	13.400	1.240	1.490	piling
1194	WAA_SSS_400kHz_IliukHarborEast-0055	53.8791536	-166.5390311	3.010	8.690	8.670	4.090	fish trap
1195	WAA_SSS_400kHz_IliukHarborEast-0056	53.8791604	-166.5383908	0.000	13.690	1.490	0.000	unknown
1196	WAA_SSS_400kHz_IliukHarborEast-0057	53.8792426	-166.5383160	0.570	14.700	4.220	4.770	unknown
1197	WAA_SSS_400kHz_IliukHarborEast-0058	53.8792752	-166.5383064	0.330	8.890	4.220	2.870	unknown
1198	WAA_SSS_400kHz_IliukHarborEast-0059	53.8789844	-166.5375879	5.830	8.100	5.430	9.710	unknown
1199	WAA_SSS_400kHz_IliukHarborEast-0060	53.8789941	-166.5375604	5.590	5.330	5.790	9.380	unknown
1200	WAA_SSS_400kHz_IliukHarborEast-0061	53.8789982	-166.5375391	5.540	3.720	3.630	9.350	unknown
1201	WAA_SSS_400kHz_IliukHarborEast-0062	53.8793417	-166.5373381	1.050	9.520	3.690	2.270	unknown
1202	WAA_SSS_400kHz_IliukHarborEast-0063	53.8787044	-166.5371313	1.220	20.850	1.280	6.390	piling
1203	WAA_SSS_400kHz_IliukHarborEast-0064	53.8790217	-166.5371288	0.290	6.230	2.160	2.900	unknown
1204	WAA_SSS_400kHz_IliukHarborEast-0065	53.8790484	-166.5364108	1.140	3.710	2.600	5.770	unknown
1205	WAA_SSS_400kHz_IliukHarborEast-0066	53.8790499	-166.5363898	1.330	15.730	3.370	6.070	unknown
1206	WAA_SSS_400kHz_IliukHarborEast-0067	53.8775554	-166.5360151	1.310	6.130	2.870	8.780	unknown
1207	WAA_SSS_400kHz_IliukHarborEast-0068	53.8775833	-166.5360044	0.880	5.670	5.480	5.440	unknown
1208	WAA_SSS_400kHz_IliukHarborEast-0069	53.8797124	-166.5351573	0.760	10.740	2.160	3.400	unknown
1209	WAA_SSS_400kHz_IliukHarborEast-0070	53.8793735	-166.5351516	0.900	6.210	3.500	16.000	unknown
1210	WAA_SSS_400kHz_IliukHarborEast-0071	53.8797306	-166.5351423	1.040	25.650	2.910	4.360	piling
1211	WAA_SSS_400kHz_IliukHarborEast-0072	53.8797088	-166.5351223	0.680	15.470	1.900	2.200	piling
1212	WAA_SSS_400kHz_IliukHarborEast-0073	53.8800311	-166.5351020	0.550	12.130	6.480	3.800	unknown
1213	WAA_SSS_400kHz_IliukHarborWest-0001	53.8800734	-166.5497541	2.160	28.440	5.650	7.370	debris
1214	WAA_SSS_400kHz_IliukHarborWest-0002	53.8796372	-166.5508126	3.850	10.620	6.420	12.280	debris cluster
1215	WAA_SSS_400kHz_IliukHarborWest-0003	53.8794661	-166.5508244	2.580	11.120	5.290	3.400	debris cluster
1216	WAA_SSS_400kHz_IliukHarborWest-0004	53.8793733	-166.5506888	2.470	4.930	3.490	7.230	debris
1217	WAA_SSS_400kHz_IliukHarborWest-0005	53.8793002	-166.5483993	1.440	9.550	5.640	4.110	debris
1218	WAA_SSS_400kHz_IliukHarborWest-0006	53.8792327	-166.5508925	1.010	4.400	1.670	1.250	debris
1219	WAA_SSS_400kHz_IliukHarborWest-0007	53.8791562	-166.5512195	0.540	5.340	1.430	1.250	debris
1220	WAA_SSS_400kHz_IliukHarborWest-0008	53.8790769	-166.5511468	1.200	8.500	4.720	3.060	debris
1221	WAA_SSS_400kHz_IliukHarborWest-0009	53.8790405	-166.5517573	0.000	3.400	3.230	0.000	debris
1222	WAA_SSS_400kHz_IliukHarborWest-0010	53.8789939	-166.5515089	2.050	6.240	2.630	4.590	debris

1223	WAA_SSS_400kHz_IliukHarborWest-0011	53.8789720	-166.5514146	0.620	6.540	1.280	1.470	debris
1224	WAA_SSS_400kHz_IliukHarborWest-0012	53.8789629	-166.5515397	1.880	7.380	5.650	4.700	fish trap
1225	WAA_SSS_400kHz_IliukHarborWest-0013	53.8789562	-166.5514416	0.740	12.650	1.500	1.880	piling
1226	WAA_SSS_400kHz_IliukHarborWest-0014	53.8789356	-166.5513420	2.220	5.970	5.290	6.120	debris
1227	WAA_SSS_400kHz_IliukHarborWest-0015	53.8788208	-166.5502384	1.090	5.800	3.330	1.930	debris
1228	WAA_SSS_400kHz_IliukHarborWest-0016	53.8787604	-166.5517743	0.730	6.200	3.950	2.820	debris
1229	WAA_SSS_400kHz_IliukHarborWest-0017	53.8786421	-166.5497923	1.220	8.290	5.460	3.050	debris
1230	WAA_SSS_400kHz_IliukHarborWest-0018	53.8785771	-166.5510119	1.500	38.660	5.590	4.560	piling
1231	WAA_SSS_400kHz_IliukHarborWest-0019	53.8784343	-166.5496057	0.440	21.270	0.890	0.850	piling
1232	WAA_SSS_400kHz_IliukHarborWest-0020	53.8784288	-166.5498797	0.000	15.330	2.820	0.000	piling
1233	WAA_SSS_400kHz_IliukHarborWest-0021	53.8783543	-166.5500679	4.820	6.790	3.630	5.790	debris
1234	WAA_SSS_400kHz_IliukHarborWest-0022	53.8783266	-166.5496019	1.760	6.100	6.710	4.240	fish trap
1235	WAA_SSS_400kHz_IliukHarborWest-0023	53.8783019	-166.5503997	1.370	9.290	4.200	2.380	debris
1236	WAA_SSS_400kHz_IliukHarborWest-0024	53.8782605	-166.5504342	2.130	15.470	4.820	3.650	debris
1237	WAA_SSS_400kHz_IliukHarborWest-0025	53.8782600	-166.5501889	1.180	5.620	1.410	2.010	debris
1238	WAA_SSS_400kHz_IliukHarborWest-0026	53.8780014	-166.5451295	8.600	65.730	26.490	17.070	debris cluster
1239	WAA_SSS_400kHz_IliukHarborWest-0027	53.8779674	-166.5492942	3.450	9.600	7.190	4.870	fish trap
1240	WAA_SSS_400kHz_IliukHarborWest-0028	53.8778687	-166.5486453	0.870	10.830	3.520	2.690	debris
1241	WAA_SSS_400kHz_IliukHarborWest-0029	53.8778406	-166.5490056	2.670	7.650	5.410	5.700	fish trap
1242	WAA_SSS_400kHz_IliukHarborWest-0030	53.8778217	-166.5488709	0.790	20.990	2.700	1.920	piling
1243	WAA_SSS_400kHz_IliukHarborWest-0031	53.8777912	-166.5489861	1.230	4.180	2.360	2.190	debris
1244	WAA_SSS_400kHz_IliukHarborWest-0032	53.8777872	-166.5467100	15.140	132.750	34.350	27.080	wreck
1245	WAA_SSS_400kHz_IliukHarborWest-0033	53.8776855	-166.5481734	0.000	12.970	0.830	0.000	piling
1246	WAA_SSS_400kHz_IliukHarborWest-0034	53.8775840	-166.5482993	0.880	11.830	1.970	1.200	piling
1247	WAA_SSS_400kHz_IliukHarborWest-0035	53.8775815	-166.5482824	0.470	21.330	3.000	2.960	piling
1248	WAA_SSS_400kHz_IliukHarborWest-0036	53.8775530	-166.5537200	1.820	45.700	16.550	4.860	debris cluster
1249	WAA_SSS_400kHz_IliukHarborWest-0037	53.8775380	-166.5550169	0.300	76.360	2.630	2.620	piling
1250	WAA_SSS_400kHz_IliukHarborWest-0038	53.8774717	-166.5546784	0.900	10.000	5.580	5.580	debris
1251	WAA_SSS_400kHz_IliukHarborWest-0039	53.8774548	-166.5487933	1.100	24.420	1.670	1.660	piling
1252	WAA_SSS_400kHz_IliukHarborWest-0040	53.8774194	-166.5547842	0.420	83.790	3.230	2.080	piling
1253	WAA_SSS_400kHz_IliukHarborWest-0041	53.8774024	-166.5529008	1.910	6.970	2.190	6.580	debris
1254	WAA_SSS_400kHz_IliukHarborWest-0042	53.8773955	-166.5555903	0.870	21.990	1.390	1.740	piling
1255	WAA_SSS_400kHz_IliukHarborWest-0043	53.8773922	-166.5551933	0.790	23.700	7.250	3.510	debris cluster
1256	WAA_SSS_400kHz_IliukHarborWest-0044	53.8773718	-166.5548668	1.150	16.050	13.020	4.810	fish trap
1257	WAA_SSS_400kHz_IliukHarborWest-0045	53.8773464	-166.5485592	1.060	9.360	4.320	2.270	debris
1258	WAA_SSS_400kHz_IliukHarborWest-0046	53.8773248	-166.5484428	1.590	28.920	4.150	4.320	debris cluster
1259	WAA_SSS_400kHz_IliukHarborWest-0047	53.8773246	-166.5539597	1.140	16.120	7.350	6.030	wreck
1260	WAA_SSS_400kHz_IliukHarborWest-0048	53.8772760	-166.5541750	2.060	18.420	10.480	9.460	debris cluster
1261	WAA_SSS_400kHz_IliukHarborWest-0049	53.8772727	-166.5545148	1.300	67.470	37.440	4.610	debris cluster
1262	WAA_SSS_400kHz_IliukHarborWest-0050	53.8771604	-166.5450887	2.530	5.780	2.720	3.990	debris
1263	WAA_SSS_400kHz_IliukHarborWest-0051	53.8771344	-166.5549603	0.580	46.710	3.020	2.000	piling
1264	WAA_SSS_400kHz_IliukHarborWest-0052	53.8770896	-166.5541559	3.580	80.260	50.590	8.200	debris cluster
1265	WAA_SSS_400kHz_IliukHarborWest-0053	53.8770169	-166.5537117	0.630	33.640	1.450	1.670	piling
1266	WAA_SSS_400kHz_IliukHarborWest-0054	53.8769595	-166.5479314	0.510	9.780	1.390	1.330	piling
1267	WAA_SSS_400kHz_IliukHarborWest-0055	53.8769533	-166.5532437	2.480	23.780	5.340	11.820	piling
1268	WAA_SSS_400kHz_IliukHarborWest-0056	53.8768703	-166.5533912	1.320	85.060	43.640	3.860	debris cluster
1269	WAA_SSS_400kHz_IliukHarborWest-0057	53.8768381	-166.5530102	0.670	4.780	2.960	3.150	debris
1270	WAA_SSS_400kHz_IliukHarborWest-0058	53.8768266	-166.5455773	0.540	12.720	7.030	2.370	debris cluster
1271	WAA_SSS_400kHz_IliukHarborWest-0059	53.8768206	-166.5456243	0.330	12.970	6.380	1.750	debris cluster
1272	WAA_SSS_400kHz_IliukHarborWest-0060	53.8768078	-166.5470112	2.440	4.310	2.890	3.660	debris
1273	WAA_SSS_400kHz_IliukHarborWest-0061	53.8768032	-166.5450549	6.760	12.190	9.380	10.140	debris
1274	WAA_SSS_400kHz_IliukHarborWest-0062	53.8767997	-166.5524675	0.420	9.390	3.830	2.460	debris
1275	WAA_SSS_400kHz_IliukHarborWest-0063	53.8767906	-166.5456175	0.340	20.040	12.880	1.340	debris cluster
1276	WAA_SSS_400kHz_IliukHarborWest-0064	53.8767485	-166.5523845	0.550	16.290	2.560	2.950	debris
1277	WAA_SSS_400kHz_IliukHarborWest-0065	53.8766899	-166.5522879	1.870	6.460	3.330	2.450	debris
1278	WAA_SSS_400kHz_IliukHarborWest-0066	53.8766804	-166.5465450	0.630	4.550	4.710	4.300	debris
1279	WAA_SSS_400kHz_IliukHarborWest-0067	53.8765456	-166.5519016	1.340	5.450	1.360	2.230	debris
1280	WAA_SSS_400kHz_IliukHarborWest-0068	53.8765258	-166.5518462	0.860	7.270	1.860	1.410	debris
1281	WAA_SSS_400kHz_IliukHarborWest-0069	53.8764970	-166.5515481	1.090	8.980	3.420	5.370	debris
1282	WAA_SSS_400kHz_IliukHarborWest-0070	53.8764608	-166.5454311	0.890	7.300	1.880	3.510	debris
1283	WAA_SSS_400kHz_IliukHarborWest-0071	53.8763791	-166.5510511	1.330	10.080	5.560	1.580	wreck
1284	WAA_SSS_400kHz_IliukHarborWest-0072	53.8763494	-166.5506980	4.540	14.830	9.780	10.720	debris cluster
1285	WAA_SSS_400kHz_IliukHarborWest-0073	53.8763094	-166.5513297	0.960	4.900	2.850	4.640	debris
1286	WAA_SSS_400kHz_IliukHarborWest-0074	53.8762784	-166.5477982	0.430	8.170	0.880	1.550	piling
1287	WAA_SSS_400kHz_IliukHarborWest-0075	53.8761346	-166.5515309	3.460	6.340	3.320	4.640	debris
1288	WAA_SSS_400kHz_IliukHarborWest-0076	53.8760263	-166.5478992	1.910	11.340	2.870	7.140	debris cluster
1289	WAA_SSS_400kHz_IliukHarborWest-0077	53.8759687	-166.5478401	2.370	5.010	4.290	5.220	debris
1290	WAA_SSS_400kHz_IliukHarborWest-0078	53.8757847	-166.5501799	1.290	22.730	8.900	3.450	debris cluster
1291	WAA_SSS_400kHz_IliukHarborWest-0079	53.8757495	-166.5473390	2.820	7.340	1.860	10.810	debris
1292	WAA_SSS_400kHz_IliukHarborWest-0080	53.8756707	-166.5468791	1.200	10.700	1.800	4.060	debris
1293	WAA_SSS_400kHz_IliukHarborWest-0081	53.8755179	-166.5501047	2.710	9.980	4.550	22.590	debris
1294	WAA_SSS_400kHz_IliukHarborWest-0082	53.8754818	-166.5501949	3.290	8.750	2.040	13.870	debris

1295	WAA_SSS_400kHz_IliukHarborWest-0083	53.8753174	-166.5480522	1.000	9.680	5.690	1.710	debris
1296	WAA_SSS_400kHz_IliukHarborWest-0084	53.8752926	-166.5471289	2.200	10.200	1.060	4.630	piling
1297	WAA_SSS_400kHz_IliukHarborWest-0085	53.8752817	-166.5471760	1.550	13.830	2.290	5.270	piling
1298	WAA_SSS_400kHz_IliukHarborWest-0086	53.8752607	-166.5471803	1.290	9.100	1.860	2.670	debris
1299	WAA_SSS_400kHz_IliukHarborWest-0087	53.8751403	-166.5471667	0.370	19.170	3.600	1.250	debris
1300	WAA_SSS_400kHz_IliukHarborWest-0088	53.8750850	-166.5463800	0.980	10.990	1.840	1.600	debris
1301	WAA_SSS_400kHz_IliukHarborWest-0089	53.8750635	-166.5482410	0.380	25.840	1.310	1.130	piling
1302	WAA_SSS_400kHz_IliukHarborWest-0090	53.8750301	-166.5464793	0.870	5.160	4.830	3.240	debris
1303	WAA_SSS_400kHz_IliukHarborWest-0091	53.8747818	-166.5471450	0.670	10.100	1.550	1.540	piling
1304	WAA_SSS_400kHz_IliukHarborWest-0092	53.8745081	-166.5478149	2.610	9.360	4.740	10.530	debris
1305	WAA_SSS_400kHz_IliukHarborWest-0093	53.8743839	-166.5472974	4.800	3.870	2.820	19.270	debris
1306	WAA_SSS_400kHz_IliukHarborWest-0094	53.8743694	-166.5456886	2.090	34.260	15.810	9.190	debris cluster
1307	WAA_SSS_400kHz_IliukHarborWest-0095	53.8743640	-166.5472018	0.860	9.560	1.070	3.380	piling
1308	WAA_SSS_400kHz_IliukHarborWest-0096	53.8743403	-166.5475035	1.420	4.160	3.240	2.470	debris
1309	WAA_SSS_400kHz_IliukHarborWest-0097	53.8743244	-166.5473304	3.870	3.980	3.640	17.770	debris
1310	WAA_SSS_400kHz_IliukHarborWest-0098	53.8743160	-166.5463378	0.910	17.980	2.930	2.370	piling
1311	WAA_SSS_400kHz_IliukHarborWest-0099	53.8743094	-166.5472221	3.390	3.350	2.750	13.530	debris
1312	WAA_SSS_400kHz_IliukHarborWest-0100	53.8741853	-166.5463806	3.760	3.250	2.470	10.060	debris
1313	WAA_SSS_400kHz_IliukHarborWest-0101	53.8741735	-166.5462543	2.990	2.210	2.110	5.320	debris
1314	WAA_SSS_400kHz_IliukHarborWest-0102	53.8741118	-166.5472836	2.850	6.570	3.330	7.590	debris
1315	WAA_SSS_400kHz_IliukHarborWest-0103	53.8739988	-166.5465524	1.230	30.060	1.290	3.550	piling
1316	WAA_SSS_400kHz_IliukHarborWest-0104	53.8737501	-166.5459687	0.590	11.230	2.290	2.010	debris
1317	WAA_SSS_400kHz_IliukHarborWest-0105	53.8737231	-166.5453413	1.430	27.250	2.430	4.130	piling
1318	WAA_SSS_400kHz_IliukHarborWest-0106	53.8737133	-166.5454175	1.900	1.450	1.880	2.650	debris
1319	WAA_SSS_400kHz_IliukHarborWest-0107	53.8737095	-166.5460270	3.130	17.470	2.200	13.860	piling
1320	WAA_SSS_400kHz_IliukHarborWest-0108	53.8736149	-166.5454244	2.740	6.450	4.130	4.080	debris
1321	WAA_SSS_400kHz_IliukHarborWest-0109	53.8735954	-166.5457194	0.730	7.570	1.030	1.060	piling
1322	WAA_SSS_400kHz_IliukHarborWest-0110	53.8735715	-166.5463120	3.030	19.200	3.600	13.160	debris
1323	WAA_SSS_400kHz_IliukHarborWest-0111	53.8735290	-166.5462438	3.310	10.640	4.220	5.690	debris
1324	WAA_SSS_400kHz_IliukHarborWest-0112	53.8735233	-166.5457603	1.760	4.660	1.930	2.750	debris
1325	WAA_SSS_400kHz_IliukHarborWest-0113	53.8735157	-166.5479191	1.710	3.540	1.540	3.220	debris
1326	WAA_SSS_400kHz_IliukHarborWest-0114	53.8734639	-166.5474669	0.360	14.360	1.030	0.860	piling
1327	WAA_SSS_400kHz_IliukHarborWest-0115	53.8734351	-166.5461612	4.400	6.260	5.720	19.370	debris
1328	WAA_SSS_400kHz_IliukHarborWest-0116	53.8734330	-166.5464362	1.560	22.640	10.430	3.490	debris cluster
1329	WAA_SSS_400kHz_IliukHarborWest-0117	53.8733859	-166.5460413	1.400	4.980	3.720	4.330	tires
1330	WAA_SSS_400kHz_IliukHarborWest-0118	53.8733633	-166.5471316	0.780	5.480	3.840	3.830	debris
1331	WAA_SSS_400kHz_IliukHarborWest-0119	53.8732318	-166.5472376	1.510	8.520	1.800	2.240	debris
1332	WAA_SSS_400kHz_IliukHarborWest-0120	53.8731384	-166.5470868	3.510	6.740	6.000	8.010	fish trap
1333	WAA_SSS_400kHz_IliukHarborWest-0121	53.8730680	-166.5479643	1.350	4.360	3.450	5.060	debris
1334	WAA_SSS_400kHz_IliukHarborWest-0122	53.8730205	-166.5472047	0.750	11.430	1.280	1.760	piling
1335	WAA_SSS_400kHz_IliukHarborWest-0123	53.8730134	-166.5454231	2.990	10.610	3.200	10.840	debris
1336	WAA_SSS_400kHz_IliukHarborWest-0124	53.8728626	-166.5487267	1.460	3.680	2.750	1.870	debris
1337	WAA_SSS_400kHz_IliukHarborWest-0125	53.8728443	-166.5488079	2.430	5.710	5.840	4.260	debris
1338	WAA_SSS_400kHz_IliukHarborWest-0126	53.8728018	-166.5457152	3.120	7.170	4.870	10.570	debris
1339	WAA_SSS_400kHz_IliukHarborWest-0127	53.8725399	-166.5478658	2.190	5.790	5.090	4.240	fish trap
1340	WAA_SSS_400kHz_IliukHarborWest-0128	53.8722486	-166.5493782	1.800	3.990	2.290	3.130	debris
1341	WAA_SSS_400kHz_IliukHarborWest-0129	53.8720465	-166.5453172	1.470	10.410	2.620	3.230	debris
1342	WAA_SSS_400kHz_IliukHarborWest-0130	53.8720234	-166.5484641	1.430	5.270	5.040	2.690	debris
1343	WAA_SSS_400kHz_IliukHarborWest-0131	53.8719856	-166.5447891	0.590	8.630	1.340	0.980	piling
1344	WAA_SSS_400kHz_IliukHarborWest-0132	53.8719547	-166.5490014	1.840	6.780	3.560	2.910	debris
1345	WAA_SSS_400kHz_IliukHarborWest-0133	53.8719205	-166.5493743	1.820	27.720	5.300	2.120	debris cluster
1346	WAA_SSS_400kHz_IliukHarborWest-0134	53.8718471	-166.5455300	1.100	3.680	2.930	8.880	debris
1347	WAA_SSS_400kHz_IliukHarborWest-0135	53.8718352	-166.5454315	1.180	5.100	2.280	8.020	debris
1348	WAA_SSS_400kHz_IliukHarborWest-0136	53.8717752	-166.5444968	2.090	7.520	5.160	4.230	fish trap
1349	WAA_SSS_400kHz_IliukHarborWest-0137	53.8717700	-166.5466262	2.090	8.330	6.480	5.670	fish trap
1350	WAA_SSS_400kHz_IliukHarborWest-0138	53.8717579	-166.5447878	0.490	6.640	0.870	1.850	piling
1351	WAA_SSS_400kHz_IliukHarborWest-0139	53.8716616	-166.5444181	2.090	3.460	3.820	7.200	debris
1352	WAA_SSS_400kHz_IliukHarborWest-0140	53.8716404	-166.5453126	1.180	5.080	4.790	4.890	debris
1353	WAA_SSS_400kHz_IliukHarborWest-0141	53.8716162	-166.5461032	6.310	8.380	5.030	7.380	debris
1354	WAA_SSS_400kHz_IliukHarborWest-0142	53.8715593	-166.5444233	0.740	3.280	1.200	3.490	debris
1355	WAA_SSS_400kHz_IliukHarborWest-0143	53.8715329	-166.5455259	2.050	3.080	2.760	9.860	debris
1356	WAA_SSS_400kHz_IliukHarborWest-0144	53.8713800	-166.5467535	3.460	16.820	5.550	3.960	debris
1357	WAA_SSS_400kHz_IliukHarborWest-0145	53.8713795	-166.5457769	2.810	6.520	5.200	12.390	fish trap
1358	WAA_SSS_400kHz_IliukHarborWest-0146	53.8712613	-166.5459220	1.140	16.240	8.580	4.970	debris cluster
1359	WAA_SSS_400kHz_IliukHarborWest-0147	53.8712568	-166.5469405	3.340	20.770	10.400	3.680	debris cluster
1360	WAA_SSS_400kHz_IliukHarborWest-0148	53.8707036	-166.5460901	1.440	2.420	2.200	6.710	debris
1361	WAA_SSS_400kHz_IliukHarborWest-0149	53.8702608	-166.5458293	1.710	4.400	1.490	7.680	debris
1362	WAA_SSS_400kHz_MuttonCove_MC-16	53.4075661	-167.5211928	1.370	5.230	4.020	4.350	Anchor Block
1363	WAA_SSS_400kHz_MuttonCove_MC-28	53.4069687	-167.5211369	1.220	7.420	9.550	5.300	Anchor Block
1364	WAA_SSS_400kHz_MuttonCove_MC-37	53.4057628	-167.5212643	2.020	8.650	7.870	5.400	Anchor Block
1365	WAA_SSS_400kHz_MuttonCove_MC-38	53.4056356	-167.5213692	4.140	6.550	7.170	7.520	Anchor Block
1366	WAA_SSS_400kHz_MuttonCove_MC-39	53.4056213	-167.5214037	3.090	22.050	4.420	4.900	Mooring Bouy

1367	WAA_SSS_400kHz_MuttonCove_MC-45	53.4047016	-167.5215825	1.250	4.000	3.600	3.040	Unknown
1368	WAA_SSS_400kHz_MuttonCove_MC-48	53.4044517	-167.5206028	1.750	52.560	2.490	2.500	Piling
1369	WAA_SSS_400kHz_MuttonCove_MC-57	53.3997384	-167.5198914	1.700	2.840	1.370	2.120	Unknown
1370	WAA_SSS_400kHz_MuttonCove_MC-58	53.3994309	-167.5189971	0.000	0.000	0.000	0.000	
1371	WAA_SSS_400kHz_MuttonCove_MC-41	53.4052753	-167.5212679	0.000	0.000	0.000	0.000	
1372	WAA_SSS_400kHz_MuttonCove_MC-40	53.4052765	-167.5213322	0.000	0.000	0.000	0.000	
1373	WAA_SSS_400kHz_MuttonCove_MC-18	53.4075481	-167.5208740	0.000	0.000	0.000	0.000	
1374	WAA_SSS_400kHz_MuttonCove_MC-15	53.4076558	-167.5205080	0.000	0.000	0.000	0.000	
1375	WAA_SSS_400kHz_MuttonCove_MC-20	53.4073746	-167.5197887	0.000	0.000	0.000	0.000	
1376	WAA_SSS_400kHz_MuttonCove_MC-47	53.4044683	-167.5199012	0.000	0.000	0.000	0.000	
1377	WAA_SSS_400kHz_MuttonCove_MC-56	53.4012681	-167.5171214	0.000	0.000	0.000	0.000	
1378	WAA_SSS_400kHz_MuttonCove_MC-14	53.4078860	-167.5194682	0.000	0.000	0.000	0.000	
1379	WAA_SSS_400kHz_MuttonCove_MC-3	53.4094556	-167.5196757	0.000	0.000	0.000	0.000	
1380	WAA_SSS_400kHz_MuttonCove_MC-13	53.4079443	-167.5193321	0.000	0.000	0.000	0.000	
1381	WAA_SSS_400kHz_MuttonCove_MC-23	53.4073144	-167.5188587	0.000	0.000	0.000	0.000	
1382	WAA_SSS_400kHz_MuttonCove_MC-27	53.4070532	-167.5188354	0.000	0.000	0.000	0.000	
1383	WAA_SSS_400kHz_MuttonCove_MC-34	53.4062922	-167.5178779	0.000	0.000	0.000	0.000	
1384	WAA_SSS_400kHz_MuttonCove_MC-32	53.4064605	-167.5179217	0.000	0.000	0.000	0.000	
1385	WAA_SSS_400kHz_MuttonCove_MC-24	53.4071454	-167.5186847	0.000	0.000	0.000	0.000	
1386	WAA_SSS_400kHz_MuttonCove_MC-19	53.4073990	-167.5187868	0.000	0.000	0.000	0.000	
1387	WAA_SSS_400kHz_MuttonCove_MC-17	53.4075503	-167.5189742	0.000	0.000	0.000	0.000	
1388	WAA_SSS_400kHz_MuttonCove_MC-1	53.4100490	-167.5201869	3.270	5.570	4.140	4.110	Unknown
1389	WAA_SSS_400kHz_MuttonCove_MC-4	53.4093703	-167.5219541	0.000	5.330	1.250	0.000	Unknown
1390	WAA_SSS_400kHz_MuttonCove_MC-6	53.4087773	-167.5222189	0.660	3.240	2.820	4.880	Unknown
1391	WAA_SSS_400kHz_MuttonCove_MC-8	53.4087724	-167.5221744	0.770	2.780	3.510	7.780	Unknown
1392	WAA_SSS_400kHz_MuttonCove_MC-7	53.4087752	-167.5221699	0.710	3.890	2.750	7.710	Unknown
1393	WAA_SSS_400kHz_MuttonCove_MC-9	53.4087050	-167.5225441	0.970	11.060	1.210	2.430	Unknown
1394	WAA_SSS_400kHz_MuttonCove_MC-2	53.4096418	-167.5191566	0.420	3.300	2.590	1.110	Unknown
1395	WAA_SSS_400kHz_MuttonCove_MC-11	53.4082660	-167.5185032	0.580	1.750	1.920	1.420	Unknown
1396	WAA_SSS_400kHz_MuttonCove_MC-51	53.4040873	-167.5135280	2.120	3.750	3.740	4.980	Unknown
1397	WAA_SSS_400kHz_MuttonCove_MC-43	53.4048570	-167.5152277	4.740	8.290	5.910	16.950	Unknown
1398	WAA_SSS_400kHz_MuttonCove_MC-42	53.4049749	-167.5153660	1.650	13.660	6.360	8.810	Unknown
1399	WAA_SSS_400kHz_MuttonCove_MC-36	53.4061047	-167.5156965	2.020	4.690	2.290	5.840	Unknown
1400	WAA_SSS_400kHz_MuttonCove_MC-35	53.4061415	-167.5158170	1.820	6.300	2.550	7.840	
1401	WAA_SSS_400kHz_MuttonCove_MC-29	53.4066556	-167.5176605	2.540	23.430	18.910	9.470	Unknown
1402	WAA_SSS_400kHz_MuttonCove_MC-30	53.4066428	-167.5180687	0.830	5.560	4.300	3.700	Unknown
1403	WAA_SSS_400kHz_MuttonCove_MC-21	53.4073532	-167.5188344	2.940	6.510	4.970	6.100	Unknown
1404	WAA_SSS_400kHz_MuttonCove_MC-25	53.4071399	-167.5188699	4.700	16.020	10.040	15.500	Unknown
1405	WAA_SSS_400kHz_MuttonCove_MC-44	53.4047362	-167.5152813	2.050	15.520	8.100	5.260	Unknown
1406	WAA_SSS_400kHz_MuttonCove_MC-50	53.4041723	-167.5150472	2.190	8.400	4.680	5.330	fish trap
1407	WAA_SSS_400kHz_MuttonCove_MC-49	53.4043152	-167.5155526	0.000	4.500	4.070	0.000	Unknown
1408	WAA_SSS_400kHz_MuttonCove_MC-53	53.4037992	-167.5140805	2.130	7.330	2.050	3.740	Unknown
1409	WAA_SSS_400kHz_MuttonCove_MC-52	53.4039034	-167.5142951	0.800	4.650	2.870	1.770	Unknown
1410	WAA_SSS_400kHz_MuttonCove_MC-33	53.4063624	-167.5178756	6.130	16.490	5.710	11.720	Unknown
1411	WAA_SSS_400kHz_MuttonCove_MC-31	53.4065346	-167.5178340	5.660	12.710	5.140	6.660	Unknown
1412	WAA_SSS_400kHz_MuttonCove_MC-54	53.4030194	-167.5135107	0.590	5.360	1.590	1.360	Unknown
1413	WAA_SSS_400kHz_MuttonCove_MC-55	53.4030042	-167.5131099	1.700	5.440	1.540	5.040	Unknown
1414	WAA_SSS_400kHz_MuttonCove_MC-5	53.4092222	-167.5219047	0.250	5.260	1.260	0.470	Unknown
1415	WAA_SSS_400kHz_MuttonCove_MC-46	53.4046727	-167.5217752	1.380	3.270	1.420	4.300	Unknown
1416	WAA_SSS_400kHz_MuttonCove_MC-26	53.4070972	-167.5223471	0.920	2.420	1.600	1.890	Unknown
1417	WAA_SSS_400kHz_MuttonCove_MC-22	53.4073412	-167.5223795	0.810	2.640	2.260	2.410	Unknown
1418	WAA_SSS_400kHz_MuttonCove_MC-12	53.4082189	-167.5220593	0.580	6.140	0.630	2.260	Unknown
1419	WAA_SSS_400kHz_MuttonCove_MC-10	53.4083438	-167.5219846	0.370	5.660	1.200	2.050	Unknown
1420	WAA_SSS_400kHz_MuttonCove-0011	53.4088277	-167.5222048	2.000	5.510	2.810	4.880	debris
1421	WAA_SSS_400kHz_MuttonCove-0008	53.4090707	-167.5223446	1.140	8.150	1.260	1.640	piling
1422	WAA_SSS_400kHz_MuttonCove-0022	53.4061355	-167.5217013	1.810	11.350	1.390	2.080	piling
1423	WAA_SSS_400kHz_MuttonCove-0023	53.4059883	-167.5211866	0.430	13.810	1.220	1.730	piling
1424	WAA_SSS_400kHz_MuttonCove-0071	53.4033737	-167.5205822	2.160	8.650	7.800	4.360	fish trap
1425	WAA_SSS_400kHz_MuttonCove-0081	53.4027392	-167.5197117	1.130	27.300	2.240	1.360	piling
1426	WAA_SSS_400kHz_MuttonCove-0083	53.4026076	-167.5196281	1.200	47.600	2.450	1.300	piling
1427	WAA_SSS_400kHz_MuttonCove-0089	53.4006870	-167.5198949	0.980	14.080	1.370	1.520	piling
1428	WAA_SSS_400kHz_MuttonCove-0094	53.3993331	-167.5192192	0.870	34.180	2.640	2.320	piling
1429	WAA_SSS_400kHz_MuttonCove-0093	53.3993628	-167.5191457	2.400	23.190	7.420	6.610	debris
1430	WAA_SSS_400kHz_MuttonCove-0024	53.4059407	-167.5207592	0.490	6.850	2.040	0.880	debris
1431	WAA_SSS_400kHz_MuttonCove-0091	53.4001257	-167.5172603	0.890	21.830	1.710	1.690	piling
1432	WAA_SSS_400kHz_MuttonCove-0014	53.4085758	-167.5195078	10.310	44.870	11.190	14.760	Unknown
1433	WAA_SSS_400kHz_MuttonCove-0013	53.4086365	-167.5195434	0.590	96.520	2.680	2.990	piling
1434	WAA_SSS_400kHz_MuttonCove-0021	53.4062253	-167.5182698	0.000	17.020	17.170	0.000	Unknown
1435	WAA_SSS_400kHz_MuttonCove-0002	53.4097610	-167.5209600	0.950	10.880	2.420	1.690	debris
1436	WAA_SSS_400kHz_MuttonCove-0003	53.4094691	-167.5208312	1.030	7.250	2.910	5.560	debris
1437	WAA_SSS_400kHz_MuttonCove-0005	53.4094096	-167.5220622	0.270	18.740	1.330	1.050	Piling
1438	WAA_SSS_400kHz_MuttonCove-0006	53.4093050	-167.5226916	1.000	10.160	2.550	2.800	piling

1439	WAA_SSS_400kHz_MuttonCove-0004	53.4094114	-167.5224591	0.720	5.020	1.110	0.990	debris
1440	WAA_SSS_400kHz_MuttonCove-0007	53.4091693	-167.5218549	0.780	4.540	1.340	6.020	Unknown
1441	WAA_SSS_400kHz_MuttonCove-0009	53.4089132	-167.5224323	0.960	10.280	1.390	2.700	piling
1442	WAA_SSS_400kHz_MuttonCove-0016	53.4080448	-167.5178611	0.340	17.260	1.820	3.030	piling
1443	WAA_SSS_400kHz_MuttonCove-0015	53.4080496	-167.5180486	0.210	15.810	0.610	0.810	piling
1444	WAA_SSS_400kHz_MuttonCove-0017	53.4079068	-167.5177244	0.460	3.780	1.260	2.310	Unknown
1445	WAA_SSS_400kHz_MuttonCove-0018	53.4072964	-167.5168792	0.280	5.030	1.790	1.460	debris
1446	WAA_SSS_400kHz_MuttonCove-0020	53.4063976	-167.5155448	0.620	13.650	7.970	5.040	Unknown
1447	WAA_SSS_400kHz_MuttonCove-0069	53.4035306	-167.5125992	0.260	7.380	3.730	1.600	debris
1448	WAA_SSS_400kHz_MuttonCove-0065	53.4036938	-167.5138324	0.360	8.660	1.590	3.650	piling
1449	WAA_SSS_400kHz_MuttonCove-0066	53.4036690	-167.5138521	0.360	16.390	1.590	3.370	piling
1450	WAA_SSS_400kHz_MuttonCove-0067	53.4036538	-167.5138518	0.320	12.170	1.430	2.680	piling
1451	WAA_SSS_400kHz_MuttonCove-0061	53.4038886	-167.5139245	0.840	10.550	9.560	2.450	Unknown
1452	WAA_SSS_400kHz_MuttonCove-0053	53.4040819	-167.5141192	3.020	31.710	2.730	4.780	Piling
1453	WAA_SSS_400kHz_MuttonCove-0048	53.4041188	-167.5145192	0.980	20.230	1.810	1.360	piling
1454	WAA_SSS_400kHz_MuttonCove-0054	53.4040679	-167.5143084	1.440	41.280	2.050	1.840	Piling
1455	WAA_SSS_400kHz_MuttonCove-0050	53.4041029	-167.5142897	1.350	31.590	1.340	2.070	piling
1456	WAA_SSS_400kHz_MuttonCove-0046	53.4041791	-167.5144982	0.760	24.090	2.370	1.360	piling
1457	WAA_SSS_400kHz_MuttonCove-0059	53.4039305	-167.5144779	1.630	5.950	6.340	2.060	debris
1458	WAA_SSS_400kHz_MuttonCove-0058	53.4039396	-167.5146805	2.480	34.110	2.490	3.170	piling
1459	WAA_SSS_400kHz_MuttonCove-0051	53.4040870	-167.5145569	1.230	92.570	2.870	1.590	piling
1460	WAA_SSS_400kHz_MuttonCove-0049	53.4041103	-167.5146677	1.270	34.110	1.980	1.610	piling
1461	WAA_SSS_400kHz_MuttonCove-0047	53.4041381	-167.5146033	1.610	38.130	2.430	2.560	Piling
1462	WAA_SSS_400kHz_MuttonCove-0045	53.4042599	-167.5146407	1.070	32.640	2.600	2.280	piling
1463	WAA_SSS_400kHz_MuttonCove-0043	53.4043555	-167.5147953	0.630	34.390	1.630	1.030	piling
1464	WAA_SSS_400kHz_MuttonCove-0044	53.4043383	-167.5149152	2.030	51.730	1.820	2.310	piling
1465	WAA_SSS_400kHz_MuttonCove-0038	53.4044907	-167.5149542	1.710	32.690	9.200	2.000	piling
1466	WAA_SSS_400kHz_MuttonCove-0035	53.4045943	-167.5150900	2.570	38.380	25.110	3.860	piling
1467	WAA_SSS_400kHz_MuttonCove-0036	53.4045867	-167.5152709	0.660	30.610	1.310	1.950	piling
1468	WAA_SSS_400kHz_MuttonCove-0033	53.4046681	-167.5152094	0.620	35.710	2.660	1.650	piling
1469	WAA_SSS_400kHz_MuttonCove-0032	53.4046816	-167.5150633	1.810	37.460	35.380	2.320	piling
1470	WAA_SSS_400kHz_MuttonCove-0037	53.4045767	-167.5149269	1.460	30.530	1.940	2.160	piling
1471	WAA_SSS_400kHz_MuttonCove-0034	53.4046197	-167.5149115	2.260	43.330	3.500	4.240	piling
1472	WAA_SSS_400kHz_MuttonCove-0031	53.4047013	-167.5148277	1.190	28.680	2.520	4.120	piling
1473	WAA_SSS_400kHz_MuttonCove-0030	53.4047398	-167.5149566	0.960	6.800	2.920	1.590	debris
1474	WAA_SSS_400kHz_MuttonCove-0026	53.4047984	-167.5150786	0.930	16.280	1.940	1.130	piling
1475	WAA_SSS_400kHz_MuttonCove-0027	53.4047938	-167.5151199	1.060	31.460	1.520	1.820	piling
1476	WAA_SSS_400kHz_MuttonCove-0028	53.4047754	-167.5151780	0.980	38.350	1.530	2.510	piling
1477	WAA_SSS_400kHz_MuttonCove-0029	53.4047413	-167.5151729	1.260	37.100	1.660	3.220	piling
1478	WAA_SSS_400kHz_MuttonCove-0025	53.4048137	-167.5155440	0.350	38.620	1.780	2.740	piling
1479	WAA_SSS_400kHz_MuttonCove-0019	53.4065566	-167.5175642	0.630	9.740	6.850	2.530	debris
1480	WAA_SSS_400kHz_MuttonCove-0039	53.4044561	-167.5152901	1.490	36.320	2.370	3.340	piling
1481	WAA_SSS_400kHz_MuttonCove-0040	53.4044543	-167.5152614	0.690	33.840	1.490	1.530	piling
1482	WAA_SSS_400kHz_MuttonCove-0042	53.4044294	-167.5151448	1.490	65.190	3.120	4.090	piling
1483	WAA_SSS_400kHz_MuttonCove-0041	53.4044410	-167.5150480	1.170	30.150	5.260	3.580	piling
1484	WAA_SSS_400kHz_MuttonCove-0055	53.4040472	-167.5149468	1.550	23.470	2.110	3.430	piling
1485	WAA_SSS_400kHz_MuttonCove-0068	53.4036244	-167.5136468	2.420	20.580	2.490	2.730	piling
1486	WAA_SSS_400kHz_MuttonCove-0077	53.4030263	-167.5141414	5.640	43.020	3.430	6.290	Piling
1487	WAA_SSS_400kHz_MuttonCove-0060	53.4039088	-167.5156392	1.900	6.270	2.360	3.540	debris
1488	WAA_SSS_400kHz_MuttonCove-0057	53.4039736	-167.5157131	2.530	20.510	5.370	4.480	piling
1489	WAA_SSS_400kHz_MuttonCove-0056	53.4039966	-167.5158228	1.870	14.720	2.170	3.060	piling
1490	WAA_SSS_400kHz_MuttonCove-0063	53.4038521	-167.5161054	1.800	5.730	1.790	1.890	debris
1491	WAA_SSS_400kHz_MuttonCove-0062	53.4038717	-167.5160003	6.350	14.890	6.240	7.780	Unknown
1492	WAA_SSS_400kHz_MuttonCove-0079	53.4029658	-167.5140262	1.510	43.550	1.890	2.440	piling
1493	WAA_SSS_400kHz_MuttonCove-0086	53.4021590	-167.5168324	8.260	4.980	5.200	16.530	Unknown
1494	WAA_SSS_400kHz_MuttonCove-0001	53.4097698	-167.5208805	0.820	17.930	3.790	1.340	Unknown
1495	WAA_SSS_400kHz_MuttonCove-0092	53.3994200	-167.5208522	1.500	3.930	2.290	10.410	Unknown
1496	WAA_SSS_400kHz_MuttonCove-0090	53.4006369	-167.5199022	0.190	12.490	1.290	2.840	Piling
1497	WAA_SSS_400kHz_MuttonCove-0088	53.4020753	-167.5202602	0.280	8.580	1.410	2.170	piling
1498	WAA_SSS_400kHz_MuttonCove-0087	53.4021470	-167.5202429	0.230	17.330	1.800	1.210	piling
1499	WAA_SSS_400kHz_MuttonCove-0085	53.4024812	-167.5203028	0.610	32.320	0.920	0.790	Piling
1500	WAA_SSS_400kHz_MuttonCove-0084	53.4025610	-167.5202741	4.700	7.550	1.970	6.150	debris
1501	WAA_SSS_400kHz_MuttonCove-0082	53.4026539	-167.5202710	2.460	30.050	1.590	2.870	Piling
1502	WAA_SSS_400kHz_MuttonCove-0080	53.4028060	-167.5203302	1.390	34.180	21.280	1.680	Piling
1503	WAA_SSS_400kHz_MuttonCove-0076	53.4030352	-167.5203603	1.340	46.440	2.290	2.690	piling
1504	WAA_SSS_400kHz_MuttonCove-0078	53.4029828	-167.5205086	1.950	42.320	8.650	2.330	Piling
1505	WAA_SSS_400kHz_MuttonCove-0074	53.4031772	-167.5204056	0.960	44.930	4.050	2.660	Piling
1506	WAA_SSS_400kHz_MuttonCove-0075	53.4031060	-167.5205551	3.110	77.100	48.930	4.820	Piling
1507	WAA_SSS_400kHz_MuttonCove-0072	53.4033233	-167.5209928	0.000	0.000	0.000	0.000	
1508	WAA_SSS_400kHz_MuttonCove-0073	53.4032966	-167.5206499	1.300	84.620	3.450	2.220	Piling
1509	WAA_SSS_400kHz_MuttonCove-0070	53.4034983	-167.5206622	0.820	36.830	2.230	2.230	piling
1510	WAA_SSS_400kHz_MuttonCove-0052	53.4040859	-167.5214730	0.760	44.720	3.800	3.300	Piling

1511	WAA_SSS_400kHz_MuttonCove-0064	53.4038448	-167.5215475	1.420	26.840	2.420	3.810	Piling
1512	WAA_SSS_400kHz_MuttonCove-0012	53.4086559	-167.5226456	0.590	8.180	1.200	0.830	debris
1513	WAA_SSS_400kHz_MuttonCove-0010	53.4088801	-167.5226928	0.740	8.490	1.770	1.870	debris
1514	WAA_SSS_400kHz_OtterPointBargeDock_6	53.3945535	-167.8406571	0.620	2.470	2.130	1.980	unknown
1515	WAA_SSS_400kHz_OtterPointBargeDock_5	53.3945688	-167.8407295	0.680	2.970	1.750	1.980	unknown
1516	WAA_SSS_400kHz_OtterPointBargeDock_7	53.3945410	-167.8412015	0.960	21.080	2.950	1.770	debris cluster
1517	WAA_SSS_400kHz_OtterPointBargeDock_4	53.3948202	-167.8412221	3.410	5.130	5.860	15.750	unknown
1518	WAA_SSS_400kHz_OtterPointBargeDock_9	53.3942066	-167.8427984	0.580	17.580	1.190	2.630	piling
1519	WAA_SSS_400kHz_OtterPointBargeDock_10	53.3940984	-167.8424905	5.610	3.080	1.910	20.330	unknown
1520	WAA_SSS_400kHz_OtterPointBargeDock_11	53.3939557	-167.8430807	0.300	6.540	1.950	1.750	unknown
1521	WAA_SSS_400kHz_OtterPointBargeDock_14	53.3931500	-167.8429103	0.970	18.610	6.620	2.280	unknown
1522	WAA_SSS_400kHz_OtterPointBargeDock_15	53.3930371	-167.8425035	2.860	46.410	8.980	14.210	unknown
1523	WAA_SSS_400kHz_OtterPointBargeDock_16	53.3930181	-167.8426143	0.790	11.710	7.680	1.750	unknown
1524	WAA_SSS_400kHz_OtterPointBargeDock_17	53.3911035	-167.8403166	5.990	22.670	7.120	27.200	
1525	WAA_SSS_400kHz_OtterPointBargeDock_12	53.3934141	-167.8427882	0.540	21.700	7.590	0.970	unknown
1526	WAA_SSS_400kHz_OtterPointBargeDock_13	53.3933422	-167.8426096	0.720	5.140	1.610	1.610	unknown
1527	WAA_SSS_400kHz_OtterPointBargeDock_8	53.3942922	-167.8427580	0.380	8.820	3.370	2.180	unknown
1528	WAA_SSS_400kHz_OtterPointBargeDock_2	53.4003368	-167.8378210	0.000	7.400	2.340	1.560	unknown
1529	WAA_SSS_400kHz_OtterPointBargeDock_1	53.4011496	-167.8377603	0.000	8.050	3.650	3.100	unknown
1530	WAA_SSS_400kHz_OtterPointBargeDock_3	53.3995396	-167.8440775	8.650	18.140	6.070	48.760	unknown
1531	WAA_SSS_400kHz_OtterPointBargeDock_0029	53.3972587	-167.8399631	2.290	14.900	5.510	6.290	debris cluster
1532	WAA_SSS_400kHz_OtterPointBargeDock_0034	53.3970509	-167.8392054	4.560	52.990	10.270	10.190	debris
1533	WAA_SSS_400kHz_OtterPointBargeDock_0028	53.3973961	-167.8385031	0.870	19.450	16.680	3.460	debris cluster
1534	WAA_SSS_400kHz_OtterPointBargeDock_0030	53.3971389	-167.8381196	6.580	30.470	15.490	22.140	debris cluster
1535	WAA_SSS_400kHz_OtterPointBargeDock_0042	53.3964307	-167.8378267	0.730	11.300	5.240	4.390	debris
1536	WAA_SSS_400kHz_OtterPointBargeDock_0047	53.3962132	-167.8378728	0.730	11.790	3.110	3.110	debris
1537	WAA_SSS_400kHz_OtterPointBargeDock_0063	53.3955875	-167.8377874	2.500	8.990	4.500	16.270	debris
1538	WAA_SSS_400kHz_OtterPointBargeDock_0059	53.3956497	-167.8382727	1.610	16.720	7.670	3.040	debris
1539	WAA_SSS_400kHz_OtterPointBargeDock_0062	53.3956247	-167.8382711	1.630	14.630	8.690	3.490	debris
1540	WAA_SSS_400kHz_OtterPointBargeDock_0085	53.3945368	-167.8405967	0.820	18.120	3.230	2.970	debris cluster
1541	WAA_SSS_400kHz_OtterPointBargeDock_0081	53.3946552	-167.8413229	1.070	15.260	1.290	1.520	piling
1542	WAA_SSS_400kHz_OtterPointBargeDock_0095	53.3932499	-167.8427793	1.500	18.850	10.140	2.540	debris
1543	WAA_SSS_400kHz_OtterPointBargeDock_0097	53.3926003	-167.8418788	1.880	6.100	4.310	11.430	debris
1544	WAA_SSS_400kHz_OtterPointBargeDock_0098	53.3925649	-167.8419093	1.460	5.230	2.180	6.600	debris
1545	WAA_SSS_400kHz_OtterPointBargeDock_0013	53.3985742	-167.8281494	1.530	10.960	3.980	2.910	debris
1546	WAA_SSS_400kHz_OtterPointBargeDock_0015	53.3984107	-167.8282817	1.890	15.310	10.050	3.230	debris cluster
1547	WAA_SSS_400kHz_OtterPointBargeDock_0014	53.3984162	-167.8290298	5.650	6.120	3.510	9.680	debris cluster
1548	WAA_SSS_400kHz_OtterPointBargeDock_0046	53.3962947	-167.8302426	1.090	12.730	2.230	2.140	debris
1549	WAA_SSS_400kHz_OtterPointBargeDock_0052	53.3959496	-167.8309828	2.030	30.110	13.600	7.010	debris cluster
1550	WAA_SSS_400kHz_OtterPointBargeDock_0057	53.3956975	-167.8296872	2.080	26.580	4.650	6.730	debris
1551	WAA_SSS_400kHz_OtterPointBargeDock_0053	53.3959004	-167.8297539	1.320	14.260	2.580	2.200	piling
1552	WAA_SSS_400kHz_OtterPointBargeDock_0048	53.3961925	-167.8293636	1.180	5.050	1.900	2.080	debris
1553	WAA_SSS_400kHz_OtterPointBargeDock_0056	53.3958213	-167.8294364	2.100	25.600	2.650	3.370	debris cluster
1554	WAA_SSS_400kHz_OtterPointBargeDock_0051	53.3959612	-167.8286986	2.210	15.440	4.600	6.800	debris cluster
1555	WAA_SSS_400kHz_OtterPointBargeDock_0058	53.3956598	-167.8295339	2.590	5.600	3.590	5.380	debris
1556	WAA_SSS_400kHz_OtterPointBargeDock_0065	53.3952558	-167.8289284	1.470	14.690	3.180	2.690	debris
1557	WAA_SSS_400kHz_OtterPointBargeDock_0069	53.3950524	-167.8293221	7.810	7.240	3.630	9.190	debris
1558	WAA_SSS_400kHz_OtterPointBargeDock_0067	53.3951492	-167.8295208	1.980	16.660	3.690	2.650	debris
1559	WAA_SSS_400kHz_OtterPointBargeDock_0066	53.3951637	-167.8297744	2.340	40.040	3.870	5.070	debris cluster
1560	WAA_SSS_400kHz_OtterPointBargeDock_0072	53.3950236	-167.8296723	2.410	15.270	2.670	3.870	debris
1561	WAA_SSS_400kHz_OtterPointBargeDock_0076	53.3949185	-167.8300846	0.000	16.100	1.460	0.000	piling
1562	WAA_SSS_400kHz_OtterPointBargeDock_0074	53.3949325	-167.8288391	0.600	16.090	2.190	1.450	debris
1563	WAA_SSS_400kHz_OtterPointBargeDock_0080	53.3946612	-167.8292236	2.050	7.890	2.570	2.710	debris
1564	WAA_SSS_400kHz_OtterPointBargeDock_0086	53.3944591	-167.8288373	1.120	20.690	5.680	2.720	debris cluster
1565	WAA_SSS_400kHz_OtterPointBargeDock_0106	53.3900200	-167.8313181	3.310	18.480	2.900	3.960	piling
1566	WAA_SSS_400kHz_OtterPointBargeDock_0118	53.3892706	-167.8311171	3.600	10.350	3.320	3.920	debris
1567	WAA_SSS_400kHz_OtterPointBargeDock_0138	53.3876191	-167.8345684	2.250	12.370	1.850	3.710	debris
1568	WAA_SSS_400kHz_OtterPointBargeDock_0120	53.3890631	-167.8314890	0.970	35.920	10.490	1.780	debris
1569	WAA_SSS_400kHz_OtterPointBargeDock_0105	53.3900377	-167.8320362	2.900	19.040	6.280	3.490	debris
1570	WAA_SSS_400kHz_OtterPointBargeDock_0111	53.3897531	-167.8321364	5.830	8.360	8.050	10.110	debris cluster
1571	WAA_SSS_400kHz_OtterPointBargeDock_0113	53.3896231	-167.8339867	2.390	37.270	18.460	4.660	debris cluster
1572	WAA_SSS_400kHz_OtterPointBargeDock_0099	53.3924097	-167.8345661	3.040	6.930	2.990	3.970	debris
1573	WAA_SSS_400kHz_OtterPointBargeDock_0087	53.3943573	-167.8341097	6.630	9.620	5.000	7.400	debris
1574	WAA_SSS_400kHz_OtterPointBargeDock_0093	53.3939193	-167.8332304	1.810	16.730	3.050	4.060	debris
1575	WAA_SSS_400kHz_OtterPointBargeDock_0092	53.3942133	-167.8334823	3.290	7.680	2.200	4.390	debris
1576	WAA_SSS_400kHz_OtterPointBargeDock_0089	53.3943391	-167.8311825	1.240	25.410	2.020	2.450	piling
1577	WAA_SSS_400kHz_OtterPointBargeDock_0083	53.3945796	-167.8314260	2.290	6.050	3.980	6.970	debris
1578	WAA_SSS_400kHz_OtterPointBargeDock_0055	53.3958551	-167.8308515	2.420	45.960	7.750	8.960	debris cluster
1579	WAA_SSS_400kHz_OtterPointBargeDock_0023	53.3975751	-167.8309452	1.650	18.990	6.110	8.610	debris cluster
1580	WAA_SSS_400kHz_OtterPointBargeDock_0010	53.3994866	-167.8300139	1.200	25.190	7.830	2.470	debris
1581	WAA_SSS_400kHz_OtterPointBargeDock_0041	53.3965012	-167.8306138	1.340	27.390	2.420	3.230	piling
1582	WAA_SSS_400kHz_OtterPointBargeDock_0075	53.3949256	-167.8302813	1.350	11.360	4.160	4.920	debris

1583	WAA_SSS_400kHz_OtterPointBargeDock_0091	53.3942615	-167.8319152	2.700	28.820	14.100	3.710	debris cluster
1584	WAA_SSS_400kHz_OtterPointBargeDock_0084	53.3945685	-167.8331361	1.720	21.080	2.440	3.250	piling
1585	WAA_SSS_400kHz_OtterPointBargeDock_0077	53.3947764	-167.8315269	1.080	20.090	1.820	2.200	piling
1586	WAA_SSS_400kHz_OtterPointBargeDock_0078	53.3947746	-167.8331086	2.200	9.140	2.590	5.330	debris
1587	WAA_SSS_400kHz_OtterPointBargeDock_0070	53.3950452	-167.8315030	2.710	9.720	1.270	6.340	debris
1588	WAA_SSS_400kHz_OtterPointBargeDock_0061	53.3956436	-167.8330716	1.010	23.380	5.950	4.160	debris
1589	WAA_SSS_400kHz_OtterPointBargeDock_0044	53.3963976	-167.8326898	3.620	15.440	6.900	13.400	wreck
1590	WAA_SSS_400kHz_OtterPointBargeDock_0035	53.3970229	-167.8321438	1.190	17.570	5.360	3.260	debris
1591	WAA_SSS_400kHz_OtterPointBargeDock_0020	53.3979428	-167.8313850	1.320	16.320	2.690	4.800	debris
1592	WAA_SSS_400kHz_OtterPointBargeDock_0021	53.3976756	-167.8322791	3.260	6.680	2.220	4.060	debris
1593	WAA_SSS_400kHz_OtterPointBargeDock_0019	53.3979818	-167.8330270	1.120	13.700	2.970	2.580	debris
1594	WAA_SSS_400kHz_OtterPointBargeDock_0073	53.3949967	-167.8339300	2.810	18.200	4.080	8.520	debris
1595	WAA_SSS_400kHz_OtterPointBargeDock_0090	53.3942812	-167.8324802	2.740	8.970	3.370	4.860	debris
1596	WAA_SSS_400kHz_OtterPointBargeDock_0088	53.3943573	-167.8333036	4.140	7.990	1.690	7.610	debris
1597	WAA_SSS_400kHz_OtterPointBargeDock_0036	53.3969857	-167.8338142	4.370	28.810	5.260	8.530	debris
1598	WAA_SSS_400kHz_OtterPointBargeDock_0025	53.3974959	-167.8337315	1.580	20.410	4.010	3.100	debris
1599	WAA_SSS_400kHz_OtterPointBargeDock_0039	53.3967116	-167.8330443	1.290	17.100	2.030	9.130	piling
1600	WAA_SSS_400kHz_OtterPointBargeDock_0101	53.3918127	-167.8349887	2.800	7.110	4.140	2.960	debris
1601	WAA_SSS_400kHz_OtterPointBargeDock_0109	53.3898129	-167.8349988	1.600	17.300	11.990	2.330	debris cluster
1602	WAA_SSS_400kHz_OtterPointBargeDock_0119	53.3892051	-167.8345816	1.600	23.690	8.220	3.950	debris
1603	WAA_SSS_400kHz_OtterPointBargeDock_0121	53.3890037	-167.8347914	5.920	19.020	8.320	14.610	debris
1604	WAA_SSS_400kHz_OtterPointBargeDock_0133	53.3878625	-167.8366882	1.870	35.410	21.950	4.650	debris
1605	WAA_SSS_400kHz_OtterPointBargeDock_0141	53.3875258	-167.8366218	1.500	18.160	2.570	1.690	debris
1606	WAA_SSS_400kHz_OtterPointBargeDock_0114	53.3895726	-167.8350203	1.490	9.600	1.750	3.490	debris
1607	WAA_SSS_400kHz_OtterPointBargeDock_0100	53.3918719	-167.8345718	1.230	53.940	2.040	2.450	piling
1608	WAA_SSS_400kHz_OtterPointBargeDock_0016	53.3982779	-167.8335383	2.070	14.280	1.530	5.620	debris
1609	WAA_SSS_400kHz_OtterPointBargeDock_0017	53.3982413	-167.8340612	0.000	9.690	4.720	4.230	debris
1610	WAA_SSS_400kHz_OtterPointBargeDock_0038	53.3967709	-167.8356029	0.000	17.680	9.740	10.390	debris
1611	WAA_SSS_400kHz_OtterPointBargeDock_0128	53.3887047	-167.8358422	0.000	22.400	6.400	4.320	debris
1612	WAA_SSS_400kHz_OtterPointBargeDock_0124	53.3888497	-167.8372056	0.000	22.780	1.590	3.770	piling
1613	WAA_SSS_400kHz_OtterPointBargeDock_0139	53.3875588	-167.8363588	0.000	20.040	7.720	8.560	debris
1614	WAA_SSS_400kHz_OtterPointBargeDock_0137	53.3876374	-167.8361966	0.000	11.140	5.950	10.430	debris
1615	WAA_SSS_400kHz_OtterPointBargeDock_0135	53.3877463	-167.8374457	2.010	10.590	3.760	2.960	debris
1616	WAA_SSS_400kHz_OtterPointBargeDock_0033	53.3970648	-167.8359406	5.010	6.900	3.990	28.480	debris
1617	WAA_SSS_400kHz_OtterPointBargeDock_0012	53.3990896	-167.8347437	0.700	13.470	3.240	2.640	debris
1618	WAA_SSS_400kHz_OtterPointBargeDock_0037	53.3969524	-167.8360072	8.160	11.850	10.960	11.180	debris
1619	WAA_SSS_400kHz_OtterPointBargeDock_0043	53.3964026	-167.8357359	1.680	7.900	3.640	3.520	debris
1620	WAA_SSS_400kHz_OtterPointBargeDock_0050	53.3961457	-167.8359649	4.040	6.960	4.170	6.490	debris
1621	WAA_SSS_400kHz_OtterPointBargeDock_0103	53.3904062	-167.8379455	3.100	29.210	9.510	8.130	debris
1622	WAA_SSS_400kHz_OtterPointBargeDock_0127	53.3887236	-167.8382839	0.520	31.560	8.570	1.380	debris
1623	WAA_SSS_400kHz_OtterPointBargeDock_0122	53.3888795	-167.8379679	2.610	15.470	3.450	4.250	debris
1624	WAA_SSS_400kHz_OtterPointBargeDock_0126	53.3887430	-167.8378313	8.100	11.170	6.850	11.180	debris
1625	WAA_SSS_400kHz_OtterPointBargeDock_0129	53.3886337	-167.8379649	2.870	7.610	2.340	4.650	debris
1626	WAA_SSS_400kHz_OtterPointBargeDock_0140	53.3875320	-167.8378394	7.010	48.720	20.200	20.610	unknown
1627	WAA_SSS_400kHz_OtterPointBargeDock_0125	53.3888487	-167.8383313	3.030	7.860	3.710	4.820	debris
1628	WAA_SSS_400kHz_OtterPointBargeDock_0082	53.3946169	-167.8369643	4.200	7.850	3.010	5.470	debris
1629	WAA_SSS_400kHz_OtterPointBargeDock_0027	53.3974237	-167.8364444	1.980	5.370	1.700	3.300	debris
1630	WAA_SSS_400kHz_OtterPointBargeDock_0024	53.3975487	-167.8362098	2.160	33.320	7.210	5.970	debris
1631	WAA_SSS_400kHz_OtterPointBargeDock_0054	53.3958622	-167.8371385	1.700	7.690	3.380	2.020	debris
1632	WAA_SSS_400kHz_OtterPointBargeDock_0068	53.3951366	-167.8369178	1.170	11.610	2.790	2.670	debris
1633	WAA_SSS_400kHz_OtterPointBargeDock_0110	53.3897850	-167.8384507	1.490	8.930	3.150	2.690	debris
1634	WAA_SSS_400kHz_OtterPointBargeDock_0104	53.3901086	-167.8392351	0.840	18.180	2.440	2.700	piling
1635	WAA_SSS_400kHz_OtterPointBargeDock_0001	53.4024751	-167.8367027	5.180	18.340	4.450	6.490	debris
1636	WAA_SSS_400kHz_OtterPointBargeDock_0004	53.4016163	-167.8373523	1.560	7.040	3.420	4.110	debris
1637	WAA_SSS_400kHz_OtterPointBargeDock_0007	53.4008254	-167.8373965	1.940	7.620	2.490	3.930	debris
1638	WAA_SSS_400kHz_OtterPointBargeDock_0008	53.4003040	-167.8374996	0.430	13.720	1.010	1.010	piling
1639	WAA_SSS_400kHz_OtterPointBargeDock_0011	53.3991870	-167.8368424	0.800	11.260	1.040	1.830	piling
1640	WAA_SSS_400kHz_OtterPointBargeDock_0031	53.3971001	-167.8377873	5.350	7.780	4.880	6.550	debris
1641	WAA_SSS_400kHz_OtterPointBargeDock_0032	53.3970857	-167.8378342	1.330	4.380	1.130	1.580	debris
1642	WAA_SSS_400kHz_OtterPointBargeDock_0040	53.3966767	-167.8376246	3.230	6.160	3.800	4.980	debris
1643	WAA_SSS_400kHz_OtterPointBargeDock_0049	53.3961578	-167.8378089	1.510	10.570	1.950	3.320	debris
1644	WAA_SSS_400kHz_OtterPointBargeDock_0064	53.3955529	-167.8376664	2.810	9.670	7.940	9.980	debris
1645	WAA_SSS_400kHz_OtterPointBargeDock_0060	53.3956456	-167.8379247	3.290	8.160	5.710	5.610	debris
1646	WAA_SSS_400kHz_OtterPointBargeDock_0079	53.3947334	-167.8375321	0.950	7.850	2.850	4.180	debris
1647	WAA_SSS_400kHz_OtterPointBargeDock_0123	53.3888784	-167.8389761	0.350	5.200	3.990	0.940	debris
1648	WAA_SSS_400kHz_OtterPointBargeDock_0130	53.3884657	-167.8389064	0.250	17.710	2.310	0.920	debris
1649	WAA_SSS_400kHz_OtterPointBargeDock_0131	53.3879047	-167.8390200	1.250	37.390	4.020	5.590	debris cluster
1650	WAA_SSS_400kHz_OtterPointBargeDock_0136	53.3877077	-167.8390982	1.030	7.170	5.770	4.170	debris
1651	WAA_SSS_400kHz_OtterPointBargeDock_0134	53.3878199	-167.8398846	0.930	14.760	2.780	1.320	piling
1652	WAA_SSS_400kHz_OtterPointBargeDock_0142	53.3872996	-167.8346009	5.200	22.530	20.990	7.440	debris
1653	WAA_SSS_400kHz_OtterPointBargeDock_0132	53.3878941	-167.8353201	1.500	12.900	3.630	3.250	debris
1654	WAA_SSS_400kHz_OtterPointBargeDock_0116	53.3894486	-167.8338835	1.850	12.080	2.010	3.590	debris

1655	WAA_SSS_400kHz_OtterPointBargeDock_0107	53.3899806	-167.8348710	2.090	10.350	2.350	2.620	debris
1656	WAA_SSS_400kHz_OtterPointBargeDock_0102	53.3904350	-167.8339669	3.560	5.890	3.110	5.010	debris
1657	WAA_SSS_400kHz_OtterPointBargeDock_0115	53.3894930	-167.8330300	4.510	7.150	6.580	8.580	debris
1658	WAA_SSS_400kHz_OtterPointBargeDock_0112	53.3896646	-167.8344713	1.730	16.630	1.550	3.470	debris
1659	WAA_SSS_400kHz_OtterPointBargeDock_0117	53.3893572	-167.8341194	6.810	29.330	19.660	10.320	unknown
1660	WAA_SSS_400kHz_OtterPointBargeDock_0108	53.3899740	-167.8313648	2.910	10.630	2.480	5.110	debris
1661	WAA_SSS_400kHz_OtterPointBargeDock_0045	53.3963182	-167.8380021	1.600	8.650	5.070	3.870	debris
1662	WAA_SSS_400kHz_OtterPointBargeDock_0018	53.3980398	-167.8382034	1.670	4.590	2.470	2.470	debris
1663	WAA_SSS_400kHz_OtterPointBargeDock_0006	53.4014049	-167.8372385	0.600	9.000	1.570	1.310	debris
1664	WAA_SSS_400kHz_OtterPointBargeDock_0071	53.3950349	-167.8394742	1.680	27.090	6.850	4.470	unknown
1665	WAA_SSS_400kHz_OtterPointBargeDock_0096	53.3926453	-167.8423781	0.000	5.710	1.320	0.000	debris
1666	WAA_SSS_400kHz_OtterPointBargeDock_0094	53.3934499	-167.8427906	0.510	8.970	7.820	4.740	debris
1667	WAA_SSS_400kHz_OtterPointBargeDock_0026	53.3974783	-167.8386499	2.800	24.590	3.370	3.850	debris
1668	WAA_SSS_400kHz_OtterPointBargeDock_0002	53.4019546	-167.8379074	2.740	4.180	3.200	3.970	debris
1669	WAA_SSS_400kHz_OtterPointBargeDock_0005	53.4015002	-167.8382566	2.580	12.030	7.350	4.810	debris
1670	WAA_SSS_400kHz_OtterPointBargeDock_0022	53.3976155	-167.8404813	0.250	11.000	3.210	1.320	debris
1671	WAA_SSS_400kHz_OtterPointBargeDock_0009	53.3996400	-167.8406771	1.750	8.860	9.570	4.630	debris
1672	WAA_SSS_400kHz_OtterPointBargeDock_0003	53.4017140	-167.8441569	0.000	21.780	1.950	0.000	debris

Note: Yellow highlight indicates those targets that were reacquired.

APPENDIX D

Geophysical Subcontractor Report

Site Investigation

Unalaska Naval Sea Defense Area

Marine Geophysical Survey Report

Prepared for:

URS Group / AECOM

Prepared by:

Gravity Consulting LLC

SeaVision Underwater Solutions Inc

July 22nd, 2016

Executive Summary

During a 15-day operational period from May 27, 2015 to June 7, 2015, Gravity Consulting LLC and SeaVision Underwater Solutions Inc. (hereafter referred to as the Survey Team) completed marine geophysical survey activities in the Unalaska Naval Defense Sea Area (NDSA) in support of U.S. Navy Contract N44255-09-D-4001, Delivery Order 80, for URS Group, Inc / AECOM and the Naval Facilities Engineering Command Northwest (NAVFAC Northwest).

Per the Final Work Plan issued on November 21, 2014, the principle objective of this Site Investigation (SI) was to investigate the presence of munitions and explosives of concern (MEC) from U.S. forces on the sea floor at known in-water ranges and bombing targets, over-water ordnance handling sites, and in-water MEC disposal areas within the Unalaska NDSA. During a previously executed preliminary assessment (PA) of this NDSA, fourteen (14) discrete survey areas in Dutch Harbor and Chernofski Harbor had been identified and prioritized for further investigation based on risks for human exposure to MEC based on reported discoveries, proximity to known human activities, and known frequency of historic MEC release.

Of these 14 areas, the survey team performed a partial and/or complete **Wide Area Assessment (WAA) of twelve (12) discrete survey areas using sidescan sonar surveys and interferometric sidescan sonar surveys.** Wide swath sidescan sonar and interferometric sidescan sonar surveying from two vessels (an 80' steel oceanographic research vessel and a 15' survey launch) had been determined by the Survey Team to be the most effective approach to maximizing seafloor survey coverage during the fixed field survey period. During this field period, **the Survey Team covered 2150 acres of seafloor** using these survey methods.

In-field processing and interpretation of the WAA sonar data led to Reacquisition and Verification (RV) efforts in ten (10) survey areas to reacquire **104 total targets** with a remotely-operated vehicle (ROV) and collect video and still image confirmation of target identification. Further processing and interpretation of the WAA sonar data yielded a total of **1672 potential targets**, some of which are readily identified in the imagery as various types of debris or fishing gear.

The total number of targets that has been identified through comprehensive post-processing after the field survey period is a testament to the challenges associated with SI activities in fixed field operations windows because field personnel must rapidly review, interpret, classify, prioritize, and select targets of interest for further RV activites, in an attempt to select the best targets for further investigation while ignoring hundreds of other targets. Additionally, RV activities must be prioritized and scheduled to make the best use of the field period and to accommodate weather and sea-state conditions so that remotely operated vehicle operations can successfully yield detailed target investigations. Therefore, RV activities represent investigation of a small percentage (7% or less) of all detected targets during WAA survey operations.

RV activities led to reacquisition of 104 targets, most of which proved to be various types of fishing traps, mooring anchor blocks, rocks, sunken mooring buoys, and debris. However, three targets: one target at Dutch Harbor City Dock 1 – 1 and two targets at Mutton Cove MC-36, investigated in Dutch Harbor and Chernofski Harbor, respectively, exhibited characteristics of 500 to 650-pound bombs. A vessel wreck was identified in Chernofski Harbor. Additionally, members of our survey team found remnant projectiles in the surf zone (below Mean High Water) along the shoreline of Eider Point in Dutch Harbor.

The results of the WAA surveys in other areas should not be construed to indicate that the surveyed areas are completely clear of MEC or that RV activities are not necessary. Rather, it is more appropriate to conclude that at the time of this WAA survey, these survey methodologies may not indicate the presence of MEC exposed on the seafloor. Sediment transport dynamics in the survey areas apparently devoid of MEC may in fact expose MEC in the future.

Comprehensive survey and RV operations are prudent for reacquiring suspicious WAA targets that have been identified in this survey effort, specifically in Mutton Cove, Dutch Harbor City Dock 1, and Eider Point. Additionally, these same survey areas should be subject to comprehensive survey efforts in order to identify any other MEC that may be present, but as yet undetected.

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1 WAA Survey Program

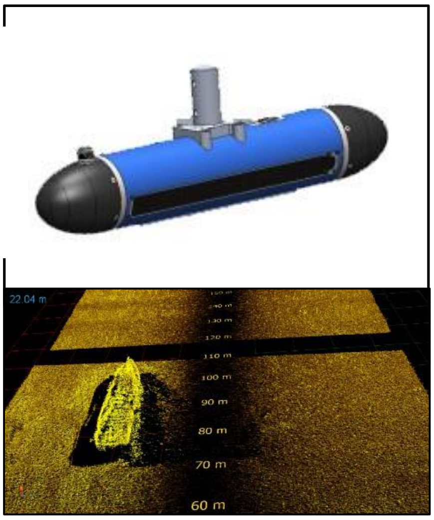
1.1 Equipment

1.1.1 Edgetech 4125 Sidescan Sonar with HemishpereGPS R320 Receiver

The Survey Team embarked onboard M/V Island C, an 85-foot survey boat, to conduct survey operations in the Unalaska NDSA. To survey large areas in the Unalaska NDSA, the Survey Team deployed an Edgetech 4125 Dual Frequency 400 kHz / 900 kHz CHIRP sidescan sonar with a depressor wing. The Survey Team paired the Edgetech sidescan sonar with a sub-meter accurate HemisphereGPS R320 GNSS Receiver. The HemisphereGPS R320 supplied WGS-84 latitutde and longitude positioning at a rate of 20 Hz, with the positioning data distributed simultaneously to the Edgetech 4125 acquisiton system and a hydrographic survey software package for monitoring real-time navigation relative to pre-planned survey lines during all survey operations.

1.1.2 PingDSP 3DSS 460 Interferometric Sonar with SBG Inertial Navigation System

In order to survey smaller survey areas (whose geometries required tighter turning radii or approaches to shallow water less than 5- meters depth), the Survey Team mobilized a 15-foot plastic survey skiff outfitted with a PingDSP 3DSS 460 Interferometric sonar and an SBG Systems Ekinox-D Inertial Navigation System. The PingDSP sonar is a high-resolution sidescan sonar operating at 460 kHz that collects simultaneous sidescan sonar imagery and bathymetry data. The SBG Inertial Navigation System couples a dual-antenna Trimble GPS receiver with a tactical grade inertial measurement unit to generate decimeter-level accurate positioning at a rate of 50 Hz. The PingDSP sonar, rigidly mounted to a pole on the port beam of the survey skiff, integrates all of the positioning and orientation data in real-time to generate high-resolution sidescan sonar imagery, 3D rendered sonar imagery, and high-resolution bathymetry.



1.2 Survey Geometry

Survey operations with both the Edgetech 4125 sidescan sonar and the PingDSP interferometric sonar required similar survey geometries in the respected survey areas, with some variations according to water depth and overall survey area shape. In general, the Survey Team utilized the following guidelines for planned survey lines:

a. Parallel survey lines throughout survey area.
b. Planned turns should be minimized so that the turns are gently sweeping maneuvers.
c. Lines that follow the shoreline should be utilized in nearshore survey areas.
d. Line spacing for the survey lines would be set at the range setting for the sonar.
e. Sonar range for the Edgetech would be set at 50 to 70 meters. Sonar range for the PingDSP would not exceed 50 meters.

Setting the line spacing equivalent to the sonar range (the range of a single channel) may appear on the surface to be somewhat inefficient, because both the Edgetech and the PingDSP sonars generate a swath width that is double the set range. However, the advantage to setting the line spacing equal to (or slightly less than) the sonar range is that coverage gaps due to the nadir gap below the sonars are minimized if not rendered completely inconsequential, and individual targets are likely illuminated in successive passes of the sonar thus providing additional opportunities to identify, measure, and characterize targets.

1.3 Acquisition

Survey data acquisition with the Edgetech 4125 sidescan sonar required deployment of the sonar from the stern a-frame of the vessel to a pre-set cable pay-out. During all survey operations, the survey team manually recorded the amount of sonar towfish tow cable paid out to the a-frame turning block so that post-processing can accurately correct the location of the towfish for cable payout, layback geometry, and distance between the turning block and the HemisphereGPS R320 antenna.

All data with the Edgetech 4125 has been collected with the Edgetech Discover software and recorded to the proprietary JSF file format that records sonar data with geographic positioning information from the HemisphereGPS R320 receiver. During survey operations, track line positioning, towfish positioning, and survey vessel positioning were monitored simultaneously in Hypack 2015 (a hydrographic survey software package) by the Survey Team and the vessel operator with cloned computer displays in the pilothouse and in the vessel salon.This allowed both the Survey Team and the vessel operator to monitor survey progress relative to planned line files.

Survey data acquisition with the PingDSP sonar utilized the Hypack 2015 hydrographic survey software to integrate and record the PingDSP data with the SBG Ekinox-D inertial navigation data, monitor vessel positioning and track line positioning, and monitor completed survey coverage. Device offsets between the PingDSP and the SBG inertial navigation system required only one measurement and entry into survey configuration files prior to all survey operations. For all survey operations, Hypack generated the HSX file format for each discrete survey line that integrated sidescan sonar, bathymetry, positioning, and orientation information.

1.4 Processing

The Survey Team completed all data processing (both in the field, and in office-based post-processing) using Chesapeake Technologies' SonarWiz 6. SonarWiz is an industry-leading sidescan sonar processing software that allows review and post processing of a variety of data from commercially available sidescan sonars. The Survey Team organized all data according to survey area and treated each survey area separately for purposes of processing.

The Survey Team utilized the following general workflow for processing data from each survey area:

a. Import JSF or HSX data with proper geodesy and initial signal gain settings.
b. Enter and confirm device and vessel geometry to account for GPS location, turning block location, a cable layout so as to properly calculate towfish layback for all sidescan sonar imagery.
c. Review all data and track bottom in all survey lines. Slant-range correct all survey data once bottom tracking is complete.
d. Review data and impose automatic gain control and/or time-varied gain signal processing techniques to improve image quality and maximize image detail.
e. Review all files individually to select targets.
f. Reconcile targets that have been selected multiple times in multiple survey files.
g. Measure and characterize targets.
h. Manipulate files to generate sidescan sonar image mosaics of entire survey area.
i. Generate deliverable files for each survey area, relative to the project horizontal datum.

The project horizontal datum is the North American Datum of 1983, Alaska (Zone 10) State Plane Feet.

Note, however, that the Survey Team rapidly executed steps a through g above when reviewing data in the field in order to select targets for further Reacquisition and Verification efforts in each survey area. Rapid targeting identified several unique targets in each Survey Area that could be investigated later in the field period, while comprehensive office-based post-processing after the field period yielded dramatically increased numbers of targets in each survey area, some of which were clearly not MEC targets.

2 WAA Survey Production

2.1 WAA Survey Areas Completed

In the Unalaska NDSA, the Survey Team completed survey operations in twelve (12) discrete survey areas for a total of 2150 acres surveyed. The survey areas are summarized in Table 2.1, below.

Survey Area	Date Surveyed	System	Area (Acres)
Captains Bay Army Pier	5/28/2015	Edgetech 4125	71
Chernofski Harbor	5/31/2015	Edgetech / PingDSP	543
Dutch Harbor Dock 1	5/29/2015	EdgeTech 4125	84
Dutch Harbor Fuel Dock	5/29/2015	Edgetech 4125	45
Dutch Harbor Landfill	5/29/2015	Edgetech 4125	173
Dutch Harbor Spit	6/3/2015	Edgetech / PingDSP	284
Eider Point Dock	6/4/2015	PingDSP 3DSS 460	224
Hog Island	5/29/2015	Edgetech 4125	89
Iliamna Harbor East	5/28/2015	PingDSP 3DSS 460	51
Iliamna Harbor West	5/29/2015	PingDSP 3DSS 460	79
Mutton Cove	5/31/2015	PingDSP 3DSS 460	122
Otter Point Barge Dock	5/30/2015	PingDSP 3DSS 460	385

Table 2.1 Summary of WAA Sidescan Sonar Survey Areas in Unalaska NDSA

2.2 WAA Survey Data Deliverables

Wide Area Assessment (WAA) Sidescan Sonar Survey deliverables consisted of the following items and file formats:

a. Sidescan Sonar Image Mosaic: GeoTiff and Google Earth KMZ
b. Sidescan Sonar Coverage Map: ESRI Shapefile of polygon coverage maps of survey areas.
c. Sidescan Sonar Targets: ESRI Shapefile and ASCII Text comma-separate values file with target locations, target identification, and interpretation information.
d. Sidescan Sonar Target Report: Adobe Acrobat PDF document with target image and interpretation information.

File formats and file naming conventions have been established in the Site Investigation Work Plan dated November 21, 2014.

3 WAA Survey Targets

3.1 WAA Target Summaries

Post-processing of the sidescan sonar survey data from the Unalaska NDSA resulted in identification of 1,672 potential targets. The tabulation of these targets according to each survey area can be found below in Table 3.1

Survey Area	Date Surveyed	System	Targets
Captains Bay Army Pier	5/28/2015	Edgetech 4125	65
Chernofski Harbor	5/31/2015	Edgetech / PingDSP	210
Dutch Harbor Dock 1	5/29/2015	EdgeTech 4125	120
Dutch Harbor Fuel Dock	5/29/2015	Edgetech 4125	60
Dutch Harbor Landfill	5/29/2015	Edgetech 4125	153
Dutch Harbor Spit	6/3/2015	Edgetech / PingDSP	373
Eider Point Dock	6/4/2015	PingDSP 3DSS 460	139
Hog Island	5/29/2015	Edgetech 4125	19
Ililiuk Harbor East	5/28/2015	PingDSP 3DSS 460	73
Ililiuk Harbor West	5/29/2015	PingDSP 3DSS 460	149
Mutton Cove	5/31/2015	PingDSP 3DSS 460	152
Otter Point Barge Dock	5/30/2015	PingDSP 3DSS 460	159

Table 3.1 Summary of WAA Sidescan Sonar Survey Targets in Unalaska NDSA

3.2 Field Targets Versus Post-Processed Targets

Office-based post-processing, performed after the field activities of May 27 through June 7, 2015, is a much more comprehensive and time-consuming effort that results in a dramatic overall increase in targets in each survey area. Due to the limitations inherent in a fixed field activity period, and the need to maximize WAA survey production while also protecting the efficiency of Reacquisition and Verification efforts on high-value targets in each survey area, field-based post-processing is driven by the Survey Team to quickly yield targets of interest that can be readily investigated within the contract survey period.

4 Reacquisition/Verification – ROV Operations

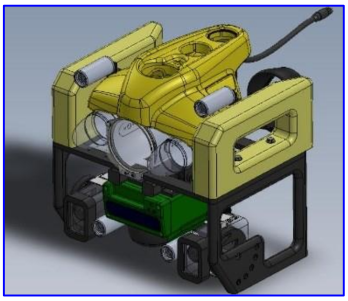
After completing WAA sidescan sonar surveys in the various project survey areas, the Survey Team, led by the lead geophysical surveyor, performed a rapid review, processing, and interpretation of the data in an attempt to identify potential MEC targets of concern. Field determination of potential targets for reacquisition and verification was based on several characteristic features in sidescan sonar imagery:

a. Size: Less than 1.5 meters by 1.5 meters. Some large targets may be of interest.
b. Shape: Cylindrical (for bombs/artillery shells), spherical (for contact sea mines), conical, or rectangular (for crates or mine anchors).
c. Strength of Acoustic Signal Return

After identifying and prioritizing potential targets for RV surveys, the Survey Team directed the vessel to anchor in the vicinity of each target. At each anchorage, an remotely-operated vehicle (ROV) was deployed to collect video, still image, and sonar imagery of each target and allow team members to classify the targets based on observations.

4.1 Equipment

The ROV system that the Survey Team deployed for the RV surveys in the Kodiak NDSA and the Unalaska NDSA consisted of the following inventory of equipment:



1. VideoRay Pro4 Mini-ROV
   a. Electrically-Powered Mini-ROV with Three
   DC-Brushless Thrusters for Horizontal and Vertical Vehicle Control.
   b. LED Lighting
   c. 570-Line Resolution Video Camera
   d. Auto-Depth and Auto-Heading Capability
   e. Spare External LED Lighting

2. Over 500' feet of control umbilical

3. Topside control unit with integrated control box featuring:
   a. Windows-based Graphic User Interface
   b. Head-Up Display of ROV Heading, Depth, Water Temperature
   c. Real-Time Video Display
   d. Real-Time Digital Video Recording to Windows Media (WMV) or AVI formats
   e. Real-Time Digital Video Still Capture Capability
   f. Multi-Function Hand Controller

4. Tritech Gemini, Forward Looking Multibeam Imaging Sonar

The Survey Team's model of the VideoRay Pro4 is a custom modified system that we have developed to install additional lighting and self-contained camera equipment on the vehicle, thus providing additional sensors and points of data collection from such a small platform.

The ROV was deployed by hand from the vessel and flown by an operator to the seafloor to reacquire each target. While video was the primary RV survey tool, the ROV was also outfitted with a Tritech Gemini high-resolution forward-looking imaging sonar that provided longer-range (greater than 100-feet) plan-view imagery in real-time, to aid the operator with understanding the underwater surroundings beyond what may be readily visible with the ROV onboard camera. The ROV provided real-time video, heading, and depth information as well as time and date stamps and user-definable text title fields that provided the operator with the ability to maintain situational awareness during underwater survey operations and to maintain a proper video record of all survey activities.

4.2 Acquisition

Upon anchoring at each target location, the Survey Team marked the location of the survey vessel relative to the target, and determined the bearing and range from the ROV launch location to each intended target. The ROV was hand-launched from the stern of the survey vessel and operated so as to descend directly down from the stern of the vessel. Upon reaching the bottom, the operator used the onboard ROV sensors (specifically the compass) to bring the ROV to bear on the intended target, and utilize the forward looking Tritech Gemini sonar to reacquire the target on sonar. Once identified via sonar, the ROV was flown until the target could be detected visually with the ROV's onboard digital video camera.

Video files and still images of each target were collected. Onboard scaling lasers, spaced at 3.25 inches apart, provide scale in the imagery to aid with characterizing target size. In some cases, multiple dives were made on the same target in order to re-deploy the ROV with an onboard high-resolution still camera and high-definition camera, to collect higher quality video and still photo imagery of specific targets of interest (the wreck in Chernofski Harbor, Dutch Harbor City Dock 1 – 1 and Mutton Cove MC-36). All data was organized and named in accordance with the conventions have established in the Site Investigation Work Plan dated November 21, 2014.

5 RV Survey Targets

In the Unalaska NDSA, the Survey Team performed Reacquisition and Verification (RV) surveys in ten (10) of the twelve (12) areas subject to Wide Area Assessment (WAA) surveys. This resulted in the investigation of 104 discrete targets. The Survey Team determined that remotely-operated vehicle (ROV) operations in the Ililiuk Harbor survey areas would not be an effective, or safe use of time due to the number of utility crossings (some of which were detected) that could represent serious hazards to anchoring the survey vessels.

5.1 RV Target Summaries

Survey Area	Date Surveyed (WAA)	Reacquired Targets
Captains Bay Army Pier	6/5/2015	5
Chernofski Harbor	6/2/2015	24
Dutch Harbor Dock 1	6/7/2015	4
Dutch Harbor Fuel Dock	6/6/2015	4
Dutch Harbor Landfill	6/6/2015	7
Dutch Harbor Spit	6/7/2015	17
Eider Point Dock	6/5/2015	6
Hog Island	6/5/2015	3
Ililiuk Harbor East	6/7/2015	0
Ililiuk Harbor West	6/6/2015	0
Mutton Cove	6/6/2015	24
Otter Point Barge Dock	6/2/2015	14

Table 5.1 Summary of Reacquisition/Verification Targets in the Unalaska NDSA

5.2 RV Target Identification – Findings of Interest

NDSA	Survey Area	RV Target ID	WAA Target ID	Easting	Northing	Height	Length	Width	Classification
Unalaska	Captains Bay Army Pier	RI_ROV_CaptainsBayArmyPier_Target_02	WAA_SSS_400kHz_CaptainsBayArmyPier_2	5310352	1174498	2.3	2.8	1.7	Heavily corroded rectangular object
Unalaska	Captains Bay Army Pier	RI_ROV_CaptainsBayArmyPier_Target_03	WAA_SSS_400kHz_CaptainsBayArmyPier_3	5310151	1174421	0.9	3.6	1.8	Battery
Unalaska	Captains Bay Army Pier	RI_ROV_CaptainsBayArmyPier_Target_04	WAA_SSS_400kHz_CaptainsBayArmyPier_4	5310317	1174422	1.9	3.1	1.9	Tire
Unalaska	Captains Bay Army Pier	RI_ROV_CaptainsBayArmyPier_Target_09	WAA_SSS_400kHz_CaptainsBayArmyPier_9	5309781	1173387	2.0	4.0	1.3	Corroded 55-gallon drum
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0001	WAA_SSS_400kHz_Chernofski-r0001	5127902	986639	1.2	2.6	2.8	Piling
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0005	WAA_SSS_400kHz_Chernofski-r0005	5128144	986404	2.4	4.2	1.9	Crab Pot
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0006	WAA_SSS_400kHz_Chernofski-r0006	5128667	986449	2.4	2.5	1.5	Drum
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0007	WAA_SSS_400kHz_Chernofski-r0007	5128213	986376	1.9	11.8	3.1	Anchor
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0008	WAA_SSS_400kHz_Chernofski-r0008	5128915	986421	0.7	10.4	1.3	Hollow timber
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0009	WAA_SSS_400kHz_Chernofski-r0009	5128871	986411	0.7	13.7	1.5	Deteriorated timber beam
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0010	WAA_SSS_400kHz_Chernofski-r0010	5129023	986399	0.5	13.4	2.0	Piling
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0012	WAA_SSS_400kHz_Chernofski-r0012	5128999	986362	0.5	14.9	1.6	Piling
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0013	WAA_SSS_400kHz_Chernofski-r0013	5128448	986264	1.0	4.1	3.2	Drum
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0014	WAA_SSS_400kHz_Chernofski-r0014	5128874	986250	0.9	5.8	1.8	Timber debris
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0016	WAA_SSS_400kHz_Chernofski-r0016	5129547	985139	2.1	4.8	3.9	Angle iron
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0017	WAA_SSS_400kHz_Chernofski-r0017	5129515	985133	2.5	24.1	3.5	Tank/Fuel Tank
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0018	WAA_SSS_400kHz_Chernofski-r0018	5129537	985131	2.9	8.3	2.1	15K Navy Anchor
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0019	WAA_SSS_400kHz_Chernofski-r0019	5129566	985099	1.4	10.7	4.2	15K Navy Anchor
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0022	WAA_SSS_400kHz_Chernofski-r0022	5129860	984592	4.6	23.9	4.7	Sunken buoy
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0023	WAA_SSS_400kHz_Chernofski-r0023	5129891	984589	3.6	6.5	4.8	Unknown debris
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0024	WAA_SSS_400kHz_Chernofski-r0024	5130382	984579	1.1	6.4	4.3	15K Navy Anchor
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0025	WAA_SSS_400kHz_Chernofski-r0025	5130440	984524	5.4	30.5	5.7	Sunken buoy
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0026	WAA_SSS_400kHz_Chernofski-r0026	5130443	984480	3.4	8.3	7.1	15K Navy Anchor
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0027	WAA_SSS_400kHz_Chernofski-r0027	5129939	984384	4.5	8.5	7.6	Partially Buried Anchor
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0031	WAA_SSS_400kHz_Chernofski-r0031	5131125	983863	1.2	56.2	1.3	Timber piling
Unalaska	Chernofski Harbor	RI_ROV_Chernofski_Target_r0033	WAA_SSS_400kHz_Chernofski-r0033	5131247	983708	1.7	3.5	2.5	Anchor
Unalaska	Dutch Harbor Dock 1	RI_ROV_DutchHarborDock1_Target_01	WAA_SSS_400kHz_DutchHarborDock1_1	5315970	1191441	1.3	6.3	3.2	Possible Bomb
Unalaska	Dutch Harbor Dock 1	RI_ROV_DutchHarborDock1_Target_02	WAA_SSS_400kHz_DutchHarborDock1_2	5316242	1190745	1.6	6.0	2.3	Tire
Unalaska	Dutch Harbor Dock 1	RI_ROV_DutchHarborDock1_Target_03	WAA_SSS_400kHz_DutchHarborDock1_3	5316752	1189687	0.4	3.5	1.5	Rock
Unalaska	Dutch Harbor Dock 1	RI_ROV_DutchHarborDock1_Target_05	WAA_SSS_400kHz_DutchHarborDock1_5	5317935	1189231	5.2	25.0	15.6	Crab Pot
Unalaska	Dutch Harbor Fuel Dock	RI_ROV_DutchHarborFuelDock_Target_01	WAA_SSS_400kHz_DutchHarborFuelDock_1	5318495	1187544	4.1	3.6	1.5	Rock
Unalaska	Dutch Harbor Fuel Dock	RI_ROV_DutchHarborFuelDock_Target_02	WAA_SSS_400kHz_DutchHarborFuelDock_2	5318502	1187507	1.8	1.1	1.1	Rock
Unalaska	Dutch Harbor Fuel Dock	RI_ROV_DutchHarborFuelDock_Target_03	WAA_SSS_400kHz_DutchHarborFuelDock_3	5318448	1187464	4.2	2.0	1.0	Rock
Unalaska	Dutch Harbor Fuel Dock	RI_ROV_DutchHarborFuelDock_Target_04	WAA_SSS_400kHz_DutchHarborFuelDock_4	5318191	1187350	0.0	4.2	1.7	Block
Unalaska	Dutch Harbor Landfill	RI_ROV_DutchHarborLandFill_Target_01	WAA_SSS_400kHz_DutchHarborLandFill_1	5322191	1188323	0.6	2.8	1.3	Not observed
Unalaska	Dutch Harbor Landfill	RI_ROV_DutchHarborLandFill_Target_02	WAA_SSS_400kHz_DutchHarborLandFill_2	5322182	1188301	0.6	3.2	1.9	Timber with cable and heavy growth
Unalaska	Dutch Harbor Landfill	RI_ROV_DutchHarborLandFill_Target_03	WAA_SSS_400kHz_DutchHarborLandFill_3	5320927	1188042	1.4	6.8	1.9	Fishing Buoy
Unalaska	Dutch Harbor Landfill	RI_ROV_DutchHarborLandFill_Target_05	WAA_SSS_400kHz_DutchHarborLandFill_5	5320360	1187580	1.6	6.2	2.8	Unknown Target with Access Door
Unalaska	Dutch Harbor Landfill	RI_ROV_DutchHarborLandFill_Target_07	WAA_SSS_400kHz_DutchHarborLandFill_7	5321376	1187380	3.3	2.7	4.8	Fish Trap
Unalaska	Dutch Harbor Landfill	RI_ROV_DutchHarborLandFill_Target_08	WAA_SSS_400kHz_DutchHarborLandFill_8	5321423	1187336	1.0	8.1	4.2	Fish Trap
Unalaska	Dutch Harbor Landfill	RI_ROV_DutchHarborLandFill_Target_09	WAA_SSS_400kHz_DutchHarborLandFill_9	5321209	1186986	2.0	2.1	3.2	Not observed
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_01	WAA_SSS_400kHz_DutchHarborSpit_1	5321337	1196905	1.3	4.4	1.1	Pyramid fish trap
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_02	WAA_SSS_400kHz_DutchHarborSpit_2	5320356	1193002	1.4	6.1	3.5	Two pieces of timber
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_03	WAA_SSS_400kHz_DutchHarborSpit_3	5320248	1192999	1.2	2.8	2.0	Rusted drum
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_04	WAA_SSS_400kHz_DutchHarborSpit_4	5320263	1193005	0.2	3.3	3.4	Rock
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_05	WAA_SSS_400kHz_DutchHarborSpit_5	5320339	1193094	0.0	7.7	5.1	Television
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_06	WAA_SSS_400kHz_DutchHarborSpit_6	5320263	1193089	1.3	6.1	3.1	Heavily corroded rectangular object
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_07	WAA_SSS_400kHz_DutchHarborSpit_7	5320297	1193115	0.0	5.1	4.2	Timber Debris
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_11	WAA_SSS_400kHz_DutchHarborSpit_11	5320458	1193357	4.7	3.6	2.1	Tire
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_12	WAA_SSS_400kHz_DutchHarborSpit_12	5320493	1193482	1.4	4.0	3.3	Tire
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_13	WAA_SSS_400kHz_DutchHarborSpit_13	5320579	1193502	1.2	3.8	2.1	Derelict section of steel sheeting
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_14	WAA_SSS_400kHz_DutchHarborSpit_14	5317047	1193167	1.8	12.8	2.4	Cut-off pipe piling
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_15	WAA_SSS_400kHz_DutchHarborSpit_15	5320762	1194810	2.6	5.0	3.2	Section of cut of pipe
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_16	WAA_SSS_400kHz_DutchHarborSpit_16	5320773	1194856	0.6	3.9	2.1	High Flyer from Fishing Gear
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_17	WAA_SSS_400kHz_DutchHarborSpit_17	5320723	1194909	1.4	3.4	1.9	Rocks
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_18	WAA_SSS_400kHz_DutchHarborSpit_18	5321162	1196054	1.5	2.3	1.7	Rocks
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_21	WAA_SSS_400kHz_DutchHarborSpit_21	5319485	1195966	0.7	4.4	2.0	Rocks
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_22	WAA_SSS_400kHz_DutchHarborSpit_22	5319869	1196170	2.1	3.8	1.5	Rocks
Unalaska	Dutch Harbor Spit	RI_ROV_DutchHarborSpit_Target_23	WAA_SSS_400kHz_DutchHarborSpit_23	5319877	1196195	1.0	2.4	2.9	Timber fender panel
Unalaska	Eider Point Dock	RI_ROV_EiderPointDock_Target_04	WAA_SSS_400kHz_EiderPointDock_4	5294791	1207229	0.3	4.4	3.4	Pipe driven into sediment
Unalaska	Eider Point Dock	RI_ROV_EiderPointDock_Target_09	WAA_SSS_400kHz_EiderPointDock_9	5295055	1208753	0.6	3.9	1.1	Timber piling
Unalaska	Eider Point Dock	RI_ROV_EiderPointDock_Target_12	WAA_SSS_400kHz_EiderPointDock_12	5295150	1208710	0.6	6.0	2.4	Timber piling
Unalaska	Eider Point Dock	RI_ROV_EiderPointDock_Target_13	WAA_SSS_400kHz_EiderPointDock_13	5295185	1208910	3.1	12.7	5.9	Fish Trap
Unalaska	Eider Point Dock	RI_ROV_EiderPointDock_Target_14	WAA_SSS_400kHz_EiderPointDock_14	5295210	1208758	1.1	6.4	2.1	Timber debris and fishing gear
Unalaska	Hog Island	RI_ROV_HogIsland_Target_03	WAA_SSS_400kHz_HogIsland-0003	5309470	1191592	1.1	6.1	3.2	Pipe (frame from old pier)
Unalaska	Hog Island	RI_ROV_HogIsland_Target_04	WAA_SSS_400kHz_HogIsland-0004	5309586	1191358	0.6	10.4	8.4	Pipe (frame from old pier)
Unalaska	Hog Island	RI_ROV_HogIsland_Target_05	WAA_SSS_400kHz_HogIsland-0005	5308840	1190842	8.3	109.2	34.7	Pipe (frame from old pier)
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-04	WAA_SSS_400kHz_MuttonCove_MC-04	5126076	988476	0.0	5.3	1.2	Tank or possible bomb
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-05	WAA_SSS_400kHz_MuttonCove_MC-05	5126093	988423	0.2	5.3	1.3	Timber Debris
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-06	WAA_SSS_400kHz_MuttonCove_MC-06	5126044	988254	0.7	3.2	2.8	55-Gallon Drum - Full of Product
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-10	WAA_SSS_400kHz_MuttonCove_MC-10	5126113	988103	0.4	5.7	1.2	Wood/timber beam
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-12	WAA_SSS_400kHz_MuttonCove_MC-12	5126103	988055	0.6	6.1	0.6	Wood/timber beam
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-17	WAA_SSS_400kHz_MuttonCove_MC-17	5126800	987892	0.0	0.0	0.0	Not observed
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-19	WAA_SSS_400kHz_MuttonCove_MC-19	5126847	987842	0.0	0.0	0.0	Unknown. Heavy marine growth
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-21	WAA_SSS_400kHz_MuttonCove_MC-21	5126839	987824	2.9	6.5	5.0	Unknown corroded object
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-23	WAA_SSS_400kHz_MuttonCove_MC-23	5126835	987810	0.0	0.0	0.0	Concrete pyramid anchor
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-28	WAA_SSS_400kHz_MuttonCove_MC-28	5126356	987626	1.2	7.4	9.5	Concrete anchor
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-30	WAA_SSS_400kHz_MuttonCove_MC-30	5127035	987586	0.8	5.6	4.3	Anchor Block
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-33	WAA_SSS_400kHz_MuttonCove_MC-33	5127089	987490	6.1	16.5	5.7	Anchor
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-35	WAA_SSS_400kHz_MuttonCove_MC-35	5127544	987463	1.8	6.3	2.6	Rocks
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-36	WAA_SSS_400kHz_MuttonCove_MC-36	5127572	987452	2.0	4.7	2.3	Possible Bomb
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-37	WAA_SSS_400kHz_MuttonCove_MC-37	5126380	987185	2.0	8.6	7.9	Anchor Block
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-38	WAA_SSS_400kHz_MuttonCove_MC-38	5126363	987137	4.1	6.6	7.2	Anchor Block and Sunken Buoy
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-40	WAA_SSS_400kHz_MuttonCove_MC-40	5126387	987007	0.0	0.0	0.0	Concrete anchor
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-41	WAA_SSS_400kHz_MuttonCove_MC-41	5126401	987009	0.0	0.0	0.0	Sunken buoy
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-45	WAA_SSS_400kHz_MuttonCove_MC-45	5126357	986792	1.3	4.0	3.6	Cylindrical target
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-46	WAA_SSS_400kHz_MuttonCove_MC-46	5126317	986777	1.4	3.3	1.4	Possible anchor
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-47	WAA_SSS_400kHz_MuttonCove_MC-47	5126731	986751	0.0	0.0	0.0	Rock
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-57	WAA_SSS_400kHz_MuttonCove_MC-57	5126937	985036	1.7	2.8	1.4	Unknown corroded object
Unalaska	Mutton Cove	RI_ROV_MuttonCove_Target_MC-58	WAA_SSS_400kHz_MuttonCove_MC-58	5127144	984948	0.0	0.0	0.0	Unknown. Heavy marine growth
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_01	WAA_SSS_400kHz_OtterPointBargeDock_1	5057982	977539	0.0	8.1	3.6	Rock
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_02	WAA_SSS_400kHz_OtterPointBargeDock_2	5058003	977242	0.0	7.4	2.3	Rock
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_04	WAA_SSS_400kHz_OtterPointBargeDock_4	5057493	975157	3.4	5.1	5.9	Unknown / Covered with Kelp
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_05	WAA_SSS_400kHz_OtterPointBargeDock_5	5057611	975078	0.7	3.0	1.7	Pilings
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_07	WAA_SSS_400kHz_OtterPointBargeDock_7	5057509	975056	1.0	21.1	3.0	3 Pilings
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_09	WAA_SSS_400kHz_OtterPointBargeDock_9	5057177	974896	0.6	17.6	1.2	Fence Panel
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_10	WAA_SSS_400kHz_OtterPointBargeDock_10	5057248	974864	5.6	3.1	1.9	Rock
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_11	WAA_SSS_400kHz_OtterPointBargeDock_11	5057126	974798	0.3	6.5	1.9	Rock
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_12	WAA_SSS_400kHz_OtterPointBargeDock_12	5057212	974608	0.5	21.7	7.6	Metal frame
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_13	WAA_SSS_400kHz_OtterPointBargeDock_13	5057254	974587	0.7	5.1	1.6	Unknown / Covered with Kelp
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_14	WAA_SSS_400kHz_OtterPointBargeDock_14	5057196	974509	1.0	18.6	6.6	Metal frame/decking
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_15	WAA_SSS_400kHz_OtterPointBargeDock_15	5057289	974479	2.9	46.4	9.0	Metal frame / Possible dragger door
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_16	WAA_SSS_400kHz_OtterPointBargeDock_16	5057266	974469	0.8	11.7	7.7	Unknown / Covered with Kelp
Unalaska	Otter Point	RI_ROV_OtterPointBargeDock_Target_17	WAA_SSS_400kHz_OtterPointBargeDock_17	5057843	973831	6.0	22.7	7.1	Metal Frame / Shipping Drawer

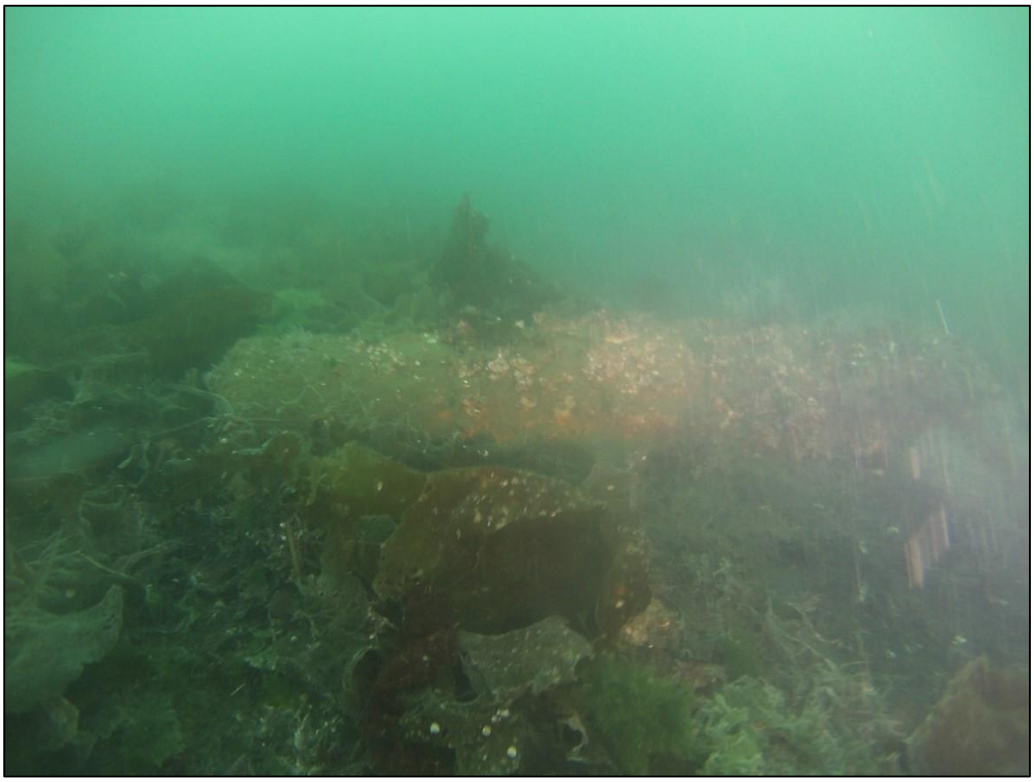
Table 5.2 Reacquisition/Verification Targets in the Unalaska NDSA

Table 5.2 (previous page) details the 104 targets surveyed by the Survey Team using the remotely operated vehicle (ROV). Critical targets of interest have been highlighted, and still photos of the targets are provided on the following pages with brief descriptions of the principal findings during each ROV mission.

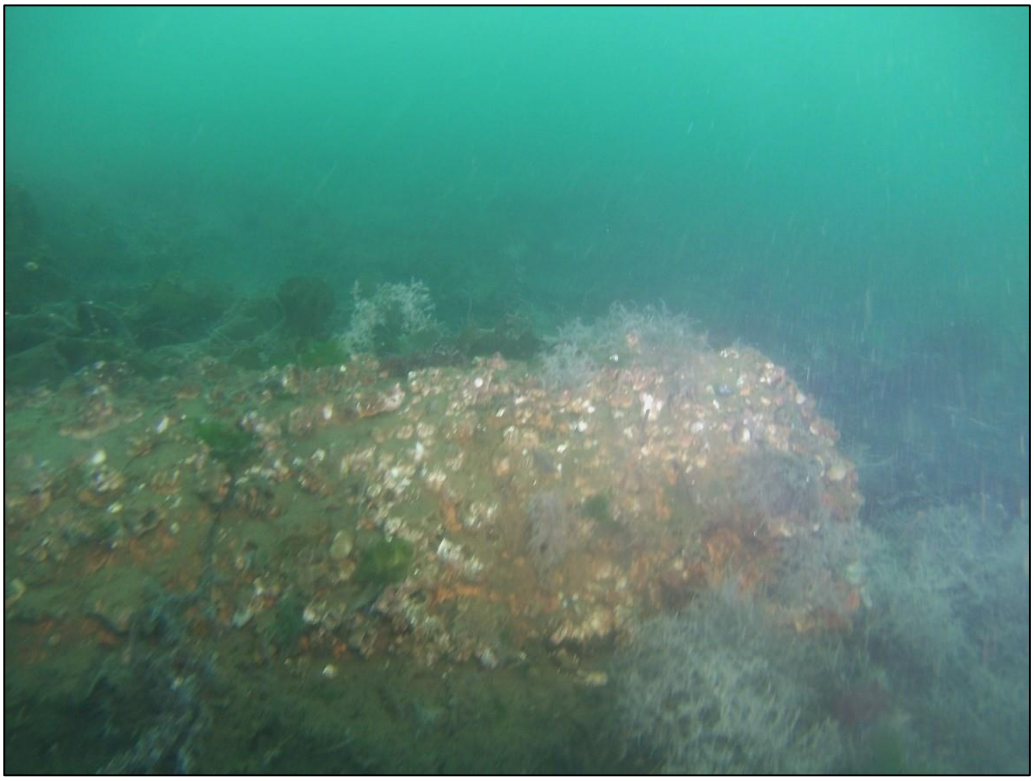
RI_ROV_DutchHarborDock1_Target_01: Possible bomb.
Target is adjacent to intersection of East Point Road and Ballyhoo Road near the approach to Unalaska Dutch Harbor Airport.

RI_ROV_DutchHarborDock1_Target_01. Nose of target, heavily overgrown with kelp and marine growth. However, bulbous nature of target is visible.

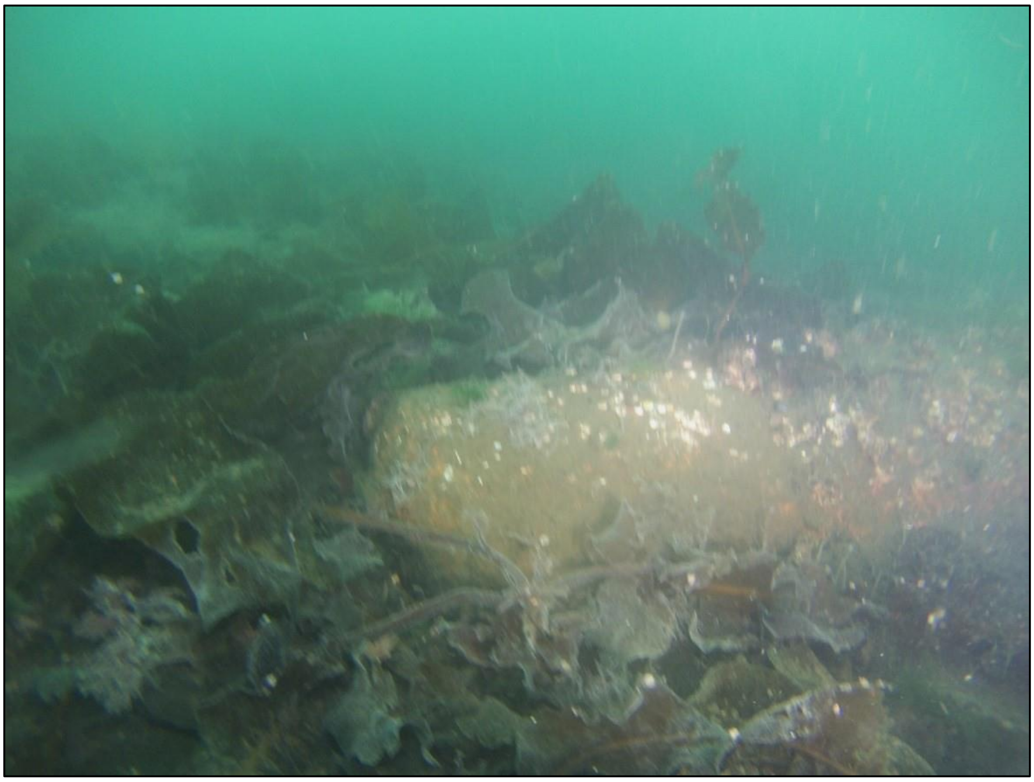
RI_ROV_MuttonCove_Target_MC-04: Possible tank or bomb.This is one end of the object that appears to be flat.



RI_ROV_MuttonCove_Target_MC-04: Possible tank or bomb.This photograph was taken with the high-resolution camera when we determined that additional missions might be necessary to characterize the target.



RI_ROV_MuttonCove_Target_MC-04: Possible tank or bomb.This photograph was taken with the high-resolution camera when we determined that additional missions might be necessary to characterize the target.



RI_ROV_MuttonCove_Target_MC-04: Possible tank or bomb. This is the bulbous end of the target. Heavy marine growth and kelp around the target, coupled with heavy corrosion on the target, make characterization difficult.

RI_ROV_MuttonCove_Target_MC-36: Possible bomb. This is the bulbous end of the target. Heavy marine growth and kelp on the target, coupled with heavy corrosion.


RI_ROV_MuttonCove_Target_MC-36: Possible bomb or depth charge. High resolution image of target taken with high definition camera.

RI_ROV_MuttonCove_Target_MC-36: Possible bomb or depth charge. High resolution image of target taken with high definition camera.

RI_ROV_MuttonCove_Target_MC-36: Possible bomb or depth charge. High resolution image of target taken with high definition camera.

RI_ROV_MuttonCove_Target_MC-06: 55-Gallon Drum. Though not MEC, this drum has been recently deposited in Mutton Cove and may contain product.

RI_ROV_MuttonCove_Target_MC-06: 55-Gallon Drum. Though not MEC, this drum has been recently deposited in Mutton Cove and may contain product. This high resolution image of the end of the drum clearly illustrates the shipping label and the addressee – Resolve Marine in Dillingham, AK.

6 Final Conclusions

During a fixed performance period, the Gravity/SeaVision Survey Team performed a wide area assessment (WAA) of twelve (12) survey areas in the Unalaska Naval Defense Sea Area (NDSA) using high-frequency sidescan sonar survey techniques. This effort resulted in the surveying of 2,150 acres of seafloor and the identification of 1,672 targets.

Of these targets, the Survey Team subjected one hundred and four (104) discrete targets to Reacquisition/Verification Surveys by using an observation-class remotely-operated vehicle to visually identify and characterize the targets. Most of these targets appeared to be debris, however three (3) targets: two (2) in Mutton Cove, and one (1) in the Dutch Harbor Dock 1, appeared to be potential submerged MEC. Additionally, the Survey Team identified two projectiles at the Eider Point survey area, in the tidal swash zone.

Based on our activities during this survey period, we can offer the following recommendations and conclusions:

1. **Future RI activities should incorporate a geophysical survey program that utilizes high resolution acoustic survey methods and electromagnetic survey methods.** The scope of survey areas for this Task Order required particular focus on WAA survey production to cover large areas. This rendered high frequency sidescan sonar surveys (900 kHz or higher) and electromagnetic survey methods with marine magnetometers or metal detectors as poor choices for instrumentation because they are not well-suited to large survey area production. However, with the survey areas more constrained, high-frequency acoustic surveys, densely spaced magnetometer surveys, and carefully conducted towed metal detector surveys may be well-suited to the RI activities at these three sites.

2. **Future RI activities may require diver intervention to clean marine growth from suspected MEC targets or to vicinity of suspected MEC targets.** The marine growth and corrosion on the targets we identified in this project made for difficult identification. Additionally, some survey areas (such as Eider Point) had very thick bull kelp beds in the rocky slope of the shoreline where the projectiles were identified in the tidal zone; divers may be required in order to clear kelp from suspected target areas.

3. **GIS Data for abandoned fishing gear should be shared with Alaska DNR.** Our survey teams identified dozens, if not hundreds, of ghost fishing pots during this survey effort. Abandoned fishing gear poses a threat to juvenile Alaskan king crab, specifically in the Kodiak area (where efforts are underway to revitalized the fishery). Alaska DNR may find this data useful as they plan ghost pot recovery programs.

APPENDIX E

Interactive Map of Survey Areas

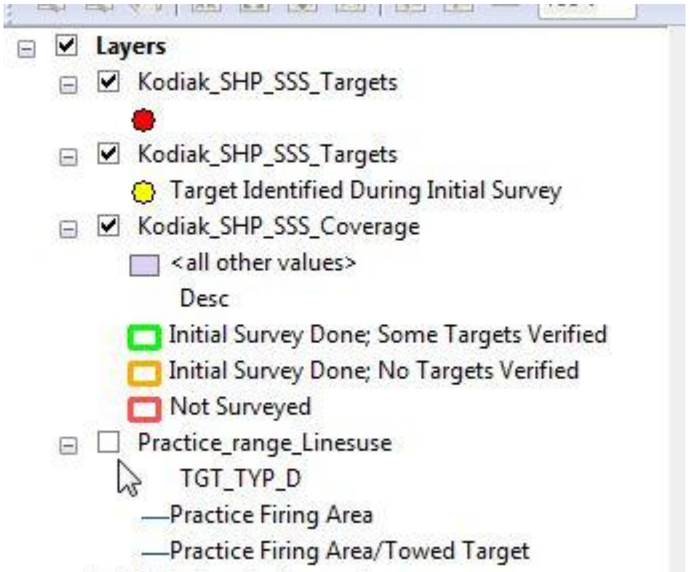
Appendix E - Brief Instructions about How to Use the Interactive GIS Map

Step 1 – Download ArcReader for free at http://www.esri.com/software/arcgis/arcreader/download by following the instructions at the ESRI (author of ArcReader) website.

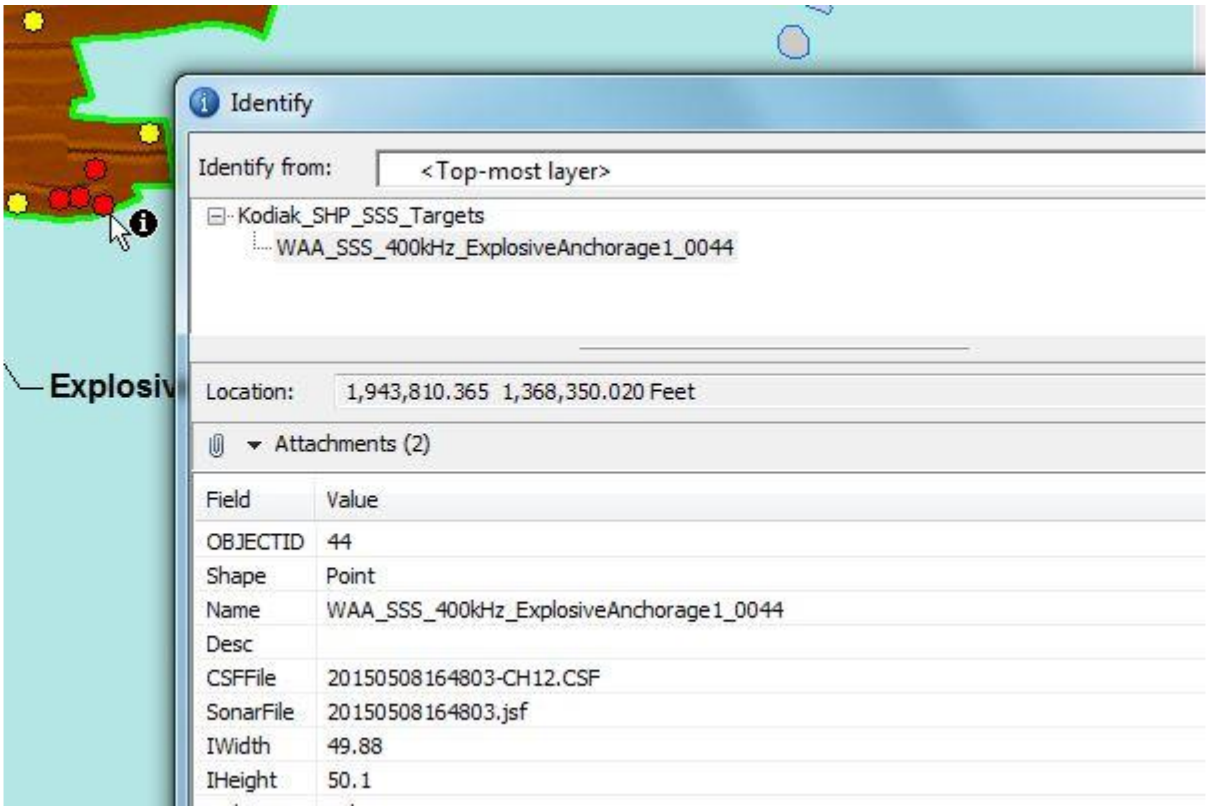
Step 2 – Open ArcReader. Click on menu File on the top left corner of the screen, select Open; then navigate to the .pmf file under the pmf folder on the DVD.

Step 3 – Some basics for operating ArcReader

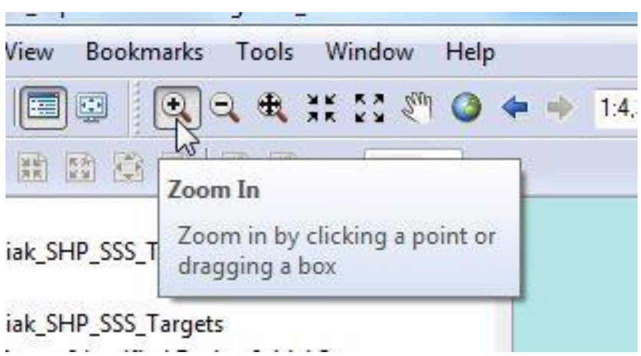
- To turn on/off GIS layers, left click the available check boxes for the various layers listed at the left of the screen. Some layers will be turned on when the file opens and some layers will be turned off.



- To view target information for any target (red or yellow point), left click on the Identify tool on the toolbar located at the top center of the screen, then left click on the target. Left click again on the symbol to exit out of the information mode.



- To enlarge an area, use magnifier symbol located at the toolbar, click on the symbol or draw a rectangle box over the intended area on the screen.



- To see the video of the reacquired targets (red points), follow three steps.

1) Click on the Identify tool and click on target in red

2) Click the Open Attachment Manager button – the paperclip icon  just above the grid of attribute values. The number of files attached to the features is shown in parentheses.

3) Click the attachment in the list to open it, or open the attachment from the list of files in Open Attachment Manager window.