



UNITED STATES COAST GUARD

INVESTIGATION INTO THE STRIKING OF SUBMERGED
OBJECTS BY THE TANK VESSEL

ATHOS I

IN THE DELAWARE RIVER ON NOVEMBER 26, 2004
WITH A MAJOR DISCHARGE OF OIL





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January 19, 2006

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COMMANDANT'S ACTION ON THE INVESTIGATION

The record and the report of the investigation into the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments.

COMMANDANT'S ACTION ON RECOMMENDATIONS

Commander, Sector Delaware Bay and Commander, Fifth Coast Guard District have concurred with the following recommendations.

Investigating Officer's Recommendation 1: It is recommended that Congress update the Refuse Act (33 USC 407) or create new legislation to require immediate reporting to the nearest Coast Guard unit, any objects that have been lost/discharged into a navigational channel or anchorage that can impede navigation.

Action: We concur with this recommendation. The pending "Coast Guard and Maritime Transportation Act of 2005" (H.R. 889) contains a provision to amend the Ports and Waterway Safety Act (33 U.S.C. 1221 et seq.) that would require appropriate reporting of the release from a vessel or facility into the navigable waters of the United States of any object that creates an obstruction to navigation.

Investigating Officer's Recommendation 2: Recommend that the Army Corps of Engineers or any agency charged with surveying U.S. Navigational Channels and Anchorages, research available technologies that may help to document, identify, and/or track bottom debris or bottom contour abnormalities between subsequent surveys.

Action: We concur with this recommendation. A copy of this report will be forwarded to the Army Corp of Engineers for their review and action as appropriate.

Investigating Officer's Recommendation 3: That the Commandant make the findings in this report available to professional mariners as a case history lesson that may prompt them to consider the presence of unknown objects/debris located in U.S. Navigable Waterways when they conduct voyage planning.

Action: We concur with this recommendation. This report will be made available to the maritime industry, as well as to the general public, via the internet. In addition, it will be submitted to the International Maritime Organization.

Investigating Officer's Recommendation 4: That Commander, Sector Delaware Bay, along with the Mariner's Advisory Committee for the Bay and Delaware River, review navigation guidelines published in NOAA Coast Pilot 3 to determine whether these guidelines remain appropriate given the findings of this investigation.

Action: We concur with this recommendation. Commander, Sector Delaware Bay will take action as appropriate.

Investigating Officer's Recommendation 5: During the course of this investigation, it was discovered that there is often a difference between predicted tidal height and actual tidal height. Therefore, to ensure that the most updated information for planning a transit through a draft restricted area is used, it is recommended that persons responsible for voyage planning check/review the NOAA web site <http://tidesonline.nos.noaa.gov/> to compare actual tidal heights to predicted tidal heights.

Action: We concur with the intent of this recommendation. This report will be made available to the maritime industry, as well as to the general public, via the internet.

Investigating Officer's Recommendation 6: That copies of this report be forwarded to the Pilots Association for the Bay and River Delaware, Mariner's Advisory Committee for the Bay and Delaware River, and the flag state for the T/V ATHOS I in accordance with IMO Resolution A.849(20) for review and dissemination, as appropriate.

Action: We concur with this recommendation. Copies of the report will be forwarded as recommended.

Investigating Officer's Recommendation 7: That this case be closed.

Action: We concur with this recommendation. This investigation is closed.


W. D. Rabe
By direction

ATHOS I – Marine Casualty Investigation Report

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I. SUMMARY

On the 26th of November 2004 at 2130, MSO/Group Philadelphia was notified of an oil discharge from the T/V ATHOS I within Anchorage #9, Delaware River, near the Citgo Asphalt Refining Facility, Paulsboro, NJ. These are the events leading up to that notification: At approximately 2115 the T/V ATHOS I suddenly developed a one-degree port list during docking maneuvers. Within ten minutes, the vessel had continued listing to port and stopped at 7 degrees. During this time, the Chief Mate discovered air venting from the #7 port wing ballast tank vent. The Chief Mate proceeded to the cargo control room and checked the ballast tank gauges and discovered fluid was entering the #7 port wing ballast tank, which created the list. The Chief Mate, along with fellow crewmembers, also detected an oily smell from air venting out of the #7 port wing ballast tank vent. Soon after, crewmembers discovered heavy cargo oil surrounding the vessel in Anchorage #9, Delaware River. The docking pilot secured the vessel's movement and had one of the nearby tugs notify the Coast Guard of the situation.

After notification, the Master immediately realized the situation and ordered the Chief Mate to pump cargo from #7 center cargo tank to #4 center cargo tank (which was empty at the time). This was done to minimize further cargo from discharging from the #7 center cargo tank. Approximately 45 minutes later, the ATHOS I reported the oil discharge was secured. An estimated 263,371 gallons had discharged from the #7 center tank into the Delaware River, a US navigable waterway. During this incident, the vessel's emergency systems cut power due to the 7 degrees port list, but power was restored approximately 45 minutes later.

On the 28th of November 2004, divers from Randive Inc (hired by owners of the T/V ATHOS I), discovered two hull punctures: one located underneath #7 port wing ballast tank that protruded into #7 center cargo tank and a second puncture located underneath #7 center cargo tank. The first puncture was oblong shaped, measured 63" long x 9" wide, located in E-37 hull plate. The #7 center tank puncture was semi-circular shaped, measured 24" x 11", located in D-13 hull plate. The second puncture was located approximately 28" forward and inboard of the first puncture. Further information detailing the damage sustained by the T/V ATHOS I can be found later on in this report.

A multi-agency search comprised of the Army Corps of Engineers (ACOE), the National Oceanic and Atmosphere Administration (NOAA), and the American Underwater Search & Survey (AUSS – hired by the RP) conducted underwater surveys for possible objects the T/V ATHOS I struck. AUSS identified several possible targets that Randive later dove on. Specifically, 3 targets were identified/located: a pump casing, a concrete block, and a 7' long anchor. Paint samples taken from the pump casing, concrete block, and anchor as well as paint samples taken from the hull of the T/V ATHOS I near the damaged section were sent to the National Transportation Safety Board (NTSB) for analysis. The NTSB reported that the samples from all three objects matched the paint sample taken from the T/V ATHOS I.

All times indicated in this report are expressed as local, Eastern Standard Time, 24-hour clock.

II. FINDING OF FACTS

II. FINDINGS OF FACT

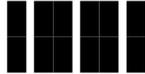
1.) VESSEL DATA:

Name: T/V ATHOS I
O.N. L8117079
Call sign: P3WL7
Flag: CYPRUS
Gross Tons: 37,895 MT
Net Tons: 16,672 MT
Length: 748.6'
Breadth: 105.6'
Depth: 63.0'
Draft at the time of incident 36' 06"
Date Keel Laid: 13 July 1982
Last Dry Docked April, 2004 @ Dallian, China
Cargo Capacity: 462, 847 bbls or 19,439,574 gallons

Owner: Frescati Shipping Company
16P Catelaris St
Diagoras House
Nicosia, Cyprus

Operator: Tsakos Shipping & Trading S.A.
Megaron Makedonia
367 Synfrou Ave. P.O. Box 79141
Amfithea 17502 Athens, Greece

Master: Iosif Markoutsis



Master's License: Greek License

River Pilot: Howard M. Teal
Delaware River Pilot Association

River Pilot's License: USCG MML No XXXXX, issue number 8, issued in Baltimore MD, endorsed for FIRST CLASS PILOT of steam or motor vessels of any gross tons upon the Delaware Bay and River to Trenton, NJ; Chesapeake and Delaware Canal between Reedy Point, Delaware to Old Town Point, MD; Radar Observer (unlimited) expires September 2009. License expires November 9, 2009.

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Docking Pilot: Joseph A Bethel

Docking Pilot's License USCG MML No. ■■■■■, issue number 3, issued in Baltimore MD, endorsed for MASTER of inland steam or motor vessels of not more than 1600 gross tons; MATE of inland steam or motor vessels of not more than 200 gross tons; Operator of un-inspected towing vessels upon Great Lakes and inland waters excepting waters subject to international regulations for preventing collisions at sea, 1972; FIRST CLASS PILOT of steam or motor vessel of any gross tons upon the Delaware River from marker "42" to Nebold Island; Radar Observer (unlimited) expires July 2003. License expires February 7, 2006.

Navigation Crew:

Chief Mate:	Georgios Zotos
2 nd Mate:	Ricardo Caro
3 rd Mate:	Noel Esplana
3 rd Mate:	Evan Pinat
Able Body Seaman:	Ruben Llunar
Able Body Seaman:	Noel Moratalla
Able Body Seaman:	Rommel Lazaro

The T/V ATHOS I is a double-sided, single-bottom hull, petroleum oil tank ship, built by ONOMICHI ZOSEN K.K., in ONOMICHI, JAPAN in 1983. Lloyds Register of Shipping classified the vessel. The engineering plant is located in the aft end of the vessel with the superstructure directly above. Forward of the superstructure are two slop tanks and seven center cargo tanks with a total cargo capacity of 19,439,574 gallons. On each side there are 7 ballast tanks providing the double-sides of the vessel. At the time of incident, the T/V ATHOS I was carrying 13,299,098.4 gallons of crude oil, with approximately 2,236,344.6 gallons carried in #7 center tank.

The T/V ATHOS I's bridge layout is typical of large merchant vessels of this size and offers adequate visibility forward of the pilothouse.

2.) **PRIMARY PERSONNEL / LICENSE PARTICULARS:**

Master:

The Master of the T/V ATHOS 1, Iosif Markoutsis, currently holds a Greece Master's Certificate of Competency, No. ■■■■■, issued on 01 April 2002. At the time of the incident, Captain Markoutsis had served in the capacity as a Master for three years and ten months and had been working in the industry for over 18 years. Captain Markoutsis was on watch for 10 hours prior to the incident and had been on the bridge the entire Delaware River transit with both the River Pilot and Docking Pilot. Captain Markoutsis had not shown any signs of fatigue and met STCW and OPA 90 rest requirements.

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River Pilot:

Mr. Howard M. Teal, Jr. was the River Pilot that piloted the T/V ATHOS I northbound on the Delaware River. Mr. Teal has been a River Pilot since 1971 and had previously served in the U.S. Coast Guard on a local buoy tender in Philadelphia, PA. Mr. Teal holds a First Class Pilot license of steam or motor vessels of any gross tons upon the Delaware Bay and River to Trenton, NJ; Chesapeake and Delaware Canal between Reedy Point, Delaware to Old Town Point, MD. Mr. Teal was notified of the pilotage between 0800-0900 on the 26th of November 2004 and had approximately 6-7 hours of sleep prior to this job. Mr. Teal boarded the vessel at Big Stone Anchorage at 12:14 along with a six person U.S. Coast Guard boarding team. Mr. Teal was on the bridge the entire transit and departed the T/V ATHOS I at approximately 2110, 5 minutes prior to the incident. Mr. Teal stated that nothing unusual occurred during his time onboard the vessel and further commented it was a beautiful evening for a boat ride. Mr. Teal had not shown any signs of fatigue and met STCW and OPA 90 rest requirements.

Docking Pilot:

Mr. Joseph A. Bethel was the Docking Pilot for the T/V ATHOS I. Mr. Bethel has been a Docking Pilot for 7 years and had over 50 previous vessel dockings at the Citgo Asphalt Refining Facility. Prior to this, he had been a mate with Moran towing for several years. He currently holds a Master of inland steam or motor vessels of not more than 200 gross tons; Operator of uninspected towing vessels upon Great lakes and Inland Waters excepting waters subject to International Regulations for preventing collisions at sea, 1972; First Class Pilot of steam or motor vessel of any gross tons upon the Delaware River from marker "42" to Nibold Island. Mr. Bethel was notified of the docking at 1600 on the 26th of November 2004. The shipping agent requested he dock the T/V ATHOS I with the starboard side, towards the facility. Mr. Bethel stated that it would be preferable to dock the vessel on the port side, due to current conditions along the river. According to Mr. Bethel, he had plenty of rest and had not worked prior to 36 hours. Mr. Bethel boarded the vessel at 2030 the day of the incident while the vessel was transiting along the Billingsport Range, Delaware River. Mr. Bethel relieved the River Pilot (Mr. Teal) at approximately 2040. Mr. Bethel was on the bridge, or bridge wing, the entire time he was onboard. Mr. Bethel stated that nothing unusual occurred until the vessel started listing. Mr. Bethel had not shown any signs of fatigue and met STCW and OPA 90 rest requirements.

Navigation Officers:

The Navigation Officers onboard the T/V ATHOS I during the transit and just prior to the incident were 2nd Mate Ricardo Caro, 3rd Mate Noel Esplana, and 3rd Mate Evan Pinat. All three officers took bearings every 5 minutes and at no time found the vessel to be outside of the channel/anchorage. All three Navigation Officers stated they did not encounter any problems during the transit. Mr. Ricardo Caro created the vessel's voyage plan that encompassed the transit from Puerto Miranda, Venezuela to Paulsboro, NJ. The Master, along with the Chief Mate, 2nd Mate, and both 3rd Mates, signed the voyage plan. Mr. Caro calculated the minimum under keel clearance for this inbound transit to be at 1.77 meters or 5.82 feet. Mr. Caro calculated this by locating the shallowest part of the Delaware River (Mr. Caro determined Baker Range was the shallowest) and added the predicted height of the tide at that location, for the vessel's predicted time of arrival. He then subtracted the maximum draft of the vessel along

II. FINDING OF FACTS

with the calculated squat to calculate the under keel clearance of the vessel at that location and time. The following information shows Mr. Caro's calculations in meters and feet:

Minimum Channel depth (Baker Range, Delaware River)	12.20 M	40.03'
Predicted Height of Tide	+ <u>1.90 M</u>	+ <u>6.23'</u>
Equals - Controlling Draft	14.10 M	46.26'
Maximum Draft	11.16 M	36.61'
Calculated Squat	+ <u>1.17 M</u>	+ <u>3.83'</u>
Equals - Deep Navigation Draft	12.33 M	40.44'
Controlling Draft	14.10 M	46.26'
Deep Navigation Draft	- <u>12.33 M</u>	- <u>40.44'</u>
Equals - Under Keel Clearance	1.77 M	5.82'

Helmsman / Lookouts:

The following crewmembers were serving as Helmsmen and Lookouts during the transit and just prior to the incident: Able Body Seamen (ABS) Ruben Llunar, Noel Moratalla, and Rommel Lazao. The three crewmembers conducted the standard 1-hour watch rotation between the helm, bow lookout, and poop lookout. All three crewmembers met STCW and OPA 90 rest requirements. At no time did they notice anything out of the ordinary, except when Mr. Rommel noticed the list and promptly notified the Captain.

3.) WEATHER INFORMATION

The following marine forecast was issued by the National Weather Service for Delaware Bay waters North of East Point NJ, to Slaughter Beach, DE:

- 1515 EST, Friday, November 26, 2004: "Tonight...W winds 5 to 10 knots becoming SW, Seas 1 ft or less".

The National Weather Service also issued no warnings, advisories, or special marine statements for the 26th of November 2004.

At the time of the incident, on scene weather was reported as west winds at 8 knots, seas-flat, visibility-12 nautical miles, full moon, and the temperature approximately 50° Fahrenheit. The River Pilot commented during interviews, "It was beautiful evening for a boat ride."

4.) TIDAL INFORMATION:

Predicted: The Docking Pilot used a NOAA tidal prediction web site for Billingsport Range, Delaware River (this is located just south of the incident). According to the NOAA Tide Tables; low tide on the evening of the 26th of November 2004, for Billingsport Range area was predicted at 1951 at a height of 0.3 feet. At the time of the incident (2115), the predicted tidal height was at 1.4 feet with a flood tide.

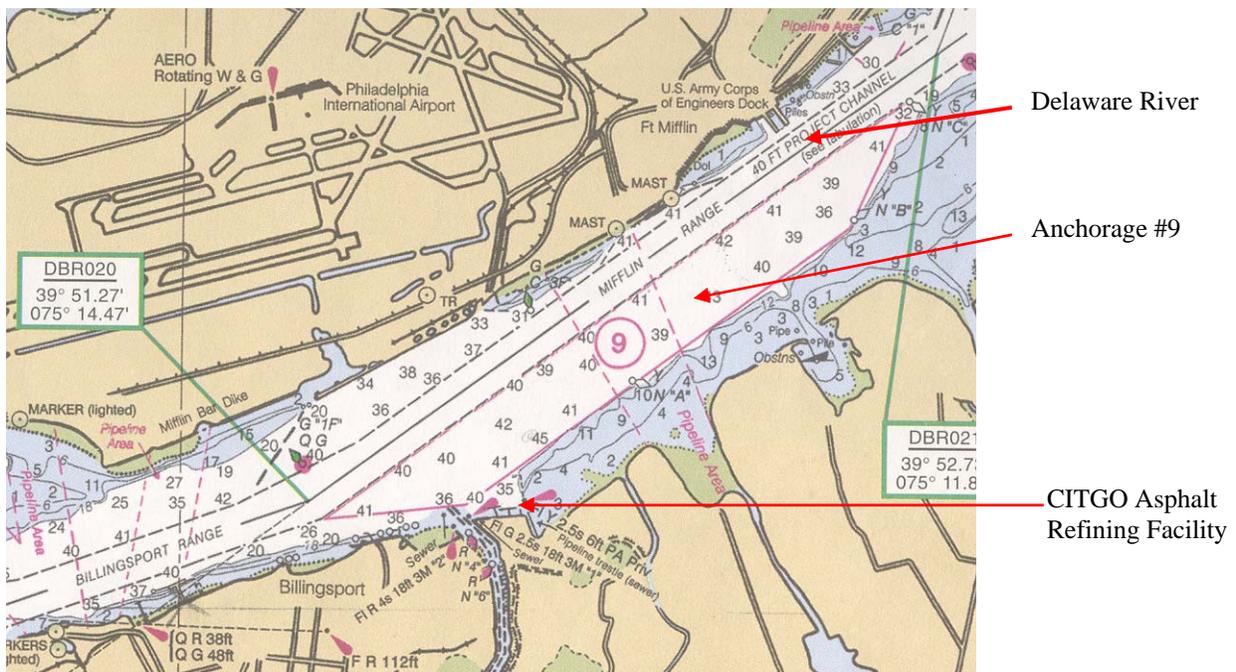
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Actual: NOAA provided a certified letter attesting to the actual water depth near the time of the incident. According to Mr. Leonard Hickman from NOAA (Acting Chief, Products and Services Division, Center of Operational Oceanographic Products and Services) the actual water depth at 39° 51.36 N, 75° 13.73 W (location of the incident) along the Delaware River at 2106 was at 0.121 meters or 0.40 feet and at 2112 was at 0.191 meters or 0.63 feet, relative to Mean Lower Low Water (MLLW).

There was a difference of 0.235 meters or 0.77 feet between actual and predicted tidal heights. According to NOAA, the difference in the tidal heights can be attributed to several types of meteorological events; such as high pressure moving into the region, and/or wind. The average mean tidal range for the Delaware River is 5.64 feet with an average current of 2 knots.

5.) DELAWARE RIVER – ANCHORAGE #9

The Docking Pilot boarded the T/V ATHOS I along the Billingsport Range, Delaware River and piloted the vessel from Billingsport Range through portions of Mifflin Range and into Anchorage #9. The controlling depth for both Mifflin Range and Billingsport Range along the Delaware River is 40 feet. Both ranges average approximately 800 feet in width. The width of the anchorage is approximately 1,350 feet wide with the longest length at 13,825 feet and the shortest length at 9,100 feet. The Citgo Asphalt Refining Facility pier is located approximately 400 feet due south of Anchorage #9.



Delaware River / Anchorage #9

- 1.) ACOE conducted a water depth survey of Anchorage #9 in June 2004, which averaged between 40.8' to 46.9' within the vicinity of the incident. ACOE normally conducts

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annual surveys of the channel and anchorage in this area. ACOE standard of practice of surveying anchorages is to use single beam sonar at 400' centers.

- 2.) The channel (Mifflin Range) of the Delaware River was last dredged by the ACOE in June 2003 by M/V McFARLAND.
- 3.) Two days after the incident, ACOE conducted water depth surveys of Anchorage #9 and found the anchorage to be at the projected depth or higher, except for a very few areas where it was shown to be approximately 39.5'.

6.) NAVIGATION CHARTS

At the time of the incident, the crew of the T/V ATHOS I were utilizing United Kingdom Hydrographic Office, Admiralty Charts and Publications, Chart No. 2604, United States – East Coast – Pennsylvania – New Jersey, Delaware River Philadelphia and Camden, December 1999, Scale 1:15000 (corrected up to 2004).

The T/V ATHOS I also utilized the following charts to navigate inbound through the Delaware River to Paulsboro, NJ.

United Kingdom Hydrographic Office, Admiralty Charts and Publications, Chart No. 2603, United States – East Coast – Delaware River Delaware Point to Little Tinicum Island, January 1999, scale 1:40000 (corrected up to 2004).

United Kingdom Hydrographic Office, Admiralty Charts and Publications, Chart No. 2564, United States – East Coast – New Jersey – Delaware – Delaware Bay, May 1997, scale 1:80000 (corrected up to 2004).

United Kingdom Hydrographic Office, Admiralty Charts and Publications, Chart No. 2563, United States – East Coast – New Jersey – Delaware – Approaches to Delaware River, May 1997, scale 1:150000 (corrected up to 2004).

7.) VOYAGE T/V ATHOS I

On the 20th of November 2004, at approximately 1000 local time, the T/V ATHOS I departed from Puerto Miranda, Venezuela, under registry, bound for Paulsboro, NJ with a crew compliment of 29. The T/V ATHOS I cargo consisted of 13,299,098.4 gallons of crude oil. Prior to departure from Puerto Miranda, T/V ATHOS I draft readings (taken at the pier in fresh water) were shown to be 36'06". The 2nd Mate onboard the T/V ATHOS I created the voyage plan which included transiting through the Gulf of Mexico, Atlantic Ocean, and up the Delaware Bay/River, to Citgo Asphalt Refining Facility located in Paulsboro, NJ to discharge their cargo. During an interview with the Master, he stated that “[n]o problems were encountered with the load or transit to Delaware Bay.” The Master did state that the vessel encountered heavy rains and 6’-8’ seas, while enroute, but sustained no damage from the weather.

At 1208, on the 26th of November 2004 – T/V ATHOS I’s echo sounder was turned on.

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At 1220, the T/V ATHOS I entered the Delaware Bay and embarked River Pilot George H. Teal along with a 6 person United States Coast Guard Boarding Team (the Boarding Team was from MSO/Group Philadelphia and was performing a standard security vessel boarding/transit). While the Coast Guard team conducted their mission, Mr. Teal and the Master conducted the pilot information exchange. The Master provided the "Pilot Card" to the River Pilot and reviewed the ship's characteristics with him. The Master stated in an interview, "It was a typical Pilot information exchange." During interviews with Mr. Teal, he indicated that he was aware of the vessel's draft but was not concerned with piloting the vessel northbound during the coming tidal stage, nor during any tidal stage. He further commented that he would be concerned if the vessel's draft was higher than 37'. Both the Pilot and the Master signed the "Pilot Card." Prior to boarding the T/V ATHOS I, Mr. Teal had the pilot launch conduct a sweep around the vessel to confirm the vessel's condition and draft (which was found to be at 36'06"). The Master, Pilot, and 2 Coast Guard Boarding Officers remained on the bridge at all times while they were aboard the vessel and just prior to the incident. During the transit, the Master decided to record the voyage through his personal computer and GPS system. The Master stated, "The Voyage Recorder was a hobby of his." Mr. Teal stated that he never used his own computer/GPS system since the Master had his on.

At 1600, the T/V ATHOS I reported in the ship's log the weather and sea state as "partly cloudy sky, slight sea state, and good visibility."

At 1850, the T/V ATHOS I passed under the Delaware Memorial Bridge.

At 1957, the T/V ATHOS I passed under the Commodore Barry Bridge.

At 2031, while the T/V ATHOS I was transiting along the Billingsport Range, Delaware River, the Docking Pilot, Mr. Joseph Bethel, along with an Apprentice-Docking Pilot, Mr. Nick Warmouth, boarded the vessel. Mr. Bethel conducted a pilot-to-pilot brief with Mr. Teal and a brief with the Master. During an interview, Mr. Bethel stated, "Nothing out of the ordinary occurred with the brief." Mr. Bethel did recall Mr. Teal stating, "It takes a lot of rudder for steerage." After the brief, Mr. Bethel proceeded to the starboard bridge wing to review the ship's position. Mr. Bethel verified that the ship was in the middle of the channel and felt comfortable relieving Mr. Teal. Mr. Bethel went back onto the bridge and stated, "I've got it" to Mr. Teal. Mr. Teal then turned to the helmsman, put his hand on his shoulder, and told him the Docking Pilot had the conn. According to Mr. Teal's statement, he observed the following: "I then observed the final ½ mile transit from Billingsport Range to the intersection of Mifflin Range with nothing unusual occurring, and I did not hear any concerns expressed from anyone else. The Docking Pilot was very verbal about his docking plan."

At 2040, Mr. Bethel commenced docking maneuvers. Mr. Bethel placed the Tug SURRIE MORAN on the starboard bow and the Tug BART J. TURECAMO on the port bow. The engines were placed on all stop with the speed of the vessel approximately 5.3 knots. Soon after, the vessel started to lose steerage. According to Mr. Bethel's statement, he put the vessel on dead slow and turned the vessel into Mifflin Range. After making the turn, he turned the wheel amidship, and put the engines astern to reduce headway as he was turning the T/V ATHOS I to starboard, with the intent of putting the bow down stream (Mr. Bethel was docking the vessel port side to the facility's pier). Mr. Bethel used both tugs to assist in turning the vessel around and paralleling it to the Citgo Asphalt Refining Facility. After turning the T/V ATHOS I three

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quarters of the way around, he had the Tug BART J. TURECAMO let go of their line and proceed to the starboard quarter.

At 2053, according to the ship's log, the Tug BART J. TURECAMO cleared lines and proceeded to the starboard quarter.

At 2110, Mr. Teal and the 6 USCG team members disembarked the vessel via the pilot launch. According to Mr. Teal's statement, "Coast Guard personnel approached him and asked if he was going to leave by the pilot launch." Mr. Teal stated, "Yes, as soon as we are at the dock." Mr. Teal further stated "Shortly thereafter, it was my understanding that a line had been sent ashore so I left the bridge and joined the Coast Guard on the starboard accommodation ladder and left the ship by launch, with no indication of anything abnormal." The lead Petty Officer from the Coast Guard Boarding Team (PO Lee Bowers) stated, "At no time during the inbound transit or docking maneuvers of the T/V ATHOS I, did I know of or observe any sudden listing or signs of oil/product discharge."

At 2113, the echo depth sound recorder log indicated that the vessel was located at: 39° 51.34 N, 075° 13.68 W

At 2115, the Tug BART J. TURECAMO made fast to the starboard aft quarter. As the ship was breasted towards the dock, Mr. Bethel, along with the crew, noticed a port list. Mr. Bethel stated in an interview, "They were approximately 400' away from the Citgo Asphalt Refining Facility when the list occurred." Mr. Bethel went on to say, "After noticing the first list, I stopped the forward tug and eased the aft tug to see if they were the cause of the list." Mr. Bethel also stated, "At no time did I notice or feel anything touch the ship during the maneuvers." During this time, the vessel continued to develop a port list. The Master of the T/V ATHOS I then requested the Chief Mate to inspect the pump room and confirm if all was in order.

At 2118, the echo depth sound recorder log indicated the vessel was located at 39° 51.31 N, 075° 13.69 W. The Master of the T/V ATHOS I requested the Chief Mate to proceed to the cargo control room. The ship's log shows the vessel list increased to 3° port. According to the Master's Statement, the Chief Officer noticed a stream of air coming out of #7 port ballast tank smelling of oil.

At 2120, an Engineer from T/V ATHOS I inspected the pump room and found everything in order. The Chief Mate contacted the Master and stated that oil was sighted on the port side, aft of the vessel. The Chief Mate also reported that water and oil was entering into the #7 port ballast tank. The Master left the bridge and started making notifications according to the vessel's response plan.

At 2125, the vessel's listing further increased to 7° port. Also, crewmembers commenced cargo transfer from #7 center tank to the slop starboard tank and #4 center tank. Mr. Bethel requested the Tug SURRIE MORAN to contact the local Coast Guard and notify them of the situation. During this time, or earlier, the vessel lost both engines/power due to the port list. The Chief Engineer stated that the engine shutdown was caused because the main engine's oil pump lost suction to the oil reserves. This occurs when the vessel lists more than 4°. The Chief Engineer repaired the problem by adding more oil into the reserve tank, bringing the engines back online.

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At 2157, T/V ATHOS I notified the Coast Guard that the clean-up company (Clean Venture) was on-scene.

At 2200, according to the ship's log, the Chief Officer informed the Master that the oil discharge had been secured and the list remained unchanged.

At 2215, Mr. Bethel informed the Coast Guard that they had dropped their starboard anchor to secure the vessel. Mr. Bethel stated during interviews, that he was concerned that the vessel might drift over into the shoaling area just north of the facility, so he brought in a third tug, Tug HELEN D. COPPEDGE, on the port bow to help secure the vessel from further movement.

At 2224, T/V ATHOS I contacted the Coast Guard and reported that they had secured the leak.

At 2231, according to the ship's log, the starboard anchor was raised, and the ship was repositioned in the anchorage.

8.) ATHOS I HULL DAMAGE:

The main damage sustained by the T/V ATHOS I was located between frames 56 and 57 in both the #7 port wing ballast tank and the #7 center cargo tank. The damage consisted of a longitudinal slice/puncture and a semi-circular shaped puncture. There were no scrapes or score marks surrounding the main damage.

Longitudinal Slice:

The longitudinal damage was approximately 63" long and was located in the #7 port wing ballast tank, extending into the #7 center tank by 2' on a 45 degree angle from outboard proceeding inboard. The width of the longitudinal damage was approximately 5" aft, with the center width at 9" and narrowing forward into the #7 center tank. Also found were contrasting directions of the fractured plating on both ends of the slice. Approximately 80% of the fractured plating flaps were pointed inboard, with the remaining 20% (at the opposite end of the slice) pointed outwards.

Semi-Circular Puncture:

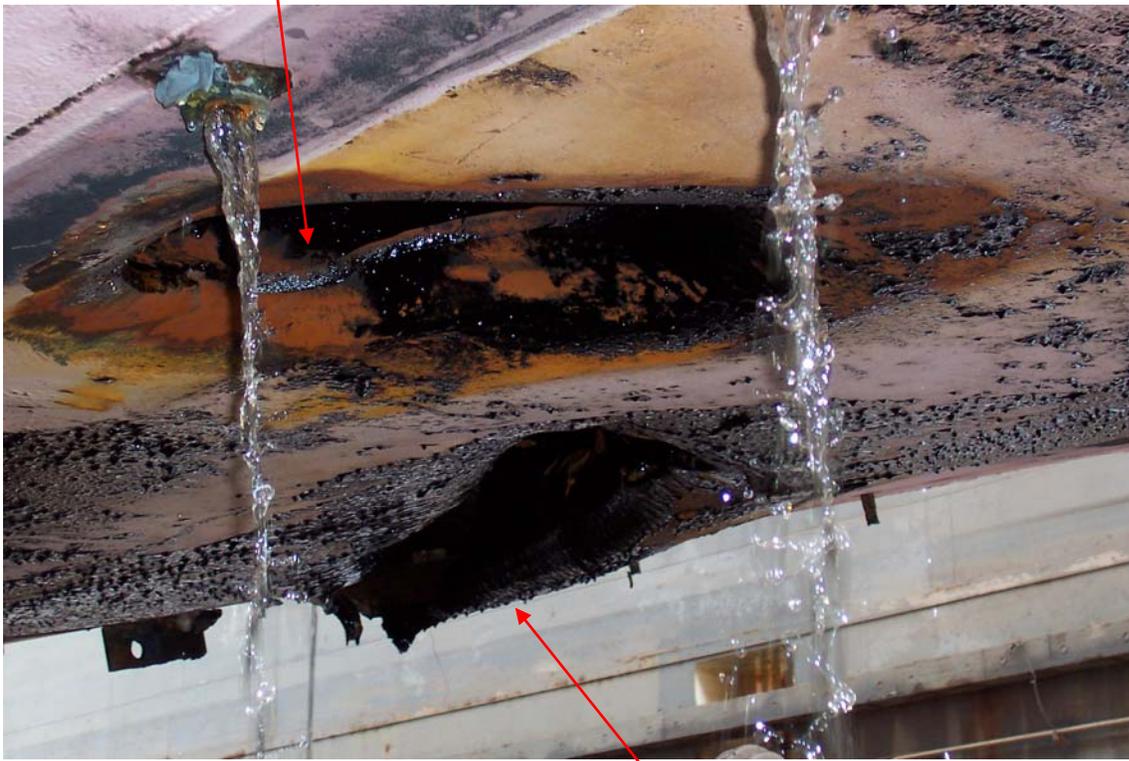
The puncture was located approximately 28" forward and starboard of the longitudinal slice. The puncture was semi-circular with a damage radius of 24" x 11" with hull damage flapped forward in a V configuration. This damage was located only in the #7 center cargo tank.

Shown below are photos of the external and internal hull damage, taken during dry dock repairs at the Alabama Shipyard, Mobile, AL.

The following pages show digital photographs of the damage.

II. FINDING OF FACTS

Semi-Circular Puncture



Main External Damage of the ATHOS I hull

Longitudinal Slice



Main External Damage of the ATHOS I hull

II. FINDING OF FACTS



Longitudinal crack intrusion from the #7 Port Wing Ballast Tank into the #7 Center Cargo Tank. ** Viewed from inside the Tank **



Puncture Damage located in the #7 Center Cargo Tank. ** Viewed from inside the tank **



Damage located in #7 Port Wing Ballast Tank
** Viewed from inside the Tank **



Damage located in #7 Port Wing Ballast Tank
** Viewed from inside the Tank **

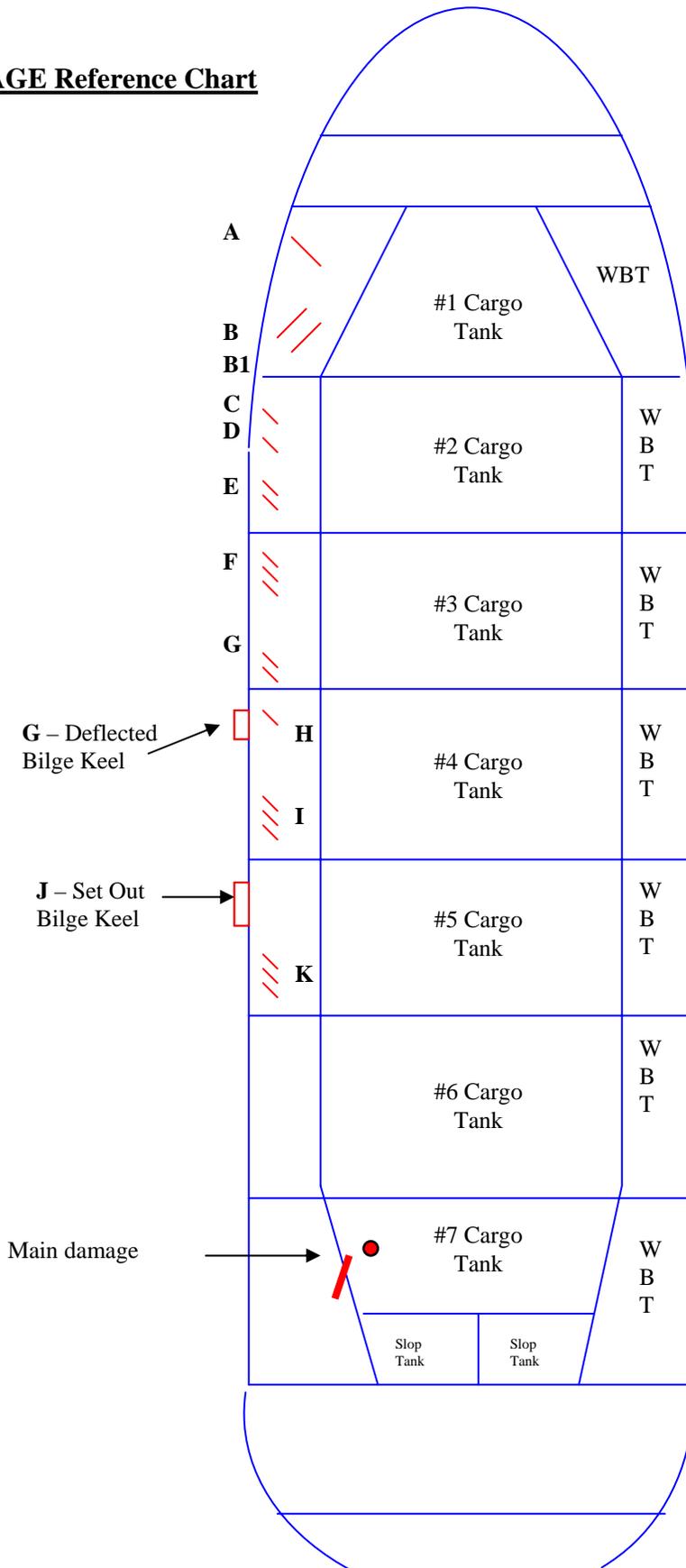
II. FINDING OF FACTS

Other minor hull damage locations (the reference diagram on the following page indicates locations of the damage marked as A through K):

- A.** 12'4" scraping, 3 distinguished marks, approximately 2' apart from each other, all in parallel orientation, approximately 45 degrees off vessel center line. Vicinity of frame 88-87
- B.** Scrape approximately 7'6" in length, ranging from 1.5" to 3" in width. Vicinity of frame 86-85. 45 degrees off vessel centerline but perpendicular to damage at **A**.
- B1.** Scrape approximately 6'3" located approximately 4'6" from **B** and in parallel orientation to the scrape at **B**. Vicinity of frame 86-85.
- C.** Small parallel scrapes, approximately 4' long by 3" wide. Vicinity of frame 84-83.
- D.** Multiple minor scrapes ranging in length, longest approximately 9'6". Vicinity of frame 83-82.
- E.** Rough abrasions on the turn of the bilge from the midpoint of 2 Port WBT to 3 Port WBT. Forward of the abrasion are "squiggly" abrasions. Vicinity of frame 81-79.
- F.** General wide spread abrasions with indications of oil presence on the hull. Some minor, deeper grooves present. Abrasions are just inboard of the turn of the bilge. Vicinity of frame 77.
- G.** More minor abrasions in vicinity of common bulkhead between 3 Port WBT and 4 Port WBT. Includes upset section of bilge keel, turned out to portside for approximately 6' of length. Vicinity of frame 75.
- H.** Minor scrapes in 4 Port WBT, underneath the bilge keel, ranging in length from 2' to 4'. Vicinity of frame 74. ** Note the bilge keel runs from just forward of the forward 3 Port WBT transverse bulkhead to 6 Port WBT.
- I.** Minor abrasions from the mid point of 4 Port WBT to 5 Port WBT. Vicinity of frame 69.
- J.** A more significant scraped area along with damage and a crack in the bilge keel. Bilge keel "set out" for a longitudinal length of approximately 18". Vicinity of frame 69.
- K.** Minor abrasions from the midpoint of 5 Port WBT to the common 5 and 6 Port WBT transverse bulkhead ranging from 2' to 5'.

II. FINDING OF FACTS

DAMAGE Reference Chart



*** Not to scale ***

Approximate location of damage shown in red. The previous pages describe the damage in detail.

II. FINDING OF FACTS

9.) POST-CASUALTY DRUG AND ALCOHOL TESTING

Pursuant to Title 46 Code of Federal Regulations, Part 4.06 – Mandatory Chemical Testing Following Serious Marine Incidents Involving Vessels In Commercial Service, post-casualty drug and alcohol testing was conducted on all individuals directly involved in this incident. The results are as follows:

River Pilot

Following the casualty, Pilot Howard Teal submitted to post casualty chemical and alcohol testing in accordance with USCG/DOT standards at 0545, 27 November 2004. Ship to Shore Drug and Alcohol Testing Services conducted the collection at Delaware Pilot Association, 41 Cape Henlopen Drive, Lewes, Delaware. The laboratory used was Clinical Reference Laboratory of Lenexa, Kansas and the results of Pilot Teal's tests were confirmed ■■■■■ by Medical Review Officer Jeffrey Kleeman of Glenolden, Pennsylvania.

Docking Pilot:

Following the casualty, Pilot Joseph Bethel submitted to post casualty chemical and alcohol testing in accordance with USCG/DOT standards at 1645, 27 November 2004. Ship to Shore Drug and Alcohol Testing Services conducted the collection at their facility located at 2961 Yorkship St, Camden, New Jersey. The laboratory used was Clinical Reference Laboratory of Lenexa, Kansas and the results of Pilot Bethel's tests were confirmed ■■■■■ by Medical Review Officer Jeffrey Kleeman of Glenolden, Pennsylvania.

Crew of ATHOS I:

Seven members of the crew of the ATHOS I submitted to post-casualty drug and alcohol testing in accordance with USCG/DOT regulations between 1045 and 1500 pm, on 27 November 2004. Ship to Shore Drug and Alcohol Testing Services conducted the collection at their facility located at 2961 Yorkship St, Camden, New Jersey. The laboratory used was Clinical Reference Laboratory of Lenexa, Kansas and the results of 7 crewmember tests were confirmed ■■■■■ by Medical Review Officer Jeffrey Kleeman of Glenolden, Pennsylvania.

III. ANALYSIS

III. ANALYSIS

1.) NAVIGATION:

It has been a standard practice over the years that the Pilots from the Delaware Pilots Association use a portable computer/GPS system for reference and to assist in navigating vessels inbound/outbound along the Delaware River. However, in this instance Mr. Teal (River Pilot) stated he had not utilized or turned his system on since the Master had his own personal portable computer/GPS system operating. The computer recorded the entire transit, originating from the mouth of the Delaware Bay to the location of the incident. Investigators reviewed the data, which showed the vessel's track line was within the navigation channel and anchorage for the entire voyage. The Master was able to provide a printout of the transit along Billingsport Range to the docking maneuvers in Anchorage #9. Again, the print out showed the vessel to be within the channel and the anchorage.

Review of the navigation charts used by the T/V ATHOS I Navigation Officers indicated that bearings were taken every 5 minutes. They corroborated the GPS track line that the vessel's locations were within the channel. The vessel was not equipped with a voyage recorder.

2.) POINT OF ALLISION:

Crewmembers from the T/V ATHOS I, including both Pilots, and members from the two tugs maneuvering the vessel neither felt nor saw the vessel collide or allide with any objects. Nor did anyone mention anything out of the ordinary occurring during the transit or during docking maneuvers. The port list was first noticed at 2115 and ended approximately 10 minutes later when it reached 7°. The US Coast Guard Marine Safety Center (MSC) conducted a brief analysis of the ship's port list assuming that approximately 9500 bbls of liquid was located in the #7 Port Wing Ballast Tank. With other assumptions being made, such as the size and locations of the holes in the ship's side shell to simplify the hydro dynamic model, MSC determined it was feasible for the list to occur within ten minutes as described by the crew. This evidence, therefore suggested that the vessel struck a submerged object in Anchorage #9 or in the navigation channel leading to the anchorage.

3.) WATER SURVEY:

The day after the incident, MSO/Group Philadelphia requested ACOE conduct an immediate underwater survey of the lower portion of Anchorage #9; after several days the survey was expanded to include navigation channels leading to Anchorage #9, as far south as the Commodore Barry Bridge. ACOE conducted multiple surveys from the 28th of November through the 9th of December using both the M/V SHUMAN and the M/V SEA ARK DAUNTLESS. MSO/Group Philadelphia also requested NOAA to assist in conducting underwater surveys of the above-mentioned area for possible objects. NOAA conducted their surveys from the 2nd of December through the 8th of December 2004.

The ACOE standard of practice for surveying anchorages and channels is to use single beam sonar at 400 foot intervals to discover possible shoaling. However, for this survey, ACOE used multi-beam sonar for relative area coverage of 100%. The ACOE generated areas of interest

III. ANALYSIS

based on their findings and reported it to NOAA for further investigation using their side scan sonar to develop a detailed profile. NOAA surveyed 7.4 lineal nautical miles of channel in the Delaware River, 1.4 square nautical miles. In that area 98 objects were found with an approximate height off the bottom of 2 feet or greater or looked conspicuous. Due to the limitations on NOAA's equipment they were unable to determine what the objects were. However, ACOE and NOAA concluded these objects were below project depth and not a hazard to navigation.

During these surveys, ACOE did conclude the anchorage and channel was at project depth except for very small regions where the water depth was approximately 39.5'.

The owners of the T/V ATHOS I took independent action to identify submerged objects and hired American Underwater Search & Survey LTD (AUSS) and Randive to assist. The AUSS group identified several submerged objects that deserved further scrutiny; and upon closer examination, the following three items were determined to be ones that the T/V ATHOS I struck: A pump casing, a concrete block, and a 7' anchor.

The following survey equipment was utilized:

A.) ACOE deployed the M/V SHUMAN and the M/V SEA ARK DAUNTLESS with the following equipment:

M/V SHUMAN – 65' catamaran with the following equipment

Multibeam:

- a. Reson 8101 multibeam system
- b. Innerspace 448 single beam
- c. Trimble 4000 GPS survey quality receiver
- d. Nav Beacon Pro differential correction receiver
- e. MARS motion compensation & gyro system
- f. Odom digibar pro velocity profiler
- g. Dell computer
- h. Hypack collection software
- i. Tides & currents program
- j. Hazen automatic tide gage & personnel monitoring tide elevations

Side Scan:

- a. Edgetec 4000 digital Side Scan
- b. Edgetec fish controller & collection software
- c. Controller / computer
- d. ISIS processing software

M/V SEA ARK DAUNTLESS – 28' Survey Vessel with the following equipment

Multibeam:

- a. Reson 8124 200khz multibeam
- b. POS-MV Navigation & Motion compensation system
 - i. Dual GPS
 - ii. Inertial guidance system
 - iii. Motion detection & compensation
- c. Nav Beacon Pro differential correction receiver

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- d. Computer
 - e. Digibar Pro velocity profiler
 - f. Hypack collection software
 - g. Tides & currents program
 - h. Hazen automatic tide gage & personnel monitoring tide elevations
- Side Scan: NONE

B.) NOAA's Survey Equipment: NOAA deployed Navigation Response Team #5 along with a 30' Sea Ark survey launch. The survey mission equipment included a Klein 3000 side scan sonar used for seafloor imaging and Klein proprietary software "Sonarpro" for data acquisition along with a Trimble differential global positioning system (DGPS). The survey launch was also equipped with an Innerspace single beam echo sounder, which was used for sounding acquisition. Both sidescan and single beam data are post processed in CARIS Side Scan Information Processing System (SIPS) and CARIS Hydrographic Information Processing System (HIPS), respectively.

C.) AUSS used the following survey equipment: Primary sonar system a Klein Model 3000 digital, dual frequency side scan sonar, a Dell latitude 500 laptop computer running SonarPro oceanographic software, and Kevlar reinforced, digital towcable. A secondary side scan sonar system that included an EG&G Model 272-TD dual frequency side scan sonar, National Instruments model 16-E4 MIO A/D converter, Seasone Hunter and Mapper oceanographic software running on a Dell Latitude 500 laptop computer, and Kevlar reinforced, multi-conductor analog tow cable. Leica Model 9250 differential GPS receiver.

4.) SUBMERGED OBJECTS:

Pump Casing – On the 4th of December 2004 at 1421, Randive dove on an object that was discovered to be a pump casing at the following location - 39° 51.370 N, 075° 13.727 W. The pump casing measured approximately 12'6" long, 6'5" wide, and 3'5" high. The orientation of the pump casing at the time of discovery was parallel to the shore and on an angle, with the one side imbedded 1.5' into the riverbed and the opposite end (discharge flange) sitting on the river floor. A broken shackle was also discovered at the bottom of the discharge flange. At the time of discovery, Randive located a small area of paint that had rubbed onto the pump casing (top center & inside edge of curve on the pump casing,) and took a sample of it (sample # 01). Several notable metal scrapes were also found and located on the top portion of the pump casing. The most significant scrapes were located on the top footing closest to the discharge flange as well as on the top portion of the discharge flange. These scrapes appeared to be fresh with visible marks generally pointed in the same direction.

On the 8th of December 2004 at 1030, Randive measured the water depth of the river at the location of the pump casing as 43' above the object; this was done while they were setting up rigging for the operation to recover the pump casing. At the time of the dive, the tidal height was at 5.4'. During the recovery operations, a loose paint scraping was located on the top center of the pump casing and was bagged as evidence (this was later split into sample # ATHOS 1-003A and ATHOS 1-003B). Also, Coast Guard investigators found paint scraping from the top portion of the discharge flange; this was also bagged as

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evidence (sample # ATHOS 1-002). On the 14th of December 2004, MSO/Group Philadelphia personnel removed a portion of the top footing of the pump casing (tagged ATHOS 1-004) and sent it to the National Transportation Safety Board (NTSB) for analysis along with the other samples.



Pump Casing



Close-up of the Pump Casing Footing

Concrete Block - On the 4th of January 2005 at 1430, Randive dove on an object that was discovered to be a concrete block at the following location - 39° 51.382 N, 075° 13.879 W. The concrete block measured 8' long, 4' wide, and 2' high. Randive measured the water depth to be 42' above the object with a tidal height of 0.6'. The object was found lying flat on the river bottom with steel rebar sticking out from the sides and top of the block. Randive also recovered three loose stone/paint chips from the top of the block (sample # ATHOS 1-005, which was later sent to the NTSB).

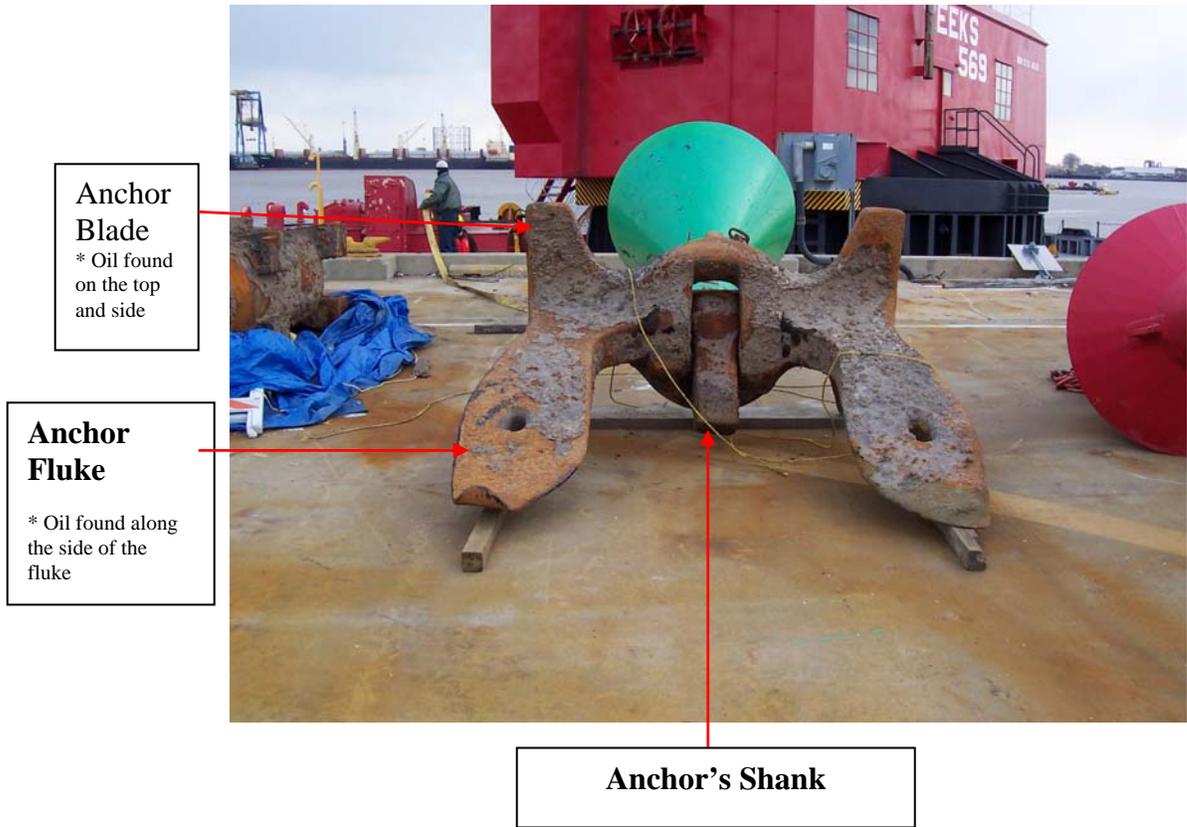
Anchor - On the 5th of January 2005 at 0830, Randive dove on an object that was discovered to be a Navy Stockless Anchor at the following location - 39° 51.4077 N, 075° 13.834 W. The anchor measured 6'8" long, 7'3" wide, and 4'6" high. The anchor was found with the flukes pointed in a 15° SSW direction with the anchor lying flat on the river bottom. Randive measured the water depth to be 44' above the object with a tidal height of 4.9'.

On the 17th of January 2005, the anchor was recovered and transported to the MSO/Group Philadelphia pier. During examinations, fresh scrapings and a heavy coat of oil were found along the top and side section of one of the anchor blades (this section was later removed by MSO/Group Philadelphia personnel and sent to NTSB for analysis/comparison to other samples. Sample # ATHOS 1-006). Fresh scrapes along with heavy oil were also found on one of the anchor flukes, which was on the same side as the anchor blade with the scrapes and oil. Also at the end of the fluke the tip was bent upwards. No scrapings or oil were located on the other side of the anchor. The shank of the anchor was found to be missing; evidence suggests that a torch removed the shank.

The following pages show photos of the recovered anchor.

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Recovered Anchor



Close-up of Anchor Blade

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On the 1st of February 2005, MSO/Group Philadelphia scraped/removed portions of the oil from the anchor and sent it to the Coast Guard Marine Safety Lab (MSL) for analysis (sample labeled “ECN 211376-07-ML” which was relabeled by MSL staff to #05-081-1).

On the 2nd of March 2005, the anchor was thoroughly cleaned and the oil contamination and sediment removed. Highly visible metal scrapes on the fluke and anchor blade were found underneath the oil coating. These scrapings were found on both sides of the fluke, extending from the bull towards the anchor blade. Also found within the metal scrapings were very dense paint rub/marks that were later sampled and bagged as evidence (sample# ATHOS I-007).



Anchor Fluke – notice the metal scrapes along the sides



Anchor Fluke – with the bull bent upwards along with metal scrapes

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Anchor Blade –
showing the metal
scrapes and red
paint rubs.

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5.) WATER DEPTH COMPARED TO THE ANCHOR:

Evidence suggests it was plausible for the T/V ATHOS I to allide with the anchor with a draft of 36.5'. ACOE and NOAA water depth surveys of the area, days later, showed water depths to be between 40.3' and 40.6' at the location of the anchor recovery. The anchor was found lying flat on the river bottom with the anchor blade at the highest point off of the river floor, at a height of 4.5'. However, there is uncertainty as to the exact orientation and location of the anchor before the strike.

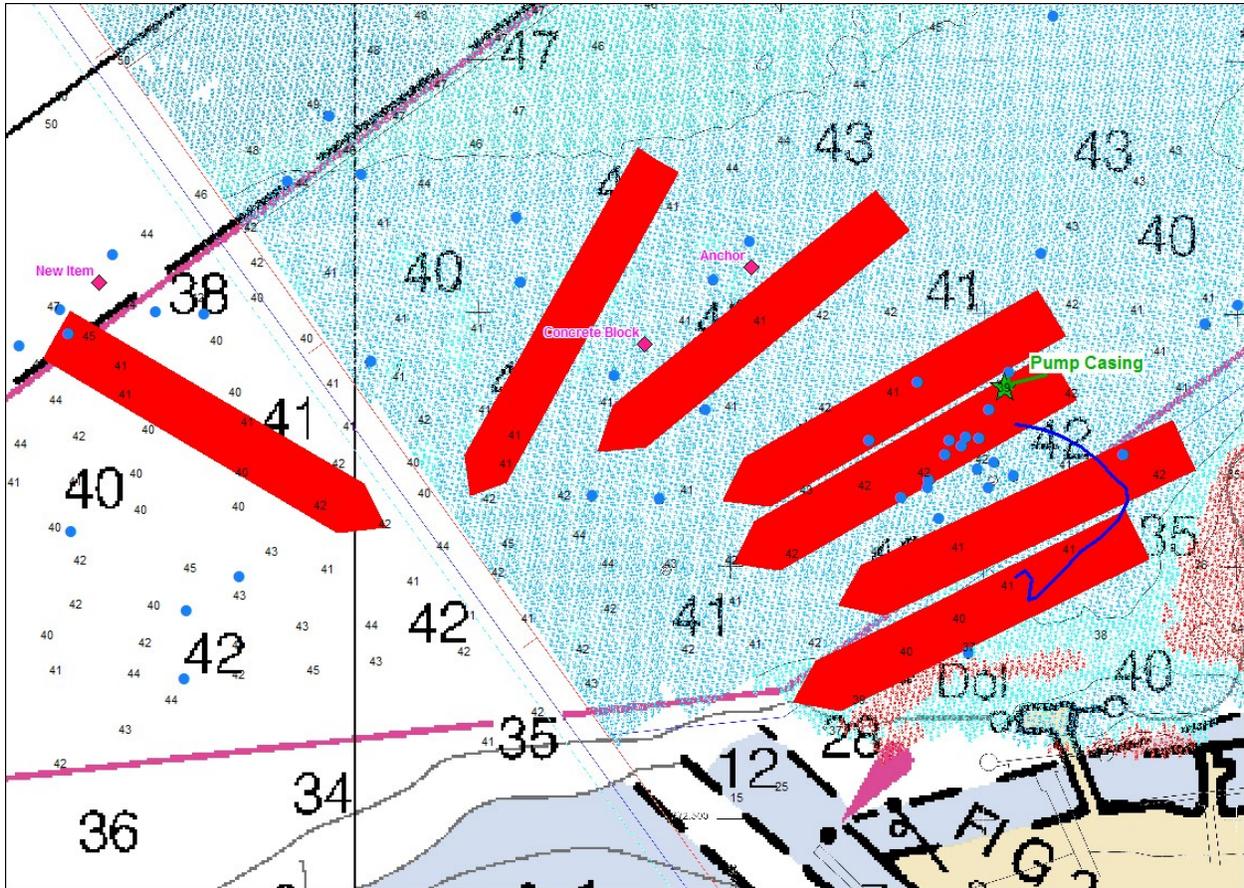
ACOE Water Depth Survey	40.30'
T/V ATHOS I draft	- 36.50'
Clearance Calculations (water depth – draft)	= 3.80'
NOAA's verified Tidal Height at 2106 during the date of the incident.	+ 0.40'
Total Clearance (water under the keel)	4.20'
Possible Height of the Anchor above the river bottom at "time of discovery"	- 4.50'
Difference of	(- 0.30)'

* This scenario is only based on the anchor lying flat on the river floor; there has been no evidence showing the exact orientation of the anchor prior to the allison. Also, the evidence suggests the anchor was lodged in the hull for a brief period of time, prior to either falling out or being forced out, due to the extent of the damage found in the #7 Port Wing Ballast Tank.

6.) VESSEL MOVEMENT RELATIVE TO SUBMERGED OBJECTS

NOAA (by request of Coast Guard MSO/Group Philadelphia) created a computer generated timeline/chart showing the relationship of T/V ATHOS I's location during transit to the submerged objects in Anchorage #9. NOAA used data taken from the T/V ATHOS I's echo depth sound recorder log to plot the course of the vessel on the chart. NOAA illustrated the concrete block and anchor as purple diamonds, while the pump casing was shown as a green star. Other submerged objects that were of interest but not proven to have allided with the vessel are shown as blue circles. Also represented is a large scour mark (discovered by AUSS) identified as a blue line.

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T/V ATHOS I locations related to submerged objects

TMC Marine Consultants hired by owners of the ATHOS I, also created a computer generated timeline/chart from the GPS data from the Master's Laptop and GPS receiver from the ATHOS I. The following page shows TMC's timeline chart showing GPS data, main damage location on the ATHOS I, vessel's orientation, anchor, pump casing, and concrete block.

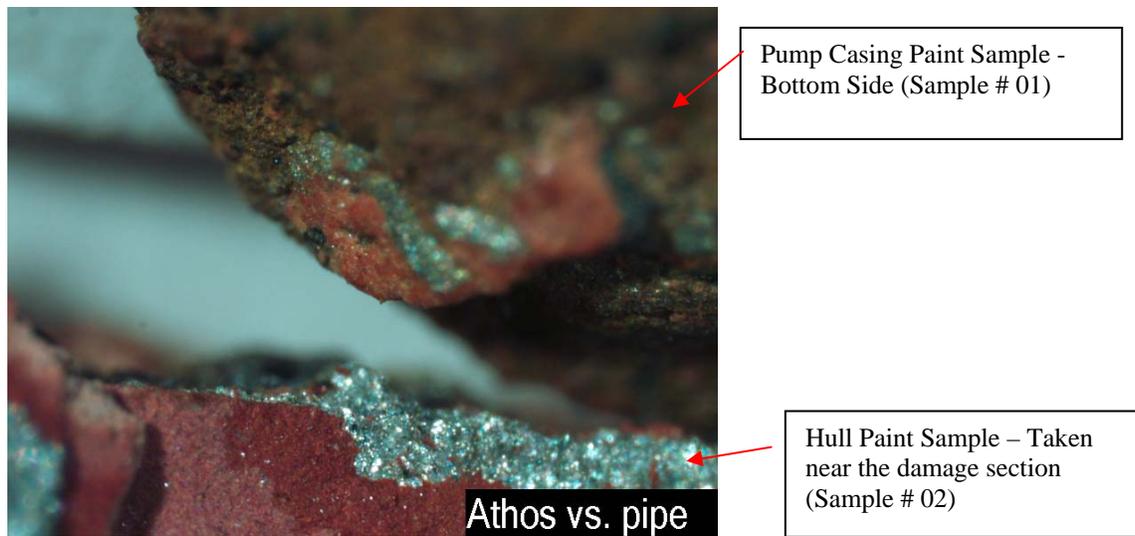
Both charts show similar track lines of the ATHOS I with regards to the submerged objects. It is important to note the relationship of the anchor and damage location on the vessel. As can be seen from the track lines, there is a high degree of correlation between the exact location of the main damage on the vessel and the location of where the anchor was found. It is not known how, or exactly where, the anchor was lying on the river bottom before the ATHOS I struck it; however, it is probable that the anchor's original location was close by.

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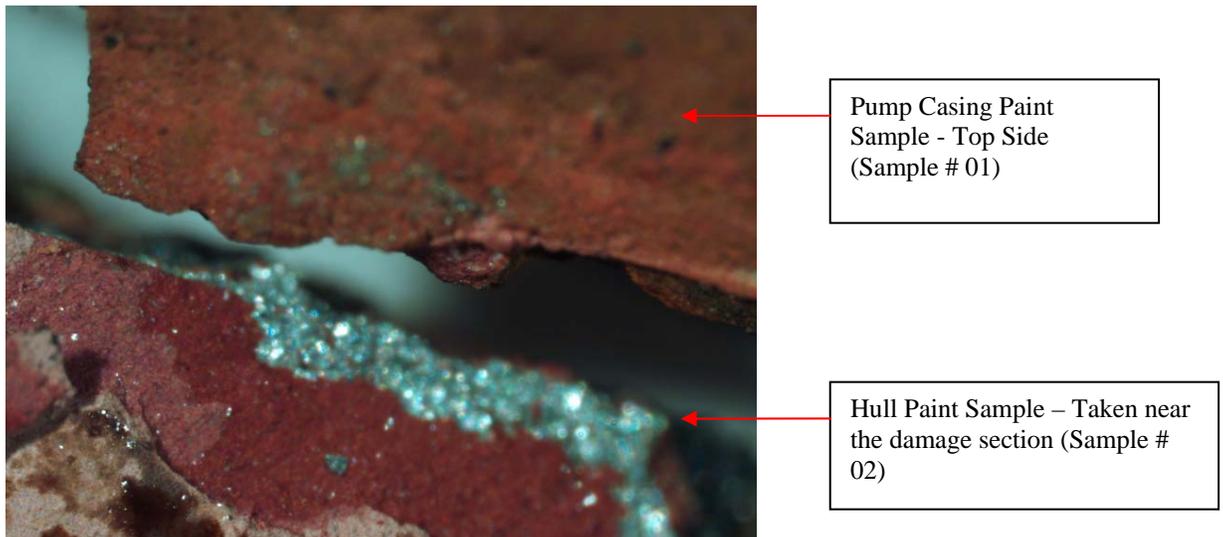
7.) FORENSIC ANALYSIS:

A.) Philadelphia Crime Lab Analysis

On the 6th of December 2004, Coast Guard investigators requested assistance from the Philadelphia City Crime Lab to conduct analysis on paint chips taken from the pump casing (sample # 01) and the T/V ATHOS I hull (sample # 02), to determine if the ATHOS I came into contact with the pump casing. Coast Guard investigators took the samples to the lab and met with Mr. Louis Szojka (Laboratory Program Scientist) who performed the analysis. At no time did the paint samples leave the sight or chain of custody of the Coast Guard investigators. Mr. Szojka used a microscope to analyze and compare the paint layers from the pump casing and the paint sample from the vessel's hull. Mr. Szojka stated "conditions are favorable for a match and warrant future testing on the samples." Mr. Szojka was able to provide a printout of the comparison between the two paint chips' samples.



Philadelphia Crime Lab Photo



Philadelphia Crime Lab Photo

III. ANALYSIS

B.) National Transportation Safety Board (NTSB) Analysis

The following paint samples were sent to NTSB for laboratory analysis between the submerged objects and the T/V ATHOS I.

Sample # 01 – Paint chip taken from the pump casing.

Sample # 02 – Paint chip taken from the T/V ATHOS I bottom hull, near the damaged section.

Sample # ATHOS I-002 - Paint chip from rubbed section of the pump casing (discharge flange).

Sample # ATHOS I-003A - Paint chip taken from pump casing, chip located within marine growth on top center portion of the pump casing.

Sample # ATHOS I-004 - Slice of the pump casing footing measuring 12” x 1.5”.

Sample # ATHOS I-005A - 3 pieces of concrete containing paint chips taken from the concrete block.

Sample #ATHOS I-006 - Removed section of the anchor blade (from the recovered anchor) measuring 12” x 5”.

NTSB Materials Laboratory Factual Report - Report No. 05-001 states the paint samples # 02, # ATHOS 1-003A, and # ATHOS 005A were examined in detail and had nine layers that **matched** closely in color, had similar composition, and were in the same sequence through the thickness of the samples. The samples from the T/V ATHOS I (# 02) and the pump casing (# ATHOS 1-003A) had two additional layers that **matched** in color, had similar composition, and were in the same sequence. The samples from the T/V ATHOS I (# 02) and the concrete block (# ATHOS 1-005A) had one additional layer that **matched** in color, had similar composition, and were in the same sequence. The sample from the concrete had two layers that did not match any layer on the other two samples. NTSB used the following equipment to perform the analysis: scanning electron microscopy (SEM) and energy dispersive x-ray spectroscopy (EDS).

NTSB Materials Laboratory Factual Report – Report No. 05-029 states that the anchor blade (# ATHOS I-006) shows many areas that were deformed, consistent with a sliding contact with another object. Also discovered were several light red deposits. All the deposits were located within areas where the sliding contact occurred. The anchor piece had several oily black deposits. A paint chip was discovered within the oily black deposit and carefully removed and cleaned. The paint chip had four visible layers of paint that **matched** in color and appearance with sample # 02 (paint sample from ATHOS I hull); this was further **matched** in composition using Scanning Electron Microscopy (SEM) and Energy Dispersive x-ray Spectroscopy (EDS)

C.) Coast Guard Marine Safety Lab (MSL) Analysis

The following samples were sent to MSL for laboratory analysis comparisons between spilled oil samples and a source sample taken from the T/V ATHOS I cargo oil tank.

Sample # 05-033-1 (clean water sample - labeled ECN-211376-01 ML) - Clean water sample taken from the Delaware River near the Citgo Asphalt Refining Facility.

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Sample # 05-033-2 (spill sample – labeled ECN-211376-02 ML) - Oil spill sample taken from the Delaware River near the Citgo Asphalt Refining Facility.

Sample # 05-033-3 (suspect source sample - ECN-211376-03-ML) - Oil source sample taken from #7 port tank onboard the T/V ATHOS I.

Sample # 05-035-1 (spill sample - labeled ECN-211376-04-ML) - Oil sample taken off of glove of a RANDIVE diver, during dive operation on the submerged pump casing, Anchorage #9, Delaware River.

Sample # 05-081-1 (spill sample - labeled ECN-211376-07-ML) - Oil sample scraped and removed from the recovered anchor located at MSO/Group Philadelphia.

Marine Safety Laboratory Report 05-033 – **MATCH** - Suspected source sample 05-033-3 and spill sample 05-033-2 are derived from a common source of petroleum oil. There were no differences noted between the chemical characteristics of these two samples. Sample 05-033-1 contains essentially oil-free water.

Marine Safety Laboratory Report 05-035 – **MATCH** - Samples 05-033-2 and 05-035-1 represent different portions of the same spill oil. There were no differences noted between the chemical characteristics of these two samples. Suspected source sample 05-033-3 and spill samples 05-033-2 and 05-035-1 are derived from a common source of petroleum oil. There were no differences noted between the chemical characteristics of these samples.

Marine Safety Laboratory Report 05-081 – **MATCH** – Samples 05-033-3 and 05-081-1 are derived from a common source of petroleum oil. Differences noted are attributable to weathering and non-petroleum contamination.

8.) COMPARISONS OF THE RECOVERED ANCHOR TO THE DAMAGED SECTION OF THE HULL:

On the 15th of January 2005, the damaged section of the T/V ATHOS I hull was removed while the vessel was dry-docked at Atlantic Shipyard, Mobile, AL. The damaged section was shipped (within a 20' container) to Coast Guard MSO/Group Philadelphia for analysis and storage.

On the 1st of February 2005, experts hired by the owners of the ATHOS I, consisting of Mr. Tony Bowman (Naval Architect from TMC Marine Consultants) and Mr. Joseph Crosson (Metallurgist from Lucius Pitkin), along with Coast Guard Investigators examined the damaged hull section in detail and compared it to the recovered anchor's physical characteristics. Mr. Bowman and Mr. Crosson created a cardboard template of the hull damage by placing a plastic sheet against the hull and cutting an outline of the damage to the sheet. The outline on the plastic sheet was then transferred to a cardboard sheet and cutout. This cardboard template was then set to the anchor blade and fluke section (the same location of the scrapes and paint found on the anchor) for comparison. Figures 1, 2, & 3 shown below show the comparison between the template and the anchor blade. The comparison showed the anchor blade and fluke **matched identically** to the cardboard template.

Also, due to the nature of the main damage observed on the ATHOS I hull, specifically the inward and outward folds found in the #7 Port Wing Ballast Tank, it is highly probable that the anchor was lodged in the T/V ATHOS I hull for a brief period of time during the strike.

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Figure 1- Cardboard Template

On the 2nd of March 2005, during cleaning operations performed on the recovered anchor, Mr. Joseph Crosson and his assistant made a more permanent template of the damaged section by transferring the cardboard template to a hard plastic sheet (shown below).



Figure 2 –Plastic Template

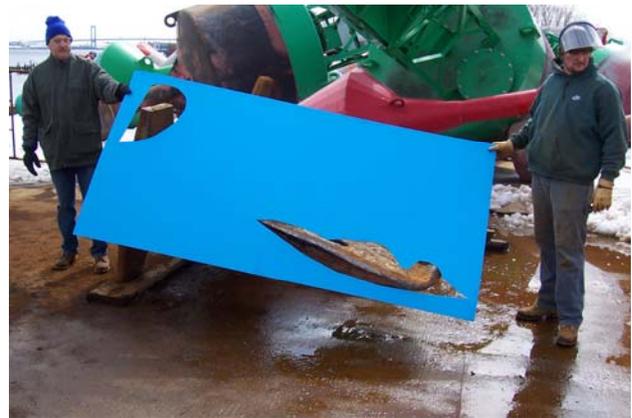


Figure 3 –Plastic Template

9.) OWNERSHIP OF SUBMERGED OBJECTS:

A.) Pump casing – The pump casing was identified to be a lower section of a two-piece dredge pump. On the 16th of December 2005, ACOE technical experts inspected the pump casing and found no credible markings or information indicating an owner. ACOE proceeded to create schematics and drawings, which were sent to a variety of different dredge pump manufacturers with negative results. On the 2nd of March 2005, both the anchor and a

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portion of the pump casing were cleaned. The following identification mark was discovered on the top center and slightly to the right of the pump casing “number 4205 with a diamond shaped mark located to the right of the number.” The ACOE conducted extensive research that led them to believe the identification mark was an American Dredging pattern made by Penn Steel. Both companies are no longer in business.

B.) Anchor - On the 2nd of March 2005, the anchor was thoroughly cleaned but no identification marks of any kind were found. Coast Guard Investigators contacted BALDT Anchor Manufacturer located in Chester, PA for assistance in identifying a possible owner of the anchor. On the 11th of March 2005, representatives from BALDT inspected the anchor and stated the anchor is an “18,000 lb Navy Stockless Anchor,” similar to anchors they had manufactured. They further stated that a marking or design would normally be located on the fluke or the blade to show the manufacturer of the anchor. The representatives also commented that while this was a “Navy Stockless Anchor,” purchased by the Navy, other commercial companies also purchased that style of anchor due to the engineering design of the anchor.

C.) Subpoenas – ACOE provided a list of dredge companies to Coast Guard Investigators who had operated in the vicinity of the incident the last 30 years. The following companies were on the list: Norfolk Dredging, Weeks Marine, & American Dredging. Coast Guard MSO/Group Philadelphia Investigators issued subpoenas to Norfolk Dredging and Week’s Marine (which also bought out American Dredging) requesting them to provide any records or knowledge of any lost or dumped dredge equipment and/or anchors within the Delaware River.

Both Norfolk Dredging & Weeks Marine responded to the subpoenas, stating they have no records or knowledge of any loss or dumping of dredge equipment or anchors in the area.

D.) U.S. Navy – Coast Guard MSO/Group Philadelphia Investigators also requested the United States Navy located at the Naval Business Shipyard, Philadelphia, to review their records for possible lost or dumping of a 18,000 lb “Navy Stockless Anchor along the Delaware River.

The U.S. Navy reported several classes of vessels commissioned as early as 1956 utilized an 18000 lb stockless anchor. The Naval Inactive Ships Maintenance Facility in Philadelphia reported that the anchor was not from any inactive ship in Philadelphia. Furthermore, the U.S. Navy reported they have no knowledge or reports of an 18,000 lb stockless anchor lost or dumped into the Delaware River.

E.) Corrosion Laboratory - Coast Guard investigators contacted the United States Navy Corrosion Laboratory for assistance to determine how long the objects have been in the anchorage. They stated that they would need to know the following prior to making a “time of immersion” estimate:

- 1) a detailed listing of components and materials.
- 2) current and original dimensions
- 3) an itemized list of current and original weights

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Without this knowledge, the Navy Corrosion Laboratory was unable to assist.

10.) ATHOS I VESSEL OPERATING PROCEDURES MANUAL (Safety Management Documents)

In 1993, the IMO adopted the International Management Code for the Safe Operation of Ships and for Pollution Prevention (the ISM Code), which became mandatory in 1998. The Code required a safety management system (SMS) to be established by vessel owners. The safety management system mandates shipboard operations procedures, safety and pollution prevention policy, recordkeeping and reporting responsibilities.

The following excerpts are taken from the ATHOS I Vessel's Operating Procedures Manual (Safety Management Documents):

A.) "Pilot On Board" - Document Number VOP-B-3, issue number 02, date effective: 10/10/99.

- The master shall have a brief discussion with the Pilot. This shall include the Pilot's planned route, his anticipated speeds, and ETA's, what assistance he expects from the shore, and what contingencies he may have in mind.
- The Master shall advise the pilot of handling characteristics of his ship, unusual features, and relevant information.
- The Pilot Card shall be readily available.
- Throughout the pilot passage the vessel's position must be plotted on the chart in use at frequent intervals.

B.) "Voyage / Passage Planning" - Document Number VOP-B-11, issue number 03, date effective: 10/10/99.

- The Deck Officer, nominated by the Master to be the Navigating Officer, is responsible to the Master for all navigation issues, such as:
 - Correcting charts and nautical publication up to the latest Notice to Mariners
 - Passage planning
 - Fully maintaining chart folios and chart corrections indexes

C.) "Navigation – 3.4 Navigating in shallow waters – squat & under keel clearance" - Document Number VOP-B-13, issue number 03, date effective: 01/03/2001.

Under-keel allowances vary with the local conditions, such as:

- a. sea state and swell
- b. tidal conditions
- c. variation in water level due to barometric pressure or tidal surges
- d. accuracy of soundings and tidal information
- e. accuracy of ship's draught observation or calculations, taking into account any hogging and sagging
- f. increase of draught due to heel or trim
- g. variation in water density
- h. sea bed conditions
- i. the effect of squat

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It is normal to consider that a water depth of approximately 110% of the maximum draught is adequate for a moored, anchored or very slow moving ship. However, in certain cases, and in particular during in-harbor transit or while alongside, it may be necessary to reduce the clearance further still. An under keel clearance of approximately 5% of the vessel's maximum draught is adequate for these circumstances. However, strict attention must be taken into account for the above conditions a. – i.

11.) **PUBLICATIONS: RECOMMENDATIONS/REQUIREMENTS:**

The following are navigational excerpts from recommended publications and US Regulations:

A.) Coast Pilot - recommendations

Coast Pilot 3 – 37th Edition, 2004 - Chapter 6: Delaware Bay

Lower River and Bay

1. The maximum fresh water draft for river transit from sea to Delair, New Jersey is 40 feet.
2. All vessels arriving with a fresh water draft in excess of 37 feet are to transit during flood current only.
3. All vessels over Panamax size beam (106 ft) having a fresh water draft in excess of 35'-06" shall only transit during flood current.
4. All vessels up to and including Panamax size beam (106 ft) having a fresh water depth of 37 feet and under should arrange their river transit to afford a minimum of three feet clearance in the Marcus Hook area. The clearance should give due consideration to vessel squat, predicated tide, and the wind effect on actual tide.

B.) Anchorage regulations - 33 CFR 110.157 Delaware Bay and River – Anchorage #9 110.157(10) – Vessels must not cast an anchor in this anchorage in such a manner as to interfere unreasonably with the passage of other vessels to and from Mantua Creek.

C.) Minimum under-keel clearance regulations 33CFR 157.445

33 CFR 157.445 (a) The owner or operator of a tankship, that is not fitted with a double bottom that covers the entire cargo tank length, shall provide the tankship master with written under-keel clearance guidance that includes –

- (1) Factors to consider when calculating the ship's deepest navigational draft;
- (2) Factors to consider when calculating the anticipated controlling depth;
- (3) Considerations of weather or environmental conditions; and
- (4) Conditions which mandate when the tankship owner or operator shall be contacted prior to port entry or getting underway; if no such conditions exist, the guidance must contain a statement to that effect.

(b) Prior to entering the port or place of destination and prior to getting underway, the master of a tankship that is not fitted with the double bottom that covers the entire cargo tank length shall plan the ship's passage using guidance issued under paragraph (a) of this section and estimate the anticipated under-keel clearance. The tankship master and the pilot shall discuss the ship's planned transit including the anticipated under-keel clearance. An entry

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must be made in the tankship's official log or in other onboard documentation reflecting discussion of the ship's anticipated passage.

12.) POST ALLISION DATA:

A.) T/V ATHOS I Draft – It has been verified that the T/V ATHOS I's draft was at 36.5' when it transited the Delaware River. The T/V ATHOS I's initial draft readings were taken in fresh water at Puerto Miranda, Venezuela from shore personnel, which was also verified through the vessel's internal draft reading equipment. Mr. Teal (River Pilot) stated prior to boarding the vessel that he ensured the vessel's draft was 36.5'.

B.) Draft Markings - Magnetech Industrial Services (subcontracted by Atlantic Marine Shipyard) was hired and verified the vessel's draft markings. Magnetech Industrial Services reported the draft markings were at the correct depth above the vessel bottom. Lloyd's Register classification society also reviewed the survey and determined it to be accurate. In addition, Lloyd's Register verified the vessel's fore and aft draft reading equipment located in the cargo control room and stated that the equipment is working correctly.

C.) Vessel's List - USCG Marine Safety Center (MSC) conducted stability calculations to determine if the T/V ATHOS I could list to 7° within 10 minutes as reported by the crew onboard. MSC was given the load of 9500 bbls of water within the #7 Port Wing Ballast Tank (discovered after the incident) and used the following factors: water flowed into the ballast tank through the larger hole only, water could not enter #7 Center Cargo Tank or enter the vessel through the hole located in that tank, and the vessel was not moving in any forward or vertical motion. MSC determined it was possible that the 9,500 bbls could transfer into #7 Port Wing Ballast Tank in less than 10 minutes creating the 7° port list.

TMC marine consultants (Tony Bowman) also conducted extensive stability calculations and similarly confirmed the crew's observation of the list occurring within that time frame.

D.) Hull Thickness – A.R.S. Co (Piraeus, Greece) certified by Lloyd's Register, conducted thickness measurements on the damaged section of the T/V ATHOS I hull. The company certified the hull plating was minimally worn and adequate.

13.) HISTORICAL INFORMATION:

A.) Citgo Asphalt Refining Facility Records – Citgo provided the records of vessels arriving at the facility for the previous year along with their corresponding draft readings. Coast Guard Investigators specifically reviewed vessels with drafts greater than 35'. During the past year, 38 vessels had drafts greater than 35'. Investigators then compared the time of arrival with regards to the tidal stage (1½ hrs past slack tide with a flood current) for the T/V ATHOS I to the other 38 vessels and found that all other 38 vessels had arrived at a later tidal stage. 2 of the 38 vessels arrived 2 hours past ebb stage with a flood current at a tidal height between 2.5' and 2.9'. Both of these vessels had a draft of 37'.

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In summary, Citgo records dating back over a year showed the T/V ATHOS I was the only vessel arriving 1½ hrs past slack tide with a flood current. All other vessels of similar draft or higher arrived 2 hours later or more.

B.) Previous ACOE survey/dredge operation: - The most recent ACOE survey for Anchorage #9 was completed in June 2004. This was an annual survey conducted by ACOE, using single beam sonar at 400' centers. ACOE conducted a survey of the entire anchorage and found the area to be at project depth of 40' or higher, except for one region in the northern portion of the anchorage where it was found to be around 35' or higher.

The last dredge operation for Anchorage #9 was completed in July 1997. The survey was performed to verify dredging operation previously conducted by Weeks Marine. Weeks Marine only dredged northern portions of Anchorage #9 and none of the southern portions where the incident took place. However, ACOE conducted a survey of the entire anchorage and found the anchorage to be at project depth of 40' or higher, except for one small area that was approximately 38'. The previous dredge operation for the entire Anchorage #9 occurred in 1986 and was conducted by Norfolk Dredging.

IV CONCLUSIONS:

IV CONCLUSIONS:

From the analysis discussed in paragraphs 2, 4, 5, 6, 7 & 11 of Section III of this report, it clearly shows the cause of the incident is directly related to an undiscovered 18,000 lb anchor submerged within anchorage #9 in the Delaware River. The T/V ATHOS I struck this anchor while navigating towards Citgo Asphalt Refining Facility, Paulsboro, NJ.

1.) ENVIRONMENTAL CONDITIONS:

There is no evidence to suggest that environmental conditions were a factor in this incident. At the time of the incident, on-scene weather was reported as: west winds at 8 knots, seas-flat, visibility-12 nautical miles, full moon, and the temperature approximately 50° Fahrenheit.

2.) TIDAL CONDITIONS:

Neither the River Pilot, Docking Pilot, nor the Master of the vessel reported experiencing navigational challenges with regards to tidal currents or the sea state while transiting the Delaware River prior to the incident. Both pilots stated they were comfortable with the characteristics of the vessel along with the vessel's draft. Mr. Teal stated he would have piloted the T/V ATHOS I during any tidal stage and would only be concerned if the draft were higher than 37'. At no time was the current a contributing factor to this incident.

3.) ANCHORAGE/CHANNEL DEPTH/ NAVIGATION OF THE ATHOS I:

ACOE concluded the anchorage and channel were found at the project depth of 40', except for very small regions where the water depth was approximately 39.5'. There is no evidence showing the T/V ATHOS I strayed from the navigation channel along the Delaware River or from Anchorage #9.

4.) SUBMERGED OBJECTS:

ACOE and NOAA identified approximately a hundred submerged objects located on the river bottom that were at least 2 feet in height off of the river floor and ruled they were below project depth and not a hazard to navigation. Recent upgrades in ACOE standard single beam procedures have allowed Philadelphia ACOE district to begin running lines parallel to the channel/anchorage obtaining depths at 25' intervals along the channel/anchorage but still leaving 100' gaps between the soundings; however even with this new procedure, they are still unable to locate submerged objects. According to ACOE, they currently do not have the resources, equipment, or the funding to conduct annual multi beam surveys with side scan sonar to identify submerged objects that can be a hazard to navigation.

The AUSS group did identify several targets that proved to be the objects the T/V ATHOS I struck (concrete block, pump casing, navy stockless anchor). Forensic evidence from the National Transportation Safety Board's Report clearly showed paint samples taken off of the pump casing, concrete block, and the anchor matched a paint sample taken from the T/V

IV CONCLUSIONS:

ATHOS I's hull. Furthermore, the Coast Guard Marine Safety Lab reported oil samples taken off of the anchor **matched** oil samples taken from the T/V ATHOS I hull.

5.) **ANCHOR:**

The evidence suggests the T/V ATHOS I allided with the anchor first, due to the location/orientation of the damage sustained on the hull. The conclusive proof of this is that the cardboard template (created from the damaged hull section) **matched** the anchor's blade and fluke characteristics. Also the GPS track line developed by both NOAA and TMC shows the ATHOS I movement regarding the anchor's location and main damage location were inline with each other.

The vessel's allision with the anchor caused significant damage to both the #7 Port Wing Ballast Tank and the #7 Cargo Center Tank, causing approximately 263,371 gallons of oil to discharge into the Delaware River as well as creating a 7^o port list to the vessel. This port list created an approximate additional 5' of draft on the vessel's port bilge turn area, increasing the total draft on the port side to approximately 42.5'.

Evidence suggests the additional draft caused the vessel to strike the concrete block, pump casing, and possible other submerged objects that were below project depth. Damage sustained by these allisions were seen as scrapes and dents along the entire port section of the bottom of the hull as documented in paragraph 8 of the Finding of Facts section and paragraph 5 of the Analysis section.

6.) **OWNERSHIP OF SUBMERGED OBJECTS:**

At the time of this report, the Coast Guard has been unsuccessful in locating the owners of the three submerged objects, specifically the Navy Stockless Anchor. At the time of the incident, there were no laws or regulations requiring owners to report the loss or dumping of these objects to the Coast Guard, only that they may report them under 33 CFR 64.11(c). However, Coast Guard MSO/Group Philadelphia reviewed their notification records for possible items that were lost or dumped in the vicinity, with negative results. Furthermore, Coast Guard investigators requested the local Pilots (Delaware Bay Pilots Association) to report any historical knowledge of these items being lost or dumped over the pass 30 years, with negative results.

7.) **UNDER KEEL CLEARANCE REQUIREMENTS**

Owners of the T/V ATHOS I met Under Keel Clearance regulation requirements as listed in 33 CFR 157.455(a), by providing written procedures located in the ATHOS I's Vessel Operating Procedures (Safety Management System).

Furthermore, crewmembers, including the Master and the Navigation Officers, followed those written procedures. Mr. Ricardo Caro, Navigation Officer for T/V ATHOS I developed a passage plan according to the Vessel Operating Procedures and determined the Under Keel Clearance to be at 1.77 meters or 5.8 feet at Baker Range, Delaware River. In addition, the T/V ATHOS I Vessel Operating Procedures state, "It is normal to consider a water depth of approximately 110% of the maximum draught adequate for a moored, anchored or very slow moving ship." Calculations showed that 110% of vessel draft (36.5') would equal 40.15', just

IV CONCLUSIONS:

above the channel/anchorage project depth. However, the actual tidal height at the time of the incident was 0.63' given an anchorage depth of at least 40.63'.

Interviews with the River Pilot, Docking Pilot, and the Master show that the standard Pilot Master information exchange took place. However, no Under-Keel Clearance information was passed to both pilots as required by 33 CFR 157.455(b). While this is important information, evidence suggests this would not have prevented the incident.

8.) VIOLATIONS

There is no evidence of negligence or any violation of International Standards, US Code, or Federal Regulations on the part of the crew of the T/V ATHOS I, the River Pilot, nor the Docking Pilot that contributed to the incident. However, the River Pilot did violate Pennsylvania Statue 4 PA Code Part XIII Chapter 405.19a by disembarking the vessel prior to the vessel docking. But this did not contribute to the incident, nor could the incident have been prevented if the River Pilot remained onboard. No drugs and/or alcohol contributed to the cause of this incident, nor was crew fatigue a contributing factor.

9.) DOUBLE BOTTOM

Under U.S. Oil Pollution Act of 1990 (OPA 90), the T/V ATHOS I is not required to be double-bottomed until the year 2011. If the T/V ATHOS I had a double-bottom in place, the marine casualty would probably still have occurred, but it is very probable that the cargo tanks would not have been penetrated, thus avoiding a major oil spill. Evidence indicates the anchor penetrated the bottom of hull on the T/V ATHOS I a maximum of 18". The minimum void space in double bottom as required under OPA 90 for a vessel of this design would have been 6'.

V. RECOMMENDATIONS:

- 1.) It is recommended that Congress update the Refuse Act (33 USC 407) or create new legislation to require immediate reporting to the nearest Coast Guard unit, any objects that have been lost/discarded into a navigational channel or anchorage that can impede navigation.
- 2.) Recommend that the Army Corps of Engineers or any agency charged with surveying U.S. Navigational Channels and Anchorages, research available technologies that may help to document, identify, and/or track bottom debris, or bottom contour abnormalities, between subsequent surveys.
- 3.) That Commandant make the findings in this report available to professional mariners as a case history lesson that may prompt them to consider the presence of unknown objects/debris located in U.S. Navigable Waterways when they conduct voyage planning.
- 4.) That Commander, Sector Delaware Bay, along with the Mariner's Advisory Committee for the Bay and Delaware River, review navigation guidelines published in NOAA Coast Pilot 3 to determine whether these guidelines remains appropriate given the findings of this investigation.
- 5.) During the course of this investigation, it was discovered that there is often a difference between predicted tidal height and actual tidal height. Therefore, to ensure that the most updated information for planning a transit through a draft restricted area is used, it is recommended that persons responsible for voyage planning check/review the NOAA web site "<http://tidesonline.nos.noaa.gov/>" to compare actual tidal heights to predicted tidal heights.
- 6.) That copies of this report be forwarded to the Pilots Association for the Bay and River Delaware, Mariner's Advisory Committee for the Bay and Delaware River, and the flag state for the T/V ATHOS I in accordance with IMO Resolution A.849(20) for review and dissemination, as appropriate.
- 7.) That this case be closed